



JACAM LABORATORIES

## DownHole R<sub>x</sub>

### WATER CHEMISTRY

BERRY PETROLEUM  
ROB SIMEONE

I-31 CHEVRON 31-17  
SEPARATOR

Report Date: 10-05-2012    Sampled: 09-04-2012  
Sample #: 23937                      at 0000  
  
Sample ID: 2580

#### CATIONS

Calcium (as Ca)	222.40
Magnesium (as Mg)	16.66
Barium (as Ba)	39.34
Strontium (as Sr)	19.91
Sodium (as Na)	5878
Potassium (as K)	118.40
Lithium (as Li)	8.72
Ammonia (as NH <sub>3</sub> )	0.00
Aluminum (as Al)	0.00
Iron (as Fe)	56.94
Manganese (as Mn)	0.0120
Zinc (as Zn)	0.747
Lead (as Pb)	0.00

#### ANIONS

Chloride (as Cl)	9500
Sulfate (as SO <sub>4</sub> )	0.00
Bromine (as Br)	0.00
Dissolved CO <sub>2</sub> (as CO <sub>2</sub> )	671.00
Bicarbonate (as HCO <sub>3</sub> )	650.00
Carbonate (as CO <sub>3</sub> )	0.00
Oxalic acid (as C <sub>2</sub> O <sub>4</sub> )	0.00
Silica (as Si)	0.00
Phosphate(as PO <sub>4</sub> )	0.00
H <sub>2</sub> S (as H <sub>2</sub> S)	0.00
Fluoride (as F)	0.00
Nitrate (as NO <sub>3</sub> )	0.00
Boron (as B)	4.48

#### PARAMETERS

Calculated T.D.S.	16551
Molar Conductivity	22884
Resistivity	43.70
Density(g/mL)	1.01
Pressure(atm)	1.00
pCO <sub>2</sub> (atm)	0.0967
pH <sub>2</sub> S(atm)	0.00
Temperature (°F)	190.00
pH	6.60

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

**JACAM LABORATORIES****DownHole R<sub>x</sub>****DEPOSITION POTENTIAL INDICATORS**BERRY PETROLEUM  
ROB SIMEONEI-31 CHEVRON 31-17  
SEPARATOR

Report Date: 10-05-2012    Sampled: 09-04-2012  
Sample #: 23937                      at 0000  
  
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**SATURATION LEVEL**

Calcite (CaCO <sub>3</sub> )	2.18
Aragonite (CaCO <sub>3</sub> )	1.78
Witherite (BaCO <sub>3</sub> )	0.0859
Strontianite (SrCO <sub>3</sub> )	0.461
Calcium oxalate (CaC <sub>2</sub> O <sub>4</sub> )	0.00
Magnesite (MgCO <sub>3</sub> )	0.325
Anhydrite (CaSO <sub>4</sub> )	0.00
Gypsum (CaSO <sub>4</sub> *2H <sub>2</sub> O)	0.00
Barite (BaSO <sub>4</sub> )	0.00
Celestite (SrSO <sub>4</sub> )	0.00
Fluorite (CaF <sub>2</sub> )	0.00
Calcium phosphate	0.00
Hydroxyapatite	0.00
Silica (SiO <sub>2</sub> )	0.00
Brucite (Mg(OH) <sub>2</sub> )	< 0.001
Magnesium silicate	0.00
Iron hydroxide (Fe(OH) <sub>3</sub> )	1878
Strengite (FePO <sub>4</sub> *2H <sub>2</sub> O)	0.00
Siderite (FeCO <sub>3</sub> )	1828
Halite (NaCl)	< 0.001
Thenardite (Na <sub>2</sub> SO <sub>4</sub> )	0.00
Iron sulfide (FeS)	0.00

**MOMENTARY EXCESS (Lbs/1000 Barrels)**

Calcite (CaCO <sub>3</sub> )	0.219
Aragonite (CaCO <sub>3</sub> )	0.176
Witherite (BaCO <sub>3</sub> )	-6.24
Strontianite (SrCO <sub>3</sub> )	-0.630
Calcium oxalate (CaC <sub>2</sub> O <sub>4</sub> )	-0.241
Magnesite (MgCO <sub>3</sub> )	-0.671
Anhydrite (CaSO <sub>4</sub> )	-688.29
Gypsum (CaSO <sub>4</sub> *2H <sub>2</sub> O)	-929.64
Barite (BaSO <sub>4</sub> )	-2.50
Celestite (SrSO <sub>4</sub> )	-96.04
Fluorite (CaF <sub>2</sub> )	-20.14
Calcium phosphate	>-0.001
Hydroxyapatite	-486.40
Silica (SiO <sub>2</sub> )	-151.12
Brucite (Mg(OH) <sub>2</sub> )	0.0382
Magnesium silicate	-166.67
Iron hydroxide (Fe(OH) <sub>3</sub> )	< 0.001
Strengite (FePO <sub>4</sub> *2H <sub>2</sub> O)	>-0.001
Siderite (FeCO <sub>3</sub> )	0.467
Halite (NaCl)	-206930
Thenardite (Na <sub>2</sub> SO <sub>4</sub> )	-56184
Iron sulfide (FeS)	-0.0225

**SIMPLE INDICES**

Langelier	0.415
Ryznar	5.77
Puckorius	3.84
Larson-Skold Index	24.98
Stiff Davis Index	1.18
Oddo-Tomson	0.496

