



Catalyst Oilfield Services
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Gardendale, TX 79758
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Water Analysis Report

Customer:	Armstrong Energy	Sample #:	76884
Area:	Permian	Analysis ID #:	74273
Lease:	TBAU		
Location:	Battery		0
Sample Point:	INJ Pump		

		mg/l		meq/l	
Sampling Date:	11/8/2018	Anions		Cations	
Analysis Date:	11/9/2018	Chloride:	136293.0	3844.33	Sodium: 78220.0 3402.38
Analyst:	Catalyst	Bicarbonate:	147.0	2.41	Magnesium: 2534.0 208.46
TDS (mg/l or g/m3):	223904	Carbonate:			Calcium: 4750.0 237.03
Density (g/cm3):	1.154	Sulfate:	1000.0	20.82	Potassium: 705.5 18.04
		Borate*:	107.7	0.68	Strontium: 145.3 3.32
		Phosphate*:			Barium: 1.0 0.01
Hydrogen Sulfide:	1	*Calculated based on measured elemental boron and phosphorus.			Iron: 0.4 0.01
Carbon Dioxide:	680				Manganese: 0.099 0.
Comments:					
		pH at time of sampling:		6.8	
		pH at time of analysis:			
		pH used in Calculation:		6.8	
		Temperature @ lab conditions (F):		75	
					Conductivity (micro-ohms/cm): 243395
					Resistivity (ohm meter): .0411

Values Calculated at the Given Conditions - Amounts of Scale in lb/1000 bbl											
Temp	Calcite CaCO ₃		Gypsum CaSO ₄ *2H ₂ O		Anhydrite CaSO ₄		Celestite SrSO ₄		Barite BaSO ₄		
	Index	Amount	Index	Amount	Index	Amount	Index	Amount	Index	Amount	
80	0.48	6.22	-0.38	0.00	-0.34	0.00	-0.28	0.00	0.67	0.28	
100	0.52	7.35	-0.46	0.00	-0.36	0.00	-0.31	0.00	0.46	0.28	
120	0.56	8.48	-0.53	0.00	-0.35	0.00	-0.33	0.00	0.27	0.28	
140	0.59	9.89	-0.60	0.00	-0.32	0.00	-0.34	0.00	0.11	0.00	
160	0.62	11.58	-0.65	0.00	-0.27	0.00	-0.34	0.00	-0.02	0.00	
180	0.65	13.28	-0.70	0.00	-0.21	0.00	-0.34	0.00	-0.14	0.00	
200	0.68	14.97	-0.74	0.00	-0.13	0.00	-0.33	0.00	-0.24	0.00	
220	0.73	16.95	-0.78	0.00	-0.05	0.00	-0.32	0.00	-0.32	0.00	