



Sidewall Core Analysis

Lawrence Berkeley Natl. Laboratory

Citizen Green #1 Well

**King Island Field
San Joaquin County, California**

FINAL REPORT

November 12, 2012

CL File: 57111-212369LA

Performed by:

Core Laboratories, Inc.

3437 Landco Drive

Bakersfield, California 93308

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November 12, 2012

Jonathan Ajo-Franklin
Lawrence Berkeley Natl. Laboratory
#1 Cyclotron Road, MS 90-1116
Berkeley, CA 94720

Subject: Sidewall Core Analysis
File No.: 57111-212369LA

Dear Mr. Ajo-Franklin:

Enclosed are final data for 15 rotary sidewall samples submitted to our laboratory from well Citizen Green #1, King Island Field, San Joaquin County, CA.

Air porosity, permeability, and saturation (PKS) determinations, along with white and ultraviolet light photographs, were performed on each of 15 samples. Brine permeability at 3400 psi was performed on the 14 suitable samples. Thin Section slides from endtrims of each sample were prepared. Per request, sample remainders were returned to Lawrence Berkeley National Laboratory. Core analysis procedures are documented on the following pages for reference.

Thank you for this opportunity to be of service to Lawrence Berkeley Natl. Laboratory. Please do not hesitate to contact us at (661-325-5657) if you have any questions regarding these results or if we can be of any additional service.

Sincerely,
Core Laboratories

Larry Kunkel
Area Manager

Distribution: 1 original report, 1 CD copy: Addressee





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Basic Test Procedures ⁽¹⁾

Core Analysis

- Remove visible drilling mud contamination from sidewall sample.
- Expose a fresh sample surface and photograph (if requested) under white and ultraviolet (UV) lighting.
- Retain endtrim for future analysis.
- Record lithological description.
- Package samples, if required, using nickel foil and end screens.
- Seat sleeve at depth - 100psi (750psi maximum).
- Remove water by Dean Stark extraction using toluene. Summation of fluids method used for samples <0.5" long or irregular shaped.
- Record stabilized produced water volume.
- Leach remaining oil and salts by Soxhlet extraction using an 80/20 mixture of methylene chloride/methanol.
- Dry at 235 °F to stable weight (minimum of 24 hours).
- Cool to ambient temperature in dessicator to prevent moisture accumulation.
- Record stable dry weight.
- Determine grain volume and grain density by helium expansion (Boyle's Law).
- Determine helium (Boyle's Law) pore volume at 250psi confining pressure.
- Determine steady-state permeability to air at 250psi confining pressure. Empirical method used for samples <0.5" long or irregular shaped.

(1) See Core Analysis Procedures page for specific methods used.






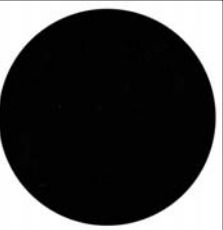




Company: Lawrence Berkely Natl. Lab.
 Well: Citizen Green #1
 Field: King Island

Location: Sec. 28-3N-5E
 Elevation:
 Drlg Fluid:

File No.: 57111-212369LA
 API No.: 04-077-20688
 Date : 8/10/2012

Rotary Sidewall Core Analysis Results

Core Images		Sample Number	Depth ft	Rec in	Perm. Kair md	Porosity %	Fluid Saturation				Grain Den g/cc	Sample Wt. g	Method
White Light	UV Light						Oil %	Water %	O/W Ratio	Total %			
		24	6400.0	1.5	367.1	33.0	0.0	90.1	0.00	90.1	2.68	23.0	4
Sst gy vf-fgr slty no stn no flor													
		23	6466.0	1.6	71.9	31.3	0.0	92.0	0.00	92.0	2.68	24.2	4
Sst gy vf-fgr vslty carb scly smica no stn no flor													
		22	6532.0	1.5	54.8	30.3	0.0	91.2	0.00	91.2	2.70	24.6	4
Sst gy vf-fgr vslty carb smica no stn no flor													
		21	6598.0	1.7	135.5	31.3	0.0	95.0	0.00	95.0	2.67	23.9	4
Sst gy vf-fgr slty carb smica no stn no flor													