**BOUND IONS**

Calcium	222.40	211.09
Barium	39.34	39.34
Carbonate	14.23	0.695
Phosphate	0.00	0.00
Sulfate	0.00	0.00

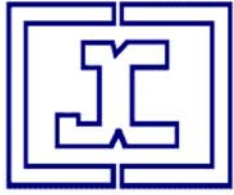
**TOTAL****FREE****OPERATING CONDITIONS**

Temperature (°F)	190.00
Time(secs)	0.00

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# DownHole SAT™ Water Analysis Report



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## SYSTEM IDENTIFICATION

BERRY PETROLEUM  
I-31 CHEVRON 31-17  
ROB SIMEONE  
SEPARATOR

Sample ID#: 23937  
ID: 2580  
Report Date: 10-05-2012  
Sample Date: 09-04-2012  
at 0000

## WATER CHEMISTRY

### CATIONS

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Magnesium(as Mg)	16.66
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Strontium(as Sr)	19.91
Sodium(as Na)	5878
Potassium(as K)	118.40
Lithium(as Li)	8.72
Iron(as Fe)	56.94
Field Iron(as Fe)	0.00
Ammonia(as NH <sub>3</sub> )	0.00
Aluminum(as Al)	0.00
Manganese(as Mn)	0.0120
Zinc(as Zn)	0.747
Lead(as Pb)	0.00

### ANIONS

Chloride(as Cl)	9500
Sulfate(as SO <sub>4</sub> )	0.00
Bromine(as Br)	0.00
Dissolved CO <sub>2</sub> (as CO <sub>2</sub> )	671.00
Bicarbonate(as HCO <sub>3</sub> )	650.00
Carbonate(as CO <sub>3</sub> )	0.00
Silica(as Si)	0.00
Phosphate(as PO <sub>4</sub> )	0.00
H <sub>2</sub> S (as H <sub>2</sub> S)	0.00
Fluoride(as F)	0.00
Nitrate(as NO <sub>3</sub> )	0.00
Boron(as B)	4.48

### PARAMETERS

Temperature(°F)	190.00
T.D.S.	16551
Resistivity:	43.70
Sample pH	6.60
Conductivity:	22884

## SCALE AND CORROSION POTENTIAL

Temp. (°F)	Press. (atm)	Calcite CaCO <sub>3</sub>		Anhydrite CaSO <sub>4</sub>		Gypsum CaSO <sub>4</sub> *2H <sub>2</sub> O		Barite BaSO <sub>4</sub>		Celestite SrSO <sub>4</sub>		Siderite FeCO <sub>3</sub>		Mackawenite FeS		CO <sub>2</sub> (mpy)	pCO <sub>2</sub> (atm)
50.00	0.00	0.265	-0.313	0.00	-1020	0.00	-837.44	0.00	-0.223	0.00	-107.22	96.85	0.129	0.00	-0.0148	0.0876	0.0967
65.45	0.00	0.379	-0.232	0.00	-1032	0.00	-863.57	0.00	-0.337	0.00	-110.27	156.11	0.163	0.00	-0.0153	0.164	0.0967
80.91	0.00	0.517	-0.160	0.00	-1011	0.00	-880.30	0.00	-0.478	0.00	-109.88	238.33	0.198	0.00	-0.0158	0.144	0.0967
96.36	0.00	0.677	-0.0956	0.00	-964.36	0.00	-888.36	0.00	-0.642	0.00	-107.67	345.91	0.232	0.00	-0.0164	0.189	0.0967
111.82	0.00	0.854	-0.0391	0.00	-901.46	0.00	-890.16	0.00	-0.826	0.00	-104.76	480.98	0.264	0.00	-0.0171	0.198	0.0967
127.27	0.00	1.06	0.0143	0.00	-845.27	0.00	-893.35	0.00	-1.05	0.00	-102.23	653.16	0.299	0.00	-0.0179	0.166	0.0967
142.73	0.00	1.29	0.0657	0.00	-797.07	0.00	-898.79	0.00	-1.32	0.00	-100.13	868.38	0.337	0.00	-0.0188	0.135	0.0967
158.18	0.00	1.56	0.116	0.00	-755.70	0.00	-906.50	0.00	-1.64	0.00	-98.42	1132	0.377	0.00	-0.0198	0.140	0.0967
173.64	0.00	1.85	0.166	0.00	-720.25	0.00	-916.52	0.00	-2.02	0.00	-97.09	1445	0.420	0.00	-0.0210	0.145	0.0967
189.09	0.00	2.16	0.216	0.00	-689.97	0.00	-928.90	0.00	-2.48	0.00	-96.09	1805	0.465	0.00	-0.0224	0.0731	0.0967
204.55	0.00	2.50	0.265	0.00	-664.29	0.00	-943.79	0.00	-3.01	0.00	-95.44	2209	0.512	0.00	-0.0242	0.0613	0.0967
220.00	0.171	2.81	0.315	0.00	-651.86	0.00	-974.54	0.00	-3.71	0.00	-96.34	2618	0.566	0.00	-0.0269	0.0835	0.113
		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 Levels (xSAT) are the ratio of ion activity to solubility, e.g. {Ca}{CO<sub>3</sub>}/K<sub>sp</sub>. pCO<sub>2</sub> (atm) is the partial pressure of CO<sub>2</sub> in the gas phase.

Lbs/1000 Barrels scale is the quantity of precipitation (or dissolution) required to instantaneously bring the water to equilibrium.

