

Water Chemistry for Three Water Sources

- Department of Energy - National Energy Technology Laboratory - Water Mixing and Scale Affinity Model - Used to evaluate potential waters
- Combining City water to East Hobbs San Andres water is favorable.
- Combining Devonian water to East Hobbs San Andres water will increase the volume of scale.

East Hobbs San Andres Unit Water Analysis Water Mixing and Scale Affinity Model

Version 1.00.000



Scale Calculations

Scale Calculations Results

Index Name	Index Result	Index Descriptions
Langelier Saturation Index	0.8553	Water tends to precipitate a scale layer of CaCO ₃ .
Stiff-Davis Stability Index	0.2974	Water is in equilibrium with CaCO ₃ . A scale layer of CaCO ₃ is neither precipitated nor dissolved.
Odoo-Tomson Scale Index	1.0905	Water tends to precipitate a scale layer of CaCO ₃ .
Ryznar Stability Index	4.4894	Heavy scale will form (Ryznar 1942). Heavy scale (Carrier 1955).
Puckorius Scaling Index	2.1651	Heavy scale will form.
Larson-Skold Index	21.8678	Dissolution of minerals may occur if available. (High rates of localized corrosion may be expected.)
Skilman Index	3.2059	Fixed at a Gypsum Ksp value for 25 C. Scaling will occur, formation of Calcium Sulfate (Gypsum).
Driving Force Index	2.9623	Scales form.
Aggressive Index	12.6314	Scales form.

Water Property

Phase	Value	Units
pe	0	
pH	6.2	
temp	43.3	C
Alkalinity as CaCO ₃	1525	ppm
Ba	0.3	ppm
Ca	709	ppm
Cl	8540	ppm
Fe	0.8	ppm
K	177	ppm
Mg	166	ppm
Na	5987	ppm
S(6)	1667	ppm
Si	21.8	ppm
TDS	18794	ppm

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Company: Tabula Rasa Energy

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City of Hobbs Water Analysis Water Mixing and Scale Affinity Model

Version 1.00.000



Scale Calculations

Scale Calculations Results

Index Name	Index Result	Index Descriptions
Langelier Saturation Index	0.2674	Water is in equilibrium with CaCO ₃ . A scale layer of CaCO ₃ is neither precipitated nor dissolved.
Stiff-Davis Stability Index	0.3954	Water is in equilibrium with CaCO ₃ . A scale layer of CaCO ₃ is neither precipitated nor dissolved.
Odoo-Tomson Scale Index	0.7018	Water tends to precipitate a scale layer of CaCO ₃ .
Ryznar Stability Index	6.7652	No difficulties (Ryznar 1942). Little scale or corrosion (Carrier 1955).
Puckorius Scaling Index	6.7756	No difficulties.
Larson-Skold Index	1.5326	Dissolution of minerals may occur if available. (High rates of localized corrosion may be expected.)
Skilman Index	0.2421	Fixed at a Gypsum Ksp value for 25 C. Dissolve mineral.
Driving Force Index	1.2105	Scales form.
Aggressive Index	11.9060	Stable water.

Water Property

Phase	Value	Units
pe	0	
pH	7.3	
temp	43.3	C
Alkalinity as CaCO ₃	219	ppm
Ca	73.8	ppm
Cl	122	ppm
Fe	0.02	ppm
Mg	13.6	ppm
Na	240	ppm
S(6)	124	ppm
TDS	792	ppm

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Devonian Water Analysis, Knowles South Water Mixing and Scale Affinity Model

Version 1.00.000



Scale Calculations

Scale Calculations Results

Index Name	Index Result	Index Descriptions
Langelier Saturation Index	2.8665	Water tends to precipitate a scale layer of CaCO ₃ .
Stiff-Davis Stability Index	2.0714	Water tends to precipitate a scale layer of CaCO ₃ .
Odoo-Tomson Scale Index	3.4474	Water tends to precipitate a scale layer of CaCO ₃ .
Ryznar Stability Index	1.4169	Heavy scale will form (Ryznar 1942).
Puckorius Scaling Index	-1.0321	Heavy scale will form.
Driving Force Index	873.8413	Scales form.
Aggressive Index	14.6692	Scales form.

Water Property

Phase	Value	Units
pe	0	
pH	7.15	
temp	43.3	C
Alkalinity as CaCO ₃	8257	ppm
Ca	1603	ppm
Cl	19995	ppm
Fe	3	ppm
Mg	1033	ppm
Na	10057	ppm
TDS	34655	ppm

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BEFORE THE OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
Exhibit No. 2
Submitted by: Linn Operating
Hearing Date: 7/16/2015