F/ Indicates Visible Fracture(s) Present











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Core Images		Sample Number	Depth ft	Rec in	Perm. Kair md	Porosity %	Fluid Saturation				Grain Den g/cc	Sample Wt. g	Method
White Light	UV Light						Oil %	Water %	O/W Ratio	Total %			
		20	6664.0	1.4	46.4	30.8	0.0	90.1	0.00	90.1	2.66	22.4	4
Sst gy vfgr vslty carb scly mica no stn no flor													
		19	6800.0	1.3	4.8	27.7	0.0	96.0	0.00	96.0	2.65	20.0	4
Sst gy vfgr vslty carb scly smica no stn no flor													
		18	6840.0	1.7	4.0	27.4	0.0	95.2	0.00	95.2	2.65	22.7	4
Sst gy vfgr vslty cly carb smica no stn no flor													
		16	6918.0	1.7	0.006	1.8	0.0	92.5	0.00	92.5	2.73	30.9	4
Sst gy vfgr slty vcalc no stn no flor													

F/ Indicates Visible Fracture(s) Present











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Rotary Sidewall Core Analysis Results

Core Images		Sample Number	Depth ft	Rec in	Perm. Kair md	Porosity %	Fluid Saturation				Grain Den g/cc	Sample Wt. g	Method
White Light	UV Light						Oil %	Water %	O/W Ratio	Total %			
		15	6936.0	1.4	299.850	34.2	0.0	94.2	0.00	94.2	2.66	23.0	4
Sst gy vfgr slty mica no stn no flor													
		14	6955.0	0.4	<5.0	22.4	0.0	98.3	0.00	98.3	2.68	5.9	4
Mdst gy vsly no stn no flor													
		9	7104.0	1.6 F/	114.3	27.6	0.0	86.6	0.00	86.6	2.67	25.8	1
Sst gy vfgr vsly carb cly mica no stn no flor													
		8	7136.0	1.6	432.6	31.3	0.0	91.9	0.00	91.9	2.69	23.9	4
Sst gy vf-fgr slty-ssly smica no stn no flor													

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 Well: Citizen Green #1
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Location: Sec. 28-3N-5E
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 API No.: 04-077-20688
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Rotary Sidewall Core Analysis Results

Core Images		Sample Number	Depth ft	Rec in	Perm. Kair md	Porosity %	Fluid Saturation				Grain Den g/cc	Sample Wt. g	Method
White Light	UV Light						Oil %	Water %	O/W Ratio	Total %			
		7	7174.0	1.7	4.9	25.2	0.0	95.8	0.00	95.8	2.80	26.2	4
Sst gy vfgr vslty-slty carb scly mica no stn no flor													
		5	7258.0	1.7	2.3	23.1	0.0	99.0	0.00	99.0	2.70	25.7	4
Sst gy vf-fgr vslty scly no stn no flor													
		4	7309.0	1.5 F/	11.1	23.0	0.0	99.5	0.00	99.5	2.66	21.7	1
Sst gy vfgr vslty cly no stn no flor													

* - Air Perm. For sample 6936ft corrected due to data entry error

F/ Indicates Visible Fracture(s) Present



Company: Lawrence Berkely Natl. Lab.
 Well: Citizen Green #1
 Field: King Island

Location : Sec. 28-3N-5E
 Elevation :
 DrIng Fluid :

CL File No. : 57111-212369LA
 API No. : 04-077-20688
 Date : 8/10/2012

Humidity Controlled Core Analysis Results

Sample Number	Depth ft	Perm. Kair md	Routine POR %	Humid POR %	Routine So %	Humid So %	Routine Sw %	Humid Sw %	Routine GD g/cc	Humid GD g/cc	Wt Ratio Hum/Dry Ratio	Clay Factor %
24	6400.0	367.1	33.0	32.1	0.0	0.0	0.0	89.8	2.68	2.66	1.005	5.1
23	6466.0	71.9	31.3	29.7	0.0	0.0	0.0	91.6	2.68	2.64	1.009	8.6
22	6532.0	54.8	30.3	29.3	0.0	0.0	0.0	90.8	2.70	2.68	1.006	5.6
21	6598.0	135.5	31.3	30.8	0.0	0.0	0.0	94.9	2.67	2.66	1.003	2.9
20	6664.0	46.4	30.8	30.0	0.0	0.0	0.0	89.9	2.66	2.64	1.005	4.6
19	6800.0	4.8	27.7	26.2	0.0	0.0	0.0	95.8	2.65	2.61	1.008	8.0
18	6840.0	4.0	27.4	25.7	0.0	0.0	0.0	94.9	2.65	2.61	1.009	9.0
16	6918.0	0.006	1.8	1.2	0.0	0.0	0.0	88.6	2.73	2.72	1.002	2.3
15	6936.0	299.9	34.2	33.5	0.0	0.0	0.0	94.1	2.66	2.64	1.004	4.1
14	6955.0	<5.0	22.4	18.5	0.0	0.0	0.0	98.0	2.68	2.60	1.019	18.9
9	7104.0 F/	114.3	27.6	23.8	0.0	0.0	0.0	84.5	2.67	2.59	1.019	19.2
8	7136.0	432.6	31.3	30.6	0.0	0.0	0.0	91.7	2.69	2.67	1.004	3.9
7	7174.0	4.9	25.2	23.2	0.0	0.0	0.0	95.4	2.80	2.76	1.009	9.4
5	7258.0	2.3	23.1	21.6	0.0	0.0	0.0	98.9	2.70	2.67	1.007	7.3
4	7309.0 F/	11.1	23.0	19.4	0.0	0.0	0.0	99.5	2.66	2.59	1.017	17.4

