LONQUIST SEQUESTRATION LLC	ATTACHMENT 01	Project No.: 2393.4
	Hackberry Carbon Sequestration, LLC Hackberry Carbon Sequestration Well No. 001 Drilling Prognosis	Date: January 2025
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Well: Hackberry Carbon Sequestration Well No. 001	**State:** Louisiana	**Parish:** Cameron	**Field:** N/A
Well API#: N/A	**Oper:** Hackberry Carbon Sequestration, LLC	**Location:** LA South Zone	**Status:** Class VI
TD: 10,100'	**Casing:** 9 5/8" x 7"	**Casing Shoe:** 10,100'	**Service:** CCS
LAT: 30° 01' 50.432" N	**LONG:** 093° 26' 53.740" W	**System:** NAD27	**Water Depth:** 4'

WORK PLAN:

1. Move in barge rig into drilling slip with tugs
    a. Expected water depth is 4'
2. Run a plumb-bob through the rotary to center well over survey marker
3. Orient rig per plan and sink the rig while holding position with tugs
4. Drive piling clusters in place
5. RU system for catching cuttings with closed top cuttings barges or cuttings boxes
    a. Make sure system has full containment for zero discharge
6. **CONTACT LDENR PRIOR TO DRIVING PIPE**
    a. Billy Carnes – LDENR Inspector
    (225) 405-7470
    b. 24 HOURS PRIOR TO DRIVING
    c. Log in Daily Report

DRIVE PIPE – 20": X-52 Grade; DDS; 166.56 lb/ft 0' – 200'

7. Drive 20" Drive Pipe
    a. Rig up hydraulic hammer
    b. Rig up handling equipment for 20" pipe
    c. Conductor Casing
        i. 20", 166.56 lb/ft, X-52 DDS
    d. Drive casing to refusal
        i. Approximately 200'
        ii. >120 blows/foot
        iii. Use drive-down joint to land top of pipe at ~ 3' below rotary table
    e. Rig down handling tools and hammer equipment
8. Rig up mud logging equipment and crew.
    a. Sample and log returns every 10' of drilled hole.

SURFACE HOLE – 17.5" Hole Size 0' – 2,500' TD

9. Weld on 20" x 21 1/4" 2M flange
10. Nipple Up 21 1/4" 2M mud cross and BOP assembly, bell nipple, and flow line
    a. Test
11. Pick up 17.5" drill bit appropriate bottom hole assembly
    a. Clean 20" Drive Pipe to TD
12. Circulate hole clean
13. Drill ahead with 17.5" drill bit to approximately 2,500'
    a. Drill with 8.5 to 9.0 ppg water-based drilling mud
        i. See attached mud program
14. Complete survey every 100' of drilled hole

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JML	01/28/2025					Louisiana Registered Firm No. EF7423

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Well: Hackberry Carbon Sequestration Well No. 001	**State:** Louisiana	**Parish:** Cameron	**Field:** N/A
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a. Maximum drift angle – 1 ½ degree
b. Maximum dog leg – ½ degree per 100'

15. Circulate hole clean and prepare for logging operation
    a. Minimum 2 bottoms up
16. POOH w/ 17.5" drill bit and BHA
17. Rig up wireline equipment
    a. Formation evaluation logging suite (Grand Slam)
    b. Run formation evaluation logging suite (see Logging Plan attached at end of Drilling Program)
    c. Run X-Y caliper on hole to determine hole volumes and location of cementation hardware
18. Rig down wireline equipment
19. **CONTACT LDENR PRIOR TO RUNNING AND CEMENTING CASING**
    a. **Billy Carnes – LDENR Inspector**
       (225) 405-7470
    b. **24 HOURS PRIOR TO RUNNING / CEMENTING**
    c. **Log in Daily Report**

SURFACE CASING – 13 3/8": L-80 Grade; BTC; 68 lb/ft 0' – 2,500' TD

20. Tally 13 3/8" casing
21. Rig up casing crews
22. Run 2,500' of 13 3/8" Surface Casing
    a. 13 3/8" Surface Casing: 68 lb/ft, L-80 Grade, BTC Connection with centralizers
    b. Guide shoe and float collars required
23. RDMO casing crew
24. Pick up drill pipe and cement hardware and RIH to float collar
25. Stab into float collar
26. Nipple up cementing head
27. Circulate and condition hole with 2 bottoms up
28. MIRU cement contractor
29. Cement 13 3/8" Casing to surface
    a. Minimum of 2 times the theoretical hole volumes
    b. Weighted spacer – 50 bbls @ 10 ppg flush
    c. Lead Cement – Type I Cement (2.34 cu.ft/sack), volume based on caliper log
    d. Tail Cement – Type I Cement (1.39 cu.ft/sack), top @ 500', volume based on caliper log
30. Circulate the cement to surface
31. Displace cement from drill pipe with conditioned drilling fluids
32. Top out 20" X 13 3/8" annulus with 50 sks lead cement
33. Rig down cement contractor and clean hole
34. Wait on Cement for 24 hours
    a. Send additional dry cement and freshwater samples and perform post job cement testing
    b. POOH drill pipe
35. Rig up wireline to run cased hole logs
    a. Temperature log

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b. Cement bond log

36. Nipple down diverter
37. Cut drive pipe to ~5' above water line
38. Cut off 13 3/8" casing and weld 13 3/8" X 13 5/8" 5M SOW
39. Rig up 13 5/8" drilling spool assembly and BOP Equipment
40. Nipple up 13 5/8" bell nipple and flow lines
41. Make up 12 1/4" drill bit and appropriate BHA
42. TIH to float equipment
43. **CONTACT LDENR PRIOR TO PRESSURE TESTING CASING**
    a. **Billy Carnes – LDENR Inspector**
       (225) 405-7470
    b. **24 HOURS PRIOR TO TESTING**
    c. **Log in Daily Report**
44. Pressure test the casing to LDENR specifications
    a. Pressure test surface casing to 600 psi for 1 hour
    b. File Form CSG-T with the LDENR
45. Drill out float collar and test to LDENR specifications
    a. Pressure test surface casing to 600 psi for 1 hour
    b. File Form CSG-T with the LDENR
46. Drill out float shoe and 15' of formation below 13 3/8" casing shoe and conduct formation integrity test (FIT)

INTERMEDIATE HOLE – 12.25" Hole Size 2,500' – 3,950' TD

47. Drill ahead with 12.25" bit to 3,950' TD
    a. Drill with 9.5 to 11.0 ppg water-based drilling mud
       i. See attached mud program
48. Complete survey every 100' of drilled hole
    a. Maximum drift angle – 1 ½ degree
    b. Maximum dog leg – ½ degree per 100'
49. Circulate hole clean
    a. Minimum 2 bottoms up
50. POOH with 12.25" bit assembly
51. Make up coring contractor and equipment
52. RIH with 30' coring barrel to TD
53. Core from 3,950' – 4,010'
    a. Attic Confinement
54. LD coring equipment
55. Make up 12 1/4" drill bit and appropriate BHA

INJECTION INTERVAL HOLE – 10.75" Hole Size 3,950' – 10,100' TD

56. Make up 10 3/4" drill bit and appropriate BHA
57. RIH to 3,950'

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58. Ream through cored interval then drill ahead with 10.75” bit to 7,440’
    a. Drill with 9.5 to 11.0 ppg water-based drilling mud
        i. See attached mud program
59. Complete survey every 100’ of drilled hole
    a. Maximum drift angle – 1 ½ degree
    b. Maximum dog leg – ½ degree per 100’
60. Circulate hole clean
    Minimum 2 bottoms up
61. POOH with 10.75” bit assembly
62. Make up coring contractor and equipment
63. RIH with 30’ coring barrel to TD
64. Core from 7,440’ – 7,500’
    a. Injection Interval
    b. Note: cores will be taken using 30’ coring barrels
65. LD coring equipment
66. Make up 10.75” drill bit and appropriate BHA
67. RIH to 7,440’
68. Ream through cored interval then drill ahead with 10.75” bit to 10,030’ TD
    a. Drill with 9.5 to 11.0 ppg water-based drilling mud
        i. See attached mud program
69. Circulate hole clean
    a. Minimum 2 bottoms up
70. POOH with 10.75” bit assembly
71. Make up coring contractor and equipment
72. RIH with 30’ coring barrel to TD
73. Core from 10,030’ – 10,090’
    a. Basement confinement
74. LD coring equipment
75. Make up 10.75” drill bit and appropriate BHA
76. RIH to 10,030’
77. Ream through cored interval then drill ahead with 10.75” bit to 10,100’ TD
    a. Drill with 9.5 to 11.0 ppg water-based drilling mud
        i. See attached mud program
78. Circulate hole clean
    a. Minimum 2 bottoms up
79. POOH with 10.75” bit assembly and lay down BHA
80. Rig up wireline equipment to run open hole logs
    a. Formation evaluation logging suite (Grand Slam)
    b. X-Y caliper on hole to determine hole volumes and location of cementation hardware
    c. Temperature
    d. XMAC Sonic
    e. Formation Tests X 4
    f. Spectra

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g. Directional survey
h. Sidewall coring
i. See Logging Plan attached at end of Drilling Program

81. Rig down wireline equipment

PRODUCTION CASING – Tapered String – 9 5/8”: L-80 Grade; Premium Conn.; 47 lb/ft 0’ – 3,550’ TD
9 5/8”: 22/25CR 110 ksi; Premium Conn.; 47 lb/ft 3,550’ – 3,950’ TD
7”: 22/25CR 110 ksi; Premium Conn.; 29 lb/ft 3,950’ – 10,100’ TD

82. Move 7” and 9 5/8” casing onto location
83. Rig up casing crews
84. Move in and rig up fiber optic equipment
85. Run 6,150’ of 7” casing for the injection interval
    a. 7” production casing: 29 lb/ft, 22/25CR 110 ksi Grade, Premium Connections with centralizers
    b. Cement retainer required
    c. Make up fiber optic cable, TEC and gauges
86. Make up and run 9 5/8” x 7” XO (est. set depth @ 3,970’)
87. Rig up 9 5/8” handling equipment
88. Make up and run PBR tool (est. set depth @ 3,950)
89. Rig up 9 5/8” handling equipment
90. Run 400’ of 9 5/8” casing from the PBR to 3,550’
    a. 9 5/8” production casing: 47 lb/ft, 22/25CR 110 ksi Grade, Premium Connections with centralizers
    b. Make up fiber optic cable and TEC
91. Make up and run galvanic XO
92. Run 3,550’ of 9 5/8” casing from the galvanic XO to surface
    a. 9 5/8” production casing: 47 lb/ft, L-80 Grade; Premium Connections with centralizers
    b. Make up fiber optic cable and TEC
93. RDMO casing crew
94. ND 13 5/8” BOP, riser, bell nipple, and flowline
95. Weld temporary flange on production casing
96. Nipple up DSA, 13 5/8” BOP, riser, bell nipple, and flowline
97. Test wellhead seals
98. Nipple up cementing head
99. Circulate and condition hole with 2 bottoms up
100. MIRU cement contractor
101. Cement tapered production string to surface
    a. 1.3 times the theoretical open hole volumes
    b. Lead Cement – PermaSet Corrosive Resistant Cement or equivalent (2.20 cu.ft/sack), volume based on caliper log
    c. Tail Cement – PermaSet Corrosive Resistant Cement or equivalent (1.32 cu.ft/sack), top @ 3,266’, volume based on caliper log
    d. Send wiper plug to chase tail
    e. Pressure increase to confirm wiper plug seated

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Well: Hackberry Carbon Sequestration Well No. 001	**State:** Louisiana	**Parish:** Cameron	**Field:** N/A
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102. Rig down cement contractor
103. Wait on Cement for 24 hours
    a. Send additional dry cement, resin, and freshwater samples and perform post job cement testing
104. Rig up wireline to run cased hole logs
    a. Temperature log
    b. Cement bond log on 9-5/8" X 7" casing string
    c. INTEX log to confirm resin bond
    d. Imaging caliper
    e. HRVert
    f. Pulse Neutron
    g. MDex
105. CONTACT LDENR PRIOR TO PRESSURE TESTING CASING
    a. Billy Carnes – LDENR Inspector
    (225) 405-7470
    b. **24 HOURS PRIOR TO TESTING**
    c. **Log in Daily Report**
106. Pressure test the casing to LDENR specifications
    a. Pressure test production casing to 1,500 psi for 1 hour
    b. File Form CSG-T with the LDENR
107. ND 13 5/8" BOP's
108. Nipple up remaining wellhead components
    a. Test wellhead seals with nitrogen equipment
109. Clean rig and inspect drill pipe
    a. Per IADC contract requirements.
110. Rig down and move out drilling rig
111. Turn over location to LA Storage personnel

DELAYED COMPLETION – Tapered String – 7": 22/25CR 110 ksi; Premium Conn.; 29 lb/ft 0' – 3,950' TD

112. Move in and rig up barge rig and equipment
113. Move 7" tubing onto location
114. Run injection packer assembly on work string
    a. 7" x 9-5/8" injection packer
    b. 7", 29 lb/ft, 22/25CR 110 ksi, Premium Conn. tail pipe and seal assembly for PBR
115. RIH to PBR at 3,950'
116. Sting into PBR
117. Set injection packer at 3,940' and pressure test
118. Sting out of packer, POOH and lay down workstring
119. Rig up casing crews and external pressure testing equipment
120. Run 3,940' of 7" tubing
    a. 7", 29 lb/ft, 22/25CR 110 ksi, Premium Conn. With packer seal assembly
    b. Pressure test each connection
121. Space out hanger joint

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122. Reverse circulate non-corrosive packer fluid in 7” x 9-5/8” annulus
123. Sting into injection packer and land hanger
124. Pressure test tubing hanger seals
125. Pressure test tubing casing annulus
126. Nipple up wellhead tree
    a. Test wellhead seals with nitrogen equipment
127. Rig up wireline to run cased hole logs
    a. MDex
128. Run perforation correlation log
    a. Log from TD to top of injection interval
129. Make up perforating guns, run in hole and perforate injection interval
    a. Correlate with through tubing gamma log
    b. Oriented perforating to avoid fiber optic cable and TEC
    c. Perforation depths to be confirmed based on open hole logging
130. Conduct stimulation as necessary
    a. Final stimulation procedures will be submitted to the LDENR for approval prior to execution
131. Conduct step-rate test
    a. Proposed step-rate test procedures will be submitted to the LDENR for approval prior to execution
132. Rig down and move out equipment

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Open Hole Logging Plan:

CARBON SEQUESTRATION / STRATIGRAPHIC TEST WELL

Hackberry Carbon Sequestration Well No. 001

OPEN HOLE LOGGING PLAN

Trip	Hole Section	Logging Suite	Target Data Acquisition	Open Hole Diameter	Depths of Survey
1	Surface Casing	Gyro Survey (Survey - prior to POOH)	Directional survey	17 1/2"	Surface - 2,500'
2		Gamma Ray HDIL/SP (Resistivity) Density Log Neutron Log Ttrm (Temperature)	Identification of Rock Properties		
3		Xmac-F1 (Sonic/Acoustic) Orientation Log Multi-Arm Caliper Gamma Ray Ttrm (Temperature)	Synthetic Ties Deep Shear Imaging Aid in Cement Calcs		
4	Production Casing	Gyro Survey (Survey - prior to POOH)	Directional survey	12 1/4" - 10 3/4"	2,500' - 10,100'
5		SpectraLog (GR) HDIL/SP (Resistivity) Density Log Neutron Log Ttrm (Temperature)	Identification of Rock Properties		
6		Xmac-F1 (Sonic/Acoustic) Orientation Log Multi-Arm Caliper Gamma Ray Ttrm (Temperature)	Synthetic Ties Deep Shear Imaging Aid in Cement Calcs		
7		Rotary Sidewall Cores	Augment Whole Core Data	10 3/4"	3,950' - 10,100'
8		STAR-XR (Resistivity Imaging) UXPL (Ultrasonic Imaging) Gamma Ray Ttrm (Temperature)	Structural Dip Analysis Max and Min Stress Regimes		
9		MReX (Magnetic Resonance) FLeX (Formation Lithology) Gamma Ray Ttrm (Temperature)	Determine Reservoir Storage Potential In-Situ Minerology		
10		Formation Fluid Sample Jar			
11		Formation Pressure Test			

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Cased Hole Logging Plan:

CARBON SEQUESTRATION / STRATIGRAPHIC TEST WELL

Hackberry Carbon Sequestration Well No. 001

CASED HOLE LOGGING PLAN

Trip	Hole Section	Logging Suite	Target Data Acquisition	Casing Dimension	Depths of Survey
1	Surface Casing	SBT (Radially Investigative Cement Inspection Tool) Gamma Ray CCL	Cement Investigation	13 3/8"	Surface - 2,500'
2	Production Casing	INTEX (Radially Investigative Cement Inspection Tool) Gamma Ray CCL	Cement Investigation	9 5/8" x 7" (Tapered String)	10,100' - 3,550'
2a		SBT (Radially Investigative Cement Inspection Tool) Gamma Ray CCL	Cement Investigation		3,550' - Surface
3		Imaging Caliper	Roundness and Ovality		10,100' - Surface
4 4a		HRVert (Vertilog)	Corrosion Identification Fiber Optic Cable Location		
5		Pulse Neutron	Gas Movement Behind Pipe		
6	Tubing & Packer	Mdex (Casing Wall Thickness)	Wall Thickness (Through Tubing)	7"	3,950' - Surface

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Notes:

1. Temperature logs will be taken if cement returns are not received back at surface.
2. Final depths are approximate targets with final determination to be made at time of drilling operations.

Certified By:
Lonquist Field Service, LLC
Louisiana Registration No. EF-5937

Ben H. Bergman, P.E.
Senior Engineer
Louisiana License No. 40184

Date Signed: December 22, 2022
Houston, Texas

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Wellbore Schematic

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WORK PLAN:

1. Move in barge rig into drilling slip with tugs
    a. Expected water depth is 4'
2. Run a plumb-bob through the rotary to center well over survey marker
3. Orient rig per plan and sink the rig while holding position with tugs
4. Drive piling clusters in place
5. RU system for catching cuttings with closed top cuttings barges or cuttings boxes
    a. Make sure system has full containment for zero discharge
6. **CONTACT LDENR PRIOR TO DRIVING PIPE**
    a. Billy Carnes – LDENR Inspector
    (225) 405-7470
    b. 24 HOURS PRIOR TO DRIVING
    c. Log in Daily Report

DRIVE PIPE – 20": X-52 Grade; DDS; 166.56 lb/ft 0' – 200'

7. Drive 20" Drive Pipe
    a. Rig up hydraulic hammer
    b. Rig up handling equipment for 20" pipe
    c. Conductor Casing
        i. 20", 166.56 lb/ft, X-52 DDS
    d. Drive casing to refusal
        i. Approximately 200'
        ii. >120 blows/foot
        iii. Use drive-down joint to land top of pipe at ~ 3' below rotary table
    e. Rig down handling tools and hammer equipment
8. Rig up mud logging equipment and crew.
    a. Sample and log returns every 10' of drilled hole.

SURFACE HOLE – 17.5" Hole Size 0' – 2,500' TD

9. Weld on 20" x 21 1/4" 2M flange
10. Nipple Up 21 1/4" 2M mud cross and BOP assembly, bell nipple, and flow line
    a. Test
11. Pick up 17.5" drill bit appropriate bottom hole assembly
    a. Clean 20" Drive Pipe to TD
12. Circulate hole clean
13. Drill ahead with 17.5" drill bit to approximately 2,500'
    a. Drill with 8.5 to 9.0 ppg water-based drilling mud
        i. See attached mud program
14. Complete survey every 100' of drilled hole

a. Maximum drift angle – 1 ½ degree
b. Maximum dog leg – ½ degree per 100'

15. Circulate hole clean and prepare for logging operation
    a. Minimum 2 bottoms up
16. POOH w/ 17.5" drill bit and BHA
17. Rig up wireline equipment
    a. Formation evaluation logging suite (Grand Slam)
    b. Run formation evaluation logging suite (see Logging Plan attached at end of Drilling Program)
    c. Run X-Y caliper on hole to determine hole volumes and location of cementation hardware
18. Rig down wireline equipment
19. **CONTACT LDENR PRIOR TO RUNNING AND CEMENTING CASING**
    a. **Billy Carnes – LDENR Inspector**
       (225) 405-7470
    b. **24 HOURS PRIOR TO RUNNING / CEMENTING**
    c. **Log in Daily Report**

SURFACE CASING – 13 3/8": L-80 Grade; BTC; 68 lb/ft 0' – 2,500' TD

20. Tally 13 3/8" casing
21. Rig up casing crews
22. Run 2,500' of 13 3/8" Surface Casing
    a. 13 3/8" Surface Casing: 68 lb/ft, L-80 Grade, BTC Connection with centralizers
    b. Guide shoe and float collars required
23. RDMO casing crew
24. Pick up drill pipe and cement hardware and RIH to float collar
25. Stab into float collar
26. Nipple up cementing head
27. Circulate and condition hole with 2 bottoms up
28. MIRU cement contractor
29. Cement 13 3/8" Casing to surface
    a. Minimum of 2 times the theoretical hole volumes
    b. Weighted spacer – 50 bbls @ 10 ppg flush
    c. Lead Cement – Type I Cement (2.34 cu.ft/sack), volume based on caliper log
    d. Tail Cement – Type I Cement (1.39 cu.ft/sack), top @ 500', volume based on caliper log
30. Circulate the cement to surface
31. Displace cement from drill pipe with conditioned drilling fluids
32. Top out 20" X 13 3/8" annulus with 50 sks lead cement
33. Rig down cement contractor and clean hole
34. Wait on Cement for 24 hours
    a. Send additional dry cement and freshwater samples and perform post job cement testing
    b. POOH drill pipe
35. Rig up wireline to run cased hole logs
    a. Temperature log

i. If cement returns not observed at surface

b. Cement bond log surface casing string

36. Nipple down diverter
37. Cut drive pipe to ~5' above water line
38. Cut off 13 3/8" casing and weld 13 3/8" X 13 5/8" 5M SOW
39. Rig up 13 5/8" drilling spool assembly and BOP Equipment
40. Nipple up 13 5/8" bell nipple and flow lines
41. Make up 12 1/4" drill bit and appropriate BHA
42. TIH to float equipment
43. **CONTACT LDENR PRIOR TO PRESSURE TESTING CASING**
    a. **Billy Carnes – LDENR Inspector**
       (225) 405-7470
    b. **24 HOURS PRIOR TO TESTING**
    c. **Log in Daily Report**
44. Pressure test the casing to LDENR specifications
    a. Pressure test surface casing to 600 psi for 1 hour
    b. File Form CSG-T with the LDENR
45. Drill out float collar and test to LDENR specifications
    a. Pressure test surface casing to 600 psi for 1 hour
    b. File Form CSG-T with the LDENR
46. Drill out float shoe and 15' of formation below 13 3/8" casing shoe and conduct formation integrity test (FIT)

INTERMEDIATE HOLE – 12.25" Hole Size 2,500' – 3,950' TD

47. Drill ahead with 12.25" bit to 3,950' TD
    a. Drill with 9.5 to 11.0 ppg water-based drilling mud
       i. See attached mud program
48. Complete survey every 100' of drilled hole
    a. Maximum drift angle – 1 ½ degree
    b. Maximum dog leg – ½ degree per 100'
49. Circulate hole clean
    a. Minimum 2 bottoms up
50. POOH with 12.25" bit assembly
51. Make up coring contractor and equipment
52. RIH with 30' coring barrel to TD
53. Core from 3,950' – 4,010'
    a. Attic Confinement
54. LD coring equipment
55. Make up 12 1/4" drill bit and appropriate BHA

INJECTION INTERVAL HOLE – 10.75" Hole Size 3,950' – 10,100' TD

56. Make up 10 3/4" drill bit and appropriate BHA

57. RIH to 3,950'
58. Ream through cored interval then drill ahead with 10.75" bit to 7,440'
    a. Drill with 9.5 to 11.0 ppg water-based drilling mud
        i. See attached mud program
59. Complete survey every 100' of drilled hole
    a. Maximum drift angle – 1 ½ degree
    b. Maximum dog leg – ½ degree per 100'
60. Circulate hole clean
    Minimum 2 bottoms up
61. POOH with 10.75" bit assembly
62. Make up coring contractor and equipment
63. RIH with 30' coring barrel to TD
64. Core from 7,440' – 7,500'
    a. Injection Interval
    b. Note: cores will be taken using 30' coring barrels
65. LD coring equipment
66. Make up 10.75" drill bit and appropriate BHA
67. RIH to 7,440'
68. Ream through cored interval then drill ahead with 10.75" bit to 10,030' TD
    a. Drill with 9.5 to 11.0 ppg water-based drilling mud
        i. See attached mud program
69. Circulate hole clean
    a. Minimum 2 bottoms up
70. POOH with 10.75" bit assembly
71. Make up coring contractor and equipment
72. RIH with 30' coring barrel to TD
73. Core from 10,030' – 10,090'
    a. Basement confinement
74. LD coring equipment
75. Make up 10.75" drill bit and appropriate BHA
76. RIH to 10,030'
77. Ream through cored interval then drill ahead with 10.75" bit to 10,100' TD
    a. Drill with 9.5 to 11.0 ppg water-based drilling mud
        i. See attached mud program
78. Circulate hole clean
    a. Minimum 2 bottoms up
79. POOH with 10.75" bit assembly and lay down BHA
80. Rig up wireline equipment to run open hole logs
    a. Formation evaluation logging suite (Grand Slam)
    b. X-Y caliper on hole to determine hole volumes and location of cementation hardware
    c. Temperature
    d. XMAC Sonic
    e. Formation Tests X 4

f. Spectra
g. Directional survey
h. Sidewall coring
i. See Logging Plan attached at end of Drilling Program

81. Rig down wireline equipment

PRODUCTION CASING – Tapered String – 9 5/8": L-80 Grade; Premium Conn.; 47 lb/ft 0' – 3,550' TD
9 5/8": 22/25CR 110 ksi; Premium Conn.; 47 lb/ft 3,550' – 3,950' TD
7": 22/25CR 110 ksi; Premium Conn.; 29 lb/ft 3,950' – 10,100' TD

82. Move 7" and 9 5/8" casing onto location
83. Rig up casing crews
84. Move in and rig up fiber optic equipment
85. Run 6,150' of 7" casing for the injection interval
    a. 7" production casing: 29 lb/ft, 22/25CR 110 ksi Grade, Premium Connections with centralizers
    b. Cement retainer required
    c. Make up fiber optic cable, TEC and gauges
86. Make up and run 9 5/8" x 7" XO (est. set depth @ 3,970')
87. Rig up 9 5/8" handling equipment
88. Make up and run PBR tool (est. set depth @ 3,950)
89. Rig up 9 5/8" handling equipment
90. Run 400' of 9 5/8" casing from the PBR to 3,550'
    a. 9 5/8" production casing: 47 lb/ft, 22/25CR 110 ksi Grade, Premium Connections with centralizers
    b. Make up fiber optic cable and TEC
91. Make up and run galvanic XO
92. Run 3,550' of 9 5/8" casing from the galvanic XO to surface
    a. 9 5/8" production casing: 47 lb/ft, L-80 Grade; Premium Connections with centralizers
    b. Make up fiber optic cable and TEC
93. RDMO casing crew
94. ND 13 5/8" BOP, riser, bell nipple, and flowline
95. Weld temporary flange on production casing
96. Nipple up DSA, 13 5/8" BOP, riser, bell nipple, and flowline
97. Test wellhead seals
98. Nipple up cementing head
99. Circulate and condition hole with 2 bottoms up
100. MIRU cement contractor
101. Cement tapered production string to surface
    a. 1.3 times the theoretical open hole volumes
    b. Lead Cement – PermaSet Corrosive Resistant Cement or equivalent (2.20 cu.ft/sack), volume based on caliper log
    c. Tail Cement – PermaSet Corrosive Resistant Cement or equivalent (1.32 cu.ft/sack), top @ 3,266', volume based on caliper log
    d. Send wiper plug to chase tail

e. Pressure increase to confirm wiper plug seated

102. Rig down cement contractor
103. Wait on Cement for 24 hours
    a. Send additional dry cement, resin, and freshwater samples and perform post job cement testing
104. Rig up wireline to run cased hole logs
    a. Temperature log
        i. If cement returns not observed at surface
    b. Cement bond log on 9-5/8" X 7" casing string
    c. INTEX log to confirm resin bond
    d. Imaging caliper
    e. HRVert
    f. Pulse Neutron
    g. MDex
105. **CONTACT LDENR PRIOR TO PRESSURE TESTING CASING**
    a. **Billy Carnes – LDENR Inspector**
       (225) 405-7470
    b. **24 HOURS PRIOR TO TESTING**
    c. **Log in Daily Report**
106. Pressure test the casing to LDENR specifications
    a. Pressure test production casing to 1,500 psi for 1 hour
    b. File Form CSG-T with the LDENR
107. ND 13 5/8" BOP's
108. Nipple up remaining wellhead components
    a. Test wellhead seals with nitrogen equipment
109. Clean rig and inspect drill pipe
    a. Per IADC contract requirements.
110. Rig down and move out drilling rig
111. Turn over location to LA Storage personnel

DELAYED COMPLETION – Tapered String – 7": 22/25CR 110 ksi; Premium Conn.; 29 lb/ft 0' – 3,950' TD

112. Move in and rig up barge rig and equipment
113. Move 7" tubing onto location
114. Run injection packer assembly on work string
    a. 7" x 9-5/8" injection packer
    b. 7", 29 lb/ft, 22/25CR 110 ksi, Premium Conn. tail pipe and seal assembly for PBR
115. RIH to PBR at 3,950'
116. Sting into PBR
117. Set injection packer at 3,940' and pressure test
118. Sting out of packer, POOH and lay down workstring
119. Rig up casing crews and external pressure testing equipment
120. Run 3,940' of 7" tubing
    a. 7", 29 lb/ft, 22/25CR 110 ksi, Premium Conn. With packer seal assembly

b. Pressure test each connection

121. Space out hanger joint
122. Reverse circulate non-corrosive packer fluid in 7" x 9-5/8" annulus
123. Sting into injection packer and land hanger
124. Pressure test tubing hanger seals
125. Pressure test tubing casing annulus
126. Nipple up wellhead tree
    a. Test wellhead seals with nitrogen equipment
127. Rig up wireline to run cased hole logs
    a. MDex
128. Run perforation correlation log
    a. Log from TD to top of injection interval
129. Make up perforating guns, run in hole and perforate injection interval
    a. Correlate with through tubing gamma log
    b. Oriented perforating to avoid fiber optic cable and TEC
    c. Perforation depths to be confirmed based on open hole logging
130. Conduct stimulation as necessary
    a. Final stimulation procedures will be submitted to the LDENR for approval prior to execution
131. Conduct step-rate test
    a. Proposed step-rate test procedures will be submitted to the LDENR for approval prior to execution
132. Rig down and move out equipment

LONQUIST SEQUESTRATION LLC	ATTACHMENT 01 **Hackberry Carbon Sequestration, LLC** **Hackberry Carbon Sequestration Well No. 001** **Drilling Prognosis**	**Project No.: 2393.4** **Date:** January 2025 **Page:** 8 **of** 11

Well: Hackberry Carbon Sequestration Well No. 001	**State:** Louisiana	**Parish:** Cameron	**Field:** N/A
Well API#: N/A	**Oper:** Hackberry Carbon Sequestration, LLC	**Location:** LA South Zone	**Status:** Class VI
TD: 10,100'	**Casing:** 9 5/8" x 7"	**Casing Shoe:** 10,100'	**Service:** CCS
LAT: 30° 01' 50.432" N	**LONG:** 093° 26' 53.740" W	**System:** NAD27	**Water Depth:** 4'

Open Hole Logging Plan:

CARBON SEQUESTRATION / STRATIGRAPHIC TEST WELL

Hackberry Carbon Sequestration Well No. 001

OPEN HOLE LOGGING PLAN

Trip	Hole Section	Logging Suite	Target Data Acquisition	Open Hole Diameter	Depths of Survey
1	Surface Casing	Gyro Survey (Survey - prior to POOH)	Directional survey	17 1/2"	Surface - 2,500'
2		Gamma Ray HDIL/SP (Resistivity) Density Log Neutron Log Ttrm (Temperature)	Identification of Rock Properties		
3		Xmac-F1 (Sonic/Acoustic) Orientation Log Multi-Arm Caliper Gamma Ray Ttrm (Temperature)	Synthetic Ties Deep Shear Imaging Aid in Cement Calcs		
4	Production Casing	Gyro Survey (Survey - prior to POOH)	Directional survey	12 1/4" - 10 3/4"	2,500' - 10,100'
5		SpectraLog (GR) HDIL/SP (Resistivity) Density Log Neutron Log Ttrm (Temperature)	Identification of Rock Properties		
6		Xmac-F1 (Sonic/Acoustic) Orientation Log Multi-Arm Caliper Gamma Ray Ttrm (Temperature)	Synthetic Ties Deep Shear Imaging Aid in Cement Calcs		
7		Rotary Sidewall Cores	Augment Whole Core Data	10 3/4"	3,950' - 10,100'
8		STAR-XR (Resistivity Imaging) UXPL (Ultrasonic Imaging) Gamma Ray Ttrm (Temperature)	Structural Dip Analysis Max and Min Stress Regimes		
9		MReX (Magnetic Resonance) FLeX (Formation Lithology) Gamma Ray Ttrm (Temperature)	Determine Reservoir Storage Potential In-Situ Minerology		
10		Formation Fluid Sample Jar			
11		Formation Pressure Test			

PREPARED BY	DATE	REVIEWED BY	DATE	APPROVED BY	DATE	Lonquist & Co., LLC
Joseph Lovewell	01/28/2025	Joseph Lovewell	1/28/2025	Ben Bergman	1/29/2025	Louisiana Registered Firm No. EF7423

Well: Hackberry Carbon Sequestration Well No. 001	**State:** Louisiana	**Parish:** Cameron	**Field:** N/A
Well API#: N/A	**Oper:** Hackberry Carbon Sequestration, LLC	**Location:** LA South Zone	**Status:** Class VI
TD: 10,100'	**Casing:** 9 5/8" x 7"	**Casing Shoe:** 10,100'	**Service:** CCS
LAT: 30° 01' 50.432" N	**LONG:** 093° 26' 53.740" W	**System:** NAD27	**Water Depth:** 4'

Cased Hole Logging Plan:

CARBON SEQUESTRATION / STRATIGRAPHIC TEST WELL

Hackberry Carbon Sequestration Well No. 001

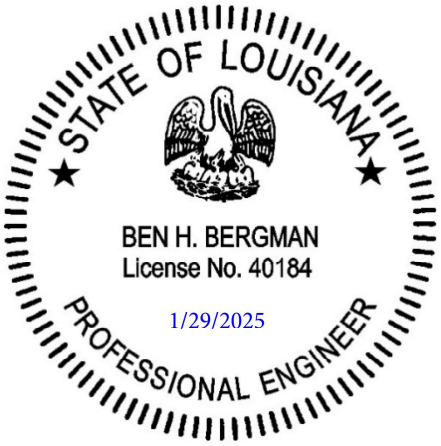
CASED HOLE LOGGING PLAN

Trip	Hole Section	Logging Suite	Target Data Acquisition	Casing Dimension	Depths of Survey
1	Surface Casing	SBT (Radially Investigative Cement Inspection Tool) Gamma Ray CCL	Cement Investigation	13 3/8"	Surface - 2,500'
2	Production Casing	INTEX (Radially Investigative Cement Inspection Tool) Gamma Ray CCL	Cement Investigation	9 5/8" x 7" (Tapered String)	10,100' - 3,550'
2a		SBT (Radially Investigative Cement Inspection Tool) Gamma Ray CCL	Cement Investigation		3,550' - Surface
3		Imaging Caliper	Roundness and Ovality		10,100' - Surface
4 4a		HRVert (Vertilog)	Corrosion Identification Fiber Optic Cable Location		
5		Pulse Neutron	Gas Movement Behind Pipe		
6	Tubing & Packer	Mdex (Casing Wall Thickness)	Wall Thickness (Through Tubing)	7"	3,950' - Surface

Well: Hackberry Carbon Sequestration Well No. 001	**State:** Louisiana	**Parish:** Cameron	**Field:** N/A
Well API#: N/A	**Oper:** Hackberry Carbon Sequestration, LLC	**Location:** LA South Zone	**Status:** Class VI
TD: 10,100'	**Casing:** 9 5/8" x 7"	**Casing Shoe:** 10,100'	**Service:** CCS
LAT: 30° 01' 50.432" N	**LONG:** 093° 26' 53.740" W	**System:** NAD27	**Water Depth:** 4'

Notes:

1. Temperature logs will be taken if cement returns are not received back at surface.
2. Final depths are approximate targets with final determination to be made at time of drilling operations.



Certified By:
Lonquist Field Service, LLC
Louisiana Registration No. EF-5937

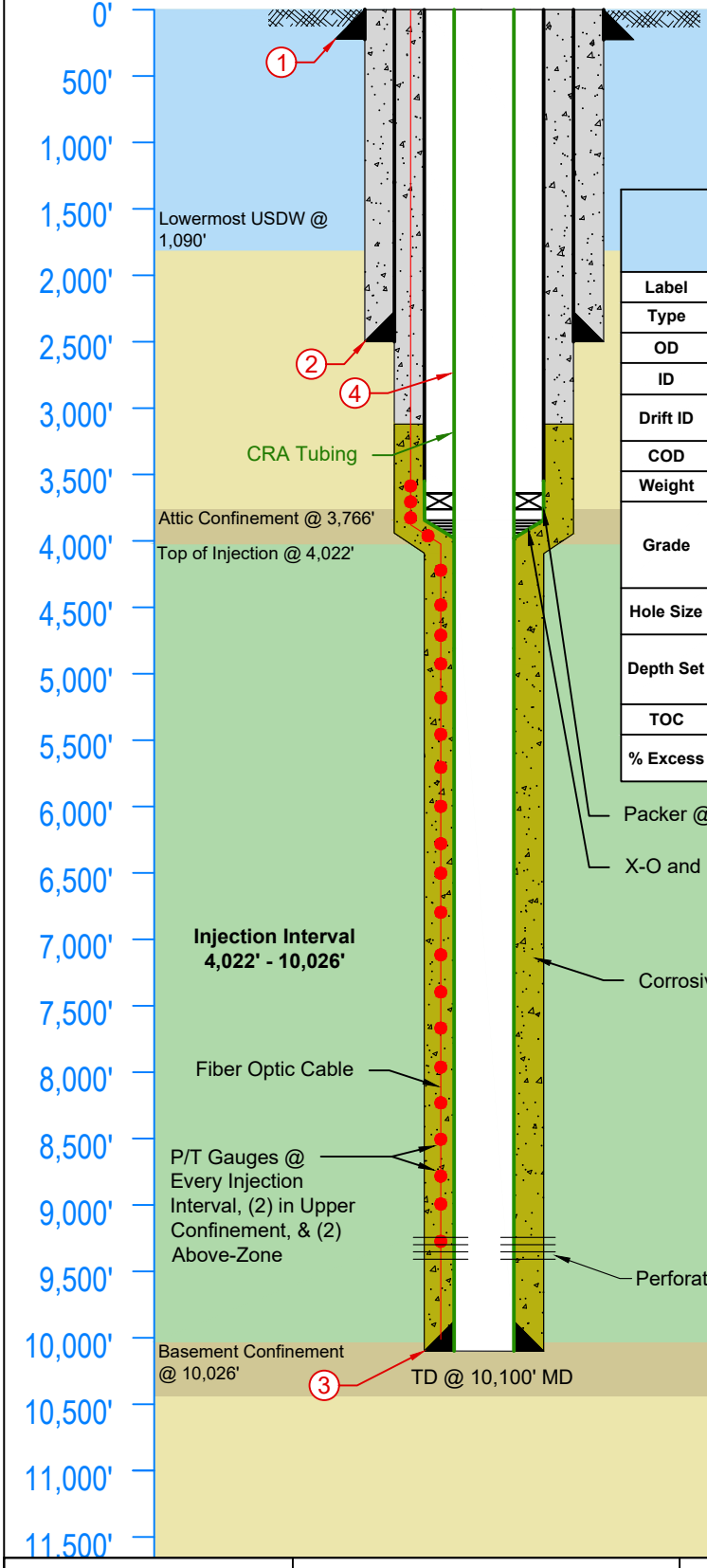
Ben H. Bergman 1/29/2025 P.E.

Ben H. Bergman, P.E.
Senior Engineer
Louisiana License No. 40184

Date Signed: January 29, 2025
Houston, Texas

Well: Hackberry Carbon Sequestration Well No. 001	**State:** Louisiana	**Parish:** Cameron	**Field:** N/A
Well API#: N/A	**Oper:** Hackberry Carbon Sequestration, LLC	**Location:** LA South Zone	**Status:** Class VI
TD: 10,100’	**Casing:** 9 5/8” x 7”	**Casing Shoe:** 10,100’	**Service:** CCS
LAT: 30° 01' 50.432" N	**LONG:** 093° 26' 53.740" W	**System:** NAD27	**Water Depth:** 4’

Wellbore Schematic



KB:	NA
BHF:	NA
GL:	NA
Spud:	NA

Casing/Tubing Information

Label	1	2	3			4
Type	Conductor	Surface	Production			Tubing
OD	18-5/8"	13-3/8"	9-5/8"	9-5/8"	7"	7"
ID	17.760"	12.415"	8.681"	8.681"	6.184"	6.184
Drift ID	N/A	12.259"	8.525"	8.525"	6.059"	6.059"
COD	N/A	14.375"	10.625"	10.625"	N/A	N/A
Weight	84.51 lb/ft	68 lb/ft	47 lb/ft	47 lb/ft	29 lb/ft	29 lb/ft
Grade	X-42	L-80 BTC	L-80 (0 - 3,550') Premium Conn.	22/25CR, 110ksi Premium Conn.	22/25CR, 110ksi Premium Conn.	22/25CR, 110ksi Premium Conn.
Hole Size	N/A	17-1/2"	12-1/4"	12-1/4"	10-3/4"	NA
Depth Set	Driven to Refusal (±200')	2,500'	3,550'	3,950'	Top: 3,950' Bottom: 10,100'	3,950'
TOC	N/A	Surface	Surface	Surface	Surface	NA
% Excess	N/A	100%	Caliper + 30%	Caliper + 30%	Caliper + 30%	NA

Coring Points	
Attic Confinement	3,950-4,010'
Injection Interval	7,440-7,500'
Base Confinement	10,030-10,090'

Ben H. Bergman P.E.

STATE OF LOUISIANA
BEN H. BERGMAN
License No. 40184
PROFESSIONAL ENGINEER

LONQUIST SEQUESTRATION LLC

Louisiana License EF-7423

12912 Hill Country Blvd. Ste F-200
Austin, Texas 78738
Tel: 512.329.6512
Fax: 512.732.9816

Hackberry Carbon Sequestration, LLC	Hackberry Carbon Sequestration Well No. 001	
Country: USA	**State/Province:** Louisiana	**County/Parish:** Cameron
API No: TBD	**Field:**	**Well Type/Status:** Class VI CCS
Permit No: TBD	**Project No:** 2393.4	**Date:** 01/27/2025
Drawn: Joseph Lovewell	**Reviewed:** Joseph Lovewell	**Approved:** Ben H Bergman
Rev No: 2	**Notes:**	

Lonquist & CO LLC

Well: Hackberry Carbon Sequestration Well #001
Rig Name: TBD

CemFACTS Report

Design Date: 02-10-23

Service Type: 9.625in x 7in Production

Customer Representative: Lonquist & CO LLC
Service Company Representative: Rodrigo Castanedo

Baker Hughes

An energy technology company

Baker Hughes CemFACTS Program Version 7.00

Job Number:
Customer: ***Lonquist & CO LLC***
Well Name: ***Hackberry Carbon Sequestration_Well #001***

Service Information	
Design Date:	02-10-23
Customer:	Lonquist & CO LLC
Well:	Hackberry Carbon Sequestration_Well #001
Location:	Black Lake
County:	Cameron
State:	LA
Customer Representative:	William H. George
Rig Name:	TBD
Service Type:	9.625in x 7in Production
Service District / Boat:	Houma
Service Company Representative:	Rodrigo Castanedo

Well Description			
Well Depth:	10100	ft	
Shoe Depth:	10100	ft	
Landing Collar Depth:	10020	ft	
Cement Top:	0	ft	
Previous Shoe Depth:	2500	ft	
Surface Temperature:	90	°F	
Static BHT:	199	°F	
Circulating BHT:	152	°F	
Surface Line Length:	200	ft	
Surface Line ID:	1.750	in	
Friction Pressure:	Concentric		
Cement Excess:	Increase Hole Size(s)		

Deviation	***Meas. Depth ft***	***Vert. Depth ft***	***Incl. Angle deg***	***Azimuth Angle deg***	
	2500	2500	0.0	0.0	
	10100	10100	0.0	0.0	

Hole	***Dia.***			***From***	***To***	
	in			***ft***	***ft***	
	12.415			0	2500	
	12.250			2500	4780	
	10.750			4780	10100	

Casing	***OD***	***ID***	***Weight***	***From***	***To***	
	in	***in***	***lbm/ft***	***ft***	***ft***	
9.625in Csg	9.625	8.681	47.00	0	4780	
7in Csg	7.000	6.184	29.00	4780	10100	

Miscellaneous				
Surf. Line 1 Volume:	1	bbl		
Surf. Line 2 Volume:	0	bbl		
Pipe Vol Above Collar:	545	bbl		
Pipe Vol Below Collar:	3	bbl		
Annulus Volume:	762	bbl		
Displacement Volume:	545	bbl	Use Surf. Line 1	
Total Volume:	1310	bbl	Use Surf. Line 1	
Casing Wt (Air):	378940	lbf		
Casing Wt (Eff):	266389	lbf		

Wellbore	***Start***	***End***		***Hole***	***Casing***	***Casing***	
Summary	***MD***	***MD***	***TVD***	***ID***	***OD***	***ID***	
	ft	***ft***	***ft***	***in***	***in***	***in***	
Cased	0	2500	2500	12.415	9.625	8.681	
Open	2500	4780	4780	12.934	9.625	8.681	
Open	4780	10100	10100	11.642	7.000	6.184	

Fluids (5 Total)

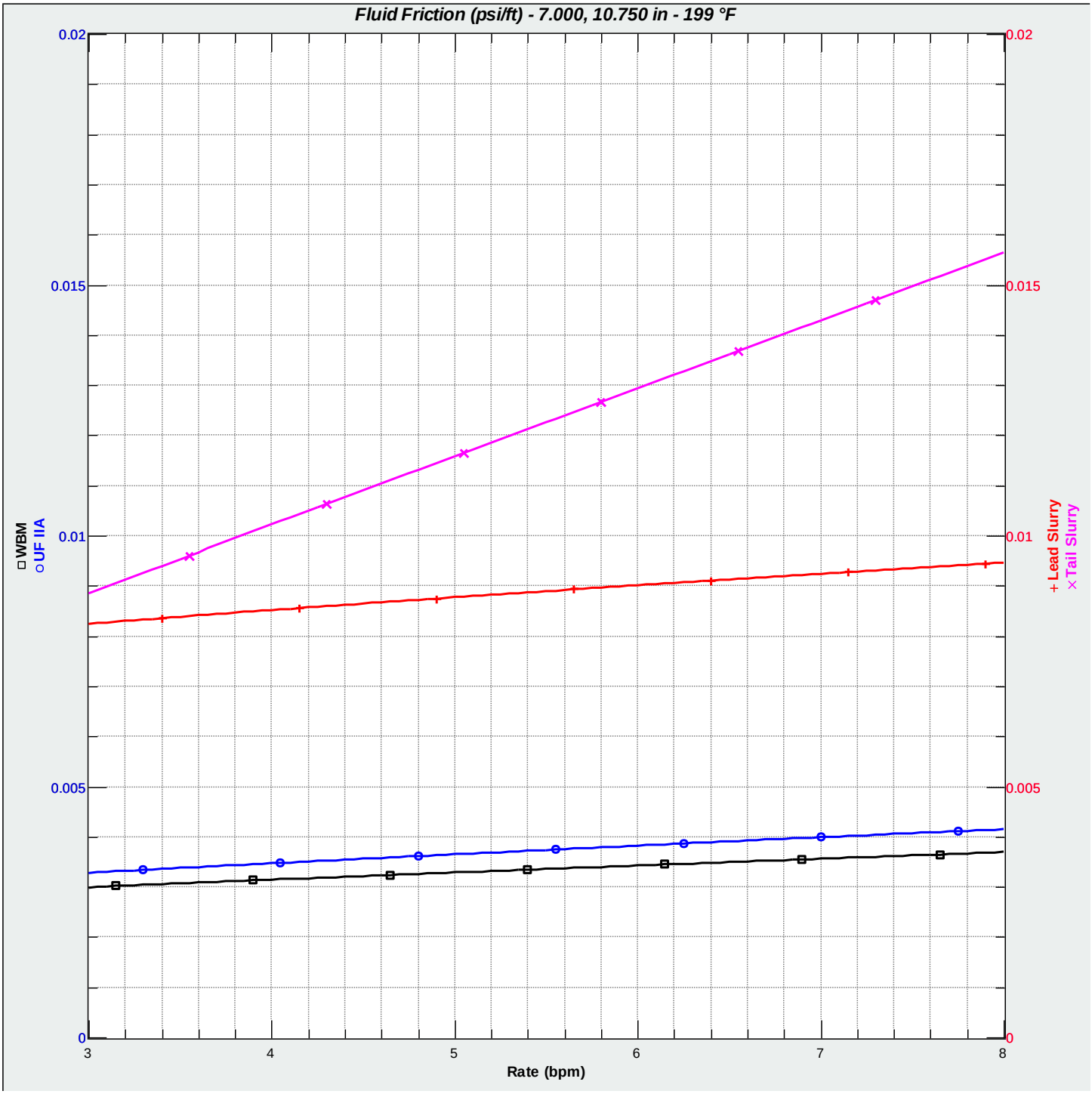
Fluid 1 Type:	***Initial Mud***		
Fluid Description:	***WBM***		
Gel Strength:	10.0	lbf/hft²	
Plastic Viscosity:	9.0	cp	
Yield Point:	2.5	lbf/hft²	
Density:	10.00	ppg	

Fluid 2 Type:	***Preflush or Spacer***		
Fluid Description:	***UF IIA***		
Plastic Viscosity:	11.5	cp	
Yield Point:	2.7	lbf/hft²	
Density:	10.50	ppg	
Fluid Volume:	50	bbl	
Water:	92.9	%	
Water Volume:	46	bbl	
Net Height:	0	ft	
Total Height:	0	ft	
Top:	0	ft	
Bottom:	0	ft	
Displacement Rate:	5.00	bpm	
Contact Time:	10.0	min	
Mixing Rate:	5.00	bpm	

Fluid 3 Type:	***Cement Slurry (Lead Slurry)***		
Fluid Description:	***Lead Slurry***		
Reference Temperature:	80	°F	
Plastic Viscosity:	18.2	cp	
Yield Point:	11.9	lbf/hft²	
Reference Temperature:	96	°F	
Plastic Viscosity:	13.3	cp	
Yield Point:	7.6	lbf/hft²	
Density:	11.00	ppg	
Cement Yield:	2.2000	ft³/sack	
Total Cement:	659	sacks	
Slurry Volume:	258	bbl	
Water:	9.12	gal/sack	
Water Volume:	143	bbl	
Excess:	30.0	%	
Excess:	0	ft	
Net Height:	4000	ft	
Total Height:	4000	ft	
Top:	0	ft	
Bottom:	4000	ft	
Mixing Rate:	10.2	sack/min	
Mixing Rate:	4.00	bpm	

Fluid 4 Type:	***Cement Slurry (PermaSet Tail)***		
Fluid Description:	***Tail Slurry***		
Reference Temperature:	80	°F	
n:	0.8542		
K:	0.6305	lbf.s^n/hft²	
Yield Point:	4.0	lbf/hft²	
Reference Temperature:	134	°F	
Plastic Viscosity:	110.0	cp	
Yield Point:	4.1	lbf/hft²	
Density:	13.00	ppg	
Cement Yield:	1.3242	ft³/sack	
Total Cement:	2149	sacks	
Slurry Volume:	507	bbl	
Water:	3.53	gal/sack	
Water Volume:	181	bbl	
Excess:	30.0	%	
Excess:	0	ft	
Net Height:	6100	ft	
Total Height:	6100	ft	
Top:	4000	ft	
Bottom:	10100	ft	
Mixing Rate:	17.0	sack/min	
Mixing Rate:	4.00	bpm	

Fluid 5 Type:	***Displacement***		
Fluid Description:	***WBM***		
Plastic Viscosity:	9.0	cp	
Yield Point:	2.5	lbf/hft²	
Density:	10.00	ppg	
Fluid Volume:	545	bbl	
Water:	95.0	%	
Water Volume:	518	bbl	
Total Height:	10020	ft	
Top:	0	ft	
Bottom:	10020	ft	



Final Pressures

Fluid	*From*	*To*	*Hydrostatic*	
	ft	*ft*	*psi*	
5. WBM	0	10020	5204	
4. Tail Slurry	10020	10100	54	
4. Tail Slurry	10100	4000	4119	
3. Lead Slurry	4000	0	2285	
2. UF IIA	0	0	0	
1. WBM	0	0	0	

Pressure Summary					
Back Pressure:	0	psi			
Pressure @ Shoe in Pipe:	5258	psi	10.02	ppg	
Pressure @ Shoe in Annulus:	6404	psi	12.21	ppg	
Differential Pressure @ Shoe:	1146	psi	2.18	ppg	

Critical Depths	*Meas. Depth*	*Vert. Depth*	*Pore Press.*	*Actual Press.*	*Frac Press.*	*Pore Den.*	*Actual Den.*	*Frac Den.*	*Crit.gel Str.*	
	ft	*ft*	*psi*	*psi*	*psi*	*ppg*	*ppg*	*ppg*	*lbf/hft²*	
Lead Slurry	2500	2500	1169	1428	1650	9.00	11.00	12.71	86.9	
Tail Slurry	10100	10100	4721	6404	6666	9.00	12.21	12.71	384.2	

Caution

Critical gel strength calculation is based on certain assumptions. Please verify.

Operating Schedule

Segment	*Volume*	*Rate*	*Time*	*Cum.Time*	*Surf. Line*	*Rotation*	
	bbl	*bpm*	*min*	*min*		*rpm*	
UF IIA	50	5.00	10.0	10.0	1	0	
Lead Slurry	258	4.00	64.5	74.5	1	0	
Tail Slurry	507	4.00	126.7	201.2	1	0	
WBM	380	6.00	63.3	264.5	1	0	
WBM	150	4.00	37.5	302.0	1	0	
WBM	15	2.00	7.6	309.6	1	0	

Pipe Movement	None

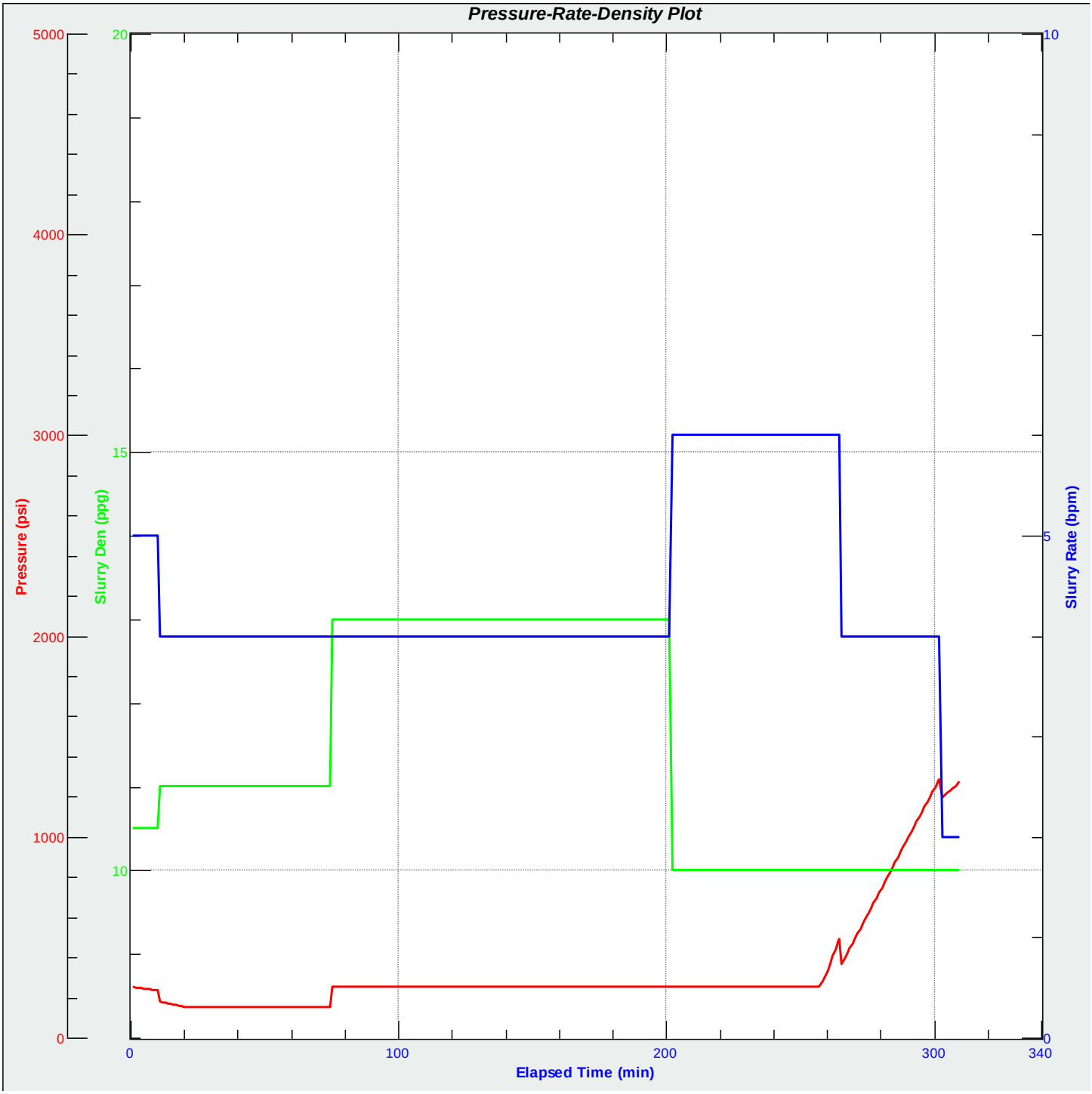
Flow Behavior	*Inner Dia*	*Outer Dia*	*Pump Rate*	*Fluid Vel.*	*Rey. No.*	*Qmin Turb.*	*Ref. Temp.*	
	in	*in*	*bpm*	*ft/min*		*bpm*	*°F*	
WBM	7.000	10.750	34.44	532.7	34470	8.32	199	
UF IIA	7.000	10.750	60.51	935.8	49329	8.39	199	
Lead Slurry	7.000	10.750	47.94	741.4	35500	13.77	199	
Tail Slurry	7.000	10.750	108.19	1673.1	11465	20.95	199	

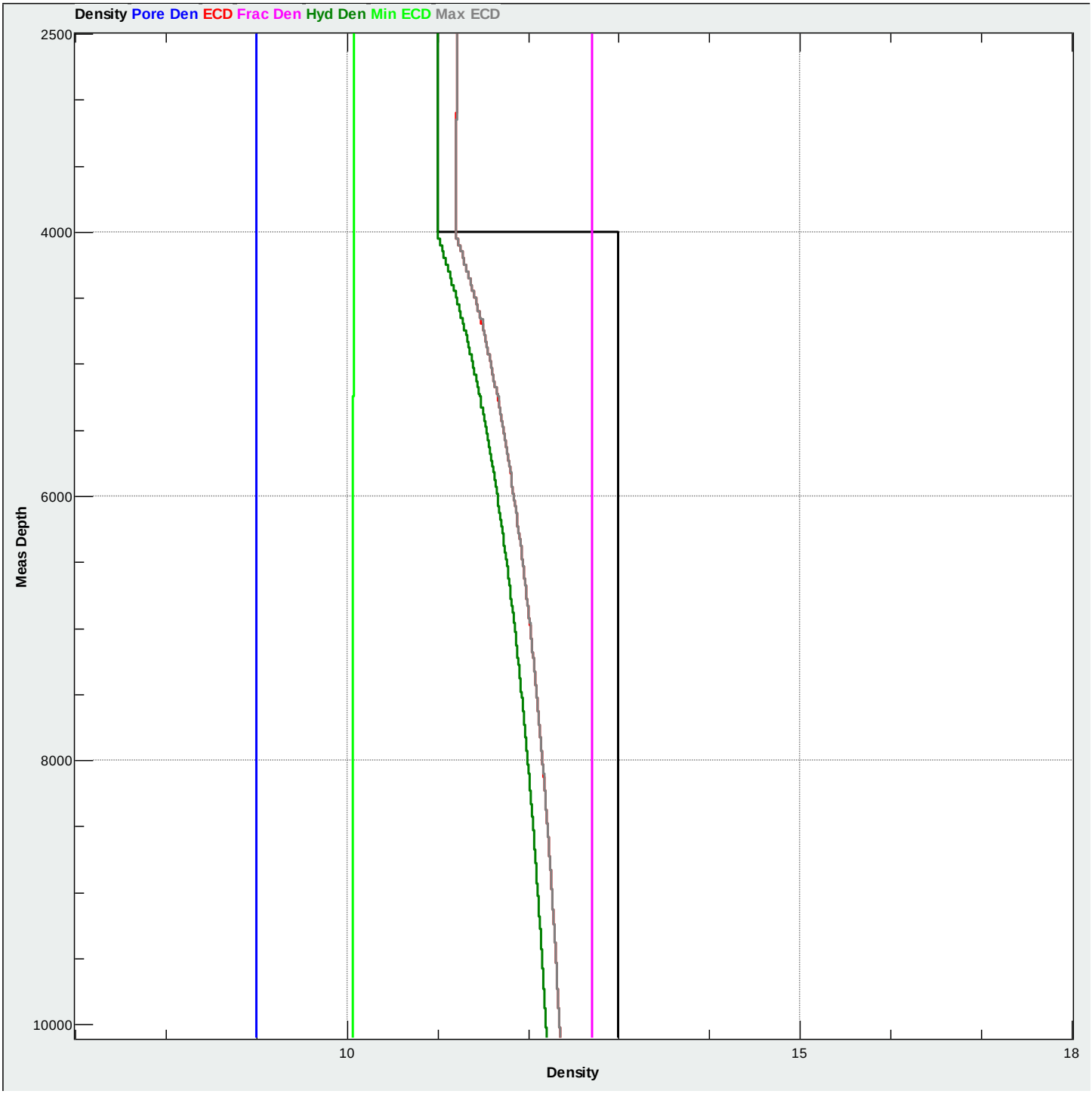
Summary			
Est. Max Disp. Rate:	16.00	bpm	
Slurries Mixing Time:	191.2	min	
Displacement Time:	108.4	min	
Net (From Cement Mixing):	299.6	min	
Total (From Start):	309.6	min	

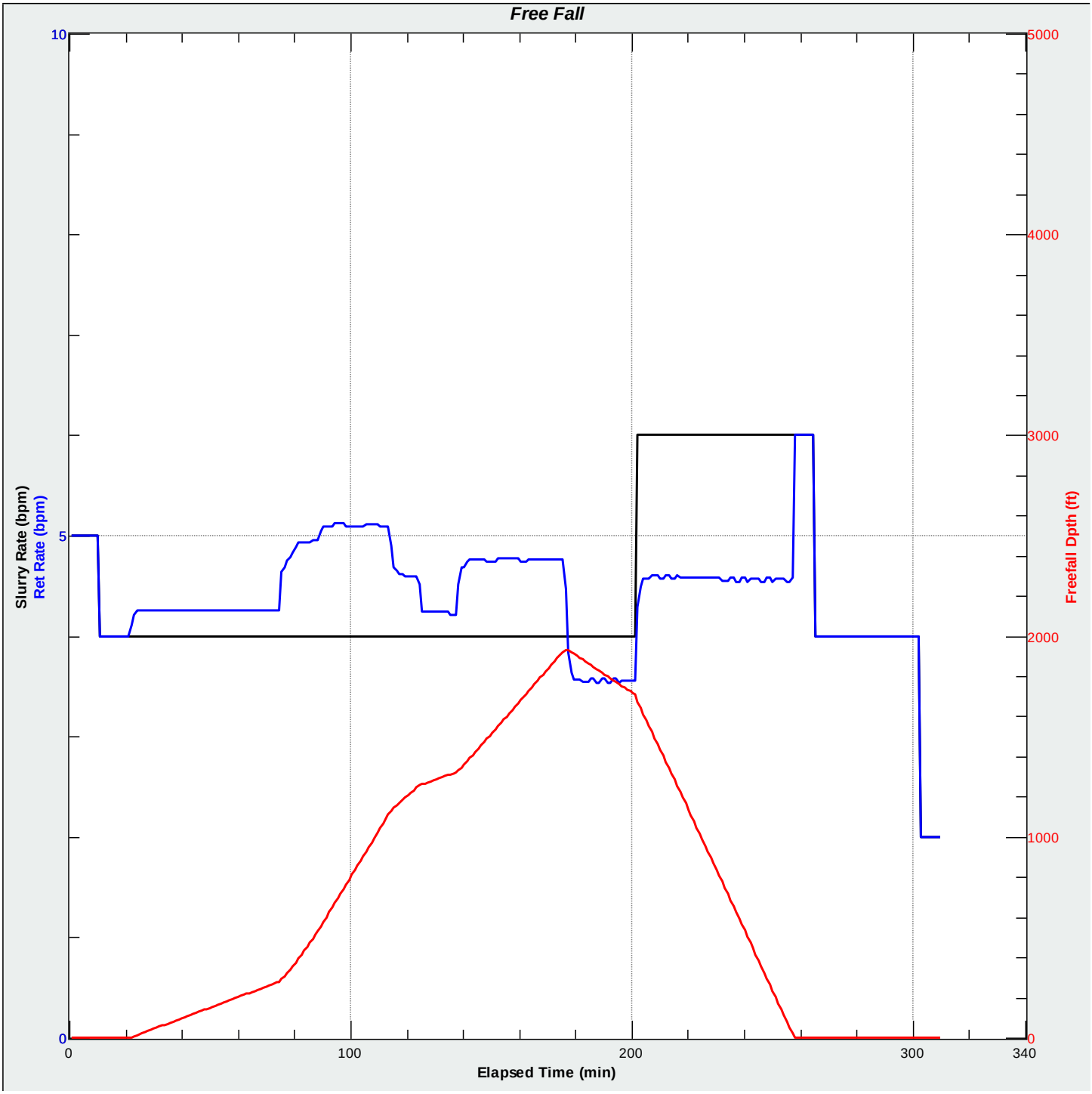
Operator's Worksheet