* - Air Perm. For sample 6936ft corrected due to data entry error



Company: Lawrence Berkely Natl. Lab.
 Well: Citizen Green #1
 Field: King Island

File No.: 57111-212369LA
 API No.: 04-077-20688
 Date : 8/10/2012
 Core Type: Rotary SW Core

Core Analysis Procedures and Conditions

	Procedure (1)	Procedure (2)	Procedure (3)	Procedure (4)
Sampling Method	Percussion	Percussion	Percussion	Rotary
Drill Coolant	N/A	N/A	N/A	N/A
Jacket Material	Nickel	None	N/A	None
Saturation Method	Dean Stark (Toluene)	Dean Stark (Toluene)	Retort	Dean Stark (Toluene)
Porosity Method				
Grain Volume	Boyle's Law (Helium)	Boyle's Law (Helium)	Bulk Vol-Pore Vol	Boyle's Law (Helium)
Pore Volume	Boyle's Law (Helium)	Bulk Vol-Grain Vol	Summation Of Fluids	Bulk Vol-Grain Vol
Bulk Volume	Pore Vol + Grain Vol	Mercury Displacement	Mercury Displacement	Mercury Displacement
Permeability Method	Air	Empirical	Empirical	Air

Common Conditions

- Sleeved Sample Seating Pressure: N/A
- Confining Pressure Pore Vol & Permeability: 400 psig
- Samples Dried At 235 Degrees Fahrenheit
- Additional Extraction by Soxhlet with Methylene Chloride/Methanol
- Oil Density used in Calculation: 0.97g/cc



SUMMARY OF LIQUID PERMEABILITY MEASUREMENTS

Net Confining Stress: 3400 psi Temperature: 75°F

Fluid: Simulated Formation Brine

PETROLEUM SERVICES

Lawrence Berkeley Natl. Laboratory

Core Lab File No: 212369LA

Well: Citizen Green #1
Field: King Island
Location: San Joaquin County

Sample ID	Depth Interval, feet	Sample Orientation	Sample Length, cm	Sample Area, cm ²	Specific Permeability to Brine, mD
24	6400.0	H	2.590	4.247	2.72
23	6466.0	H	2.670	4.255	2.87
22	6532.0	H	2.650	4.287	23.1
21	6598.0	H	2.640	4.250	86.3
20	6664.0	H	2.510	4.203	23.6
19	6800.0	H	2.170	4.226	0.570
18	6840.0	H	2.480	4.181	0.670
16	6918.0	H	2.720	4.213	<0.001
15	6936.0	H	2.580	4.302	139
9	7104.0	H	2.750	4.314	0.00297
8	7136.0	H	2.660	4.218	123
7	7174.0	H	2.670	4.195	0.0973
5	7258.0	H	2.690	4.145	0.0353
4	7309.0	H	2.270	4.201	<0.001

Simulated Formation Brine requested by client: 18,700 ppm with 80% NaCl and 20% KCl

Brine Saturation Procedure

- Place dried samples in saturator cell.
- Vacuum samples overnight.
- Saturate samples with brine at 2000 psi for several hours
- Unload saturator, weigh samples and store under brine
- Load in hydrostatic coreholder at net confining stress.
- Flow through saturate sample with several pore volumes of brine at 400 psi back pressure.
- Begin brine permeability test.

Brine Permeability Procedure

- K_w was measured at three flow rates with the exception of the very low permeability samples.
- For low K_w samples, a constant pressure was applied and time and volume were used to calculate flow rate.
- Flow rate, differential pressure and test temperature were measured at each rate.
- Brine permeability was calculated using sample length & area, brine viscosity, flow rate and differential pressure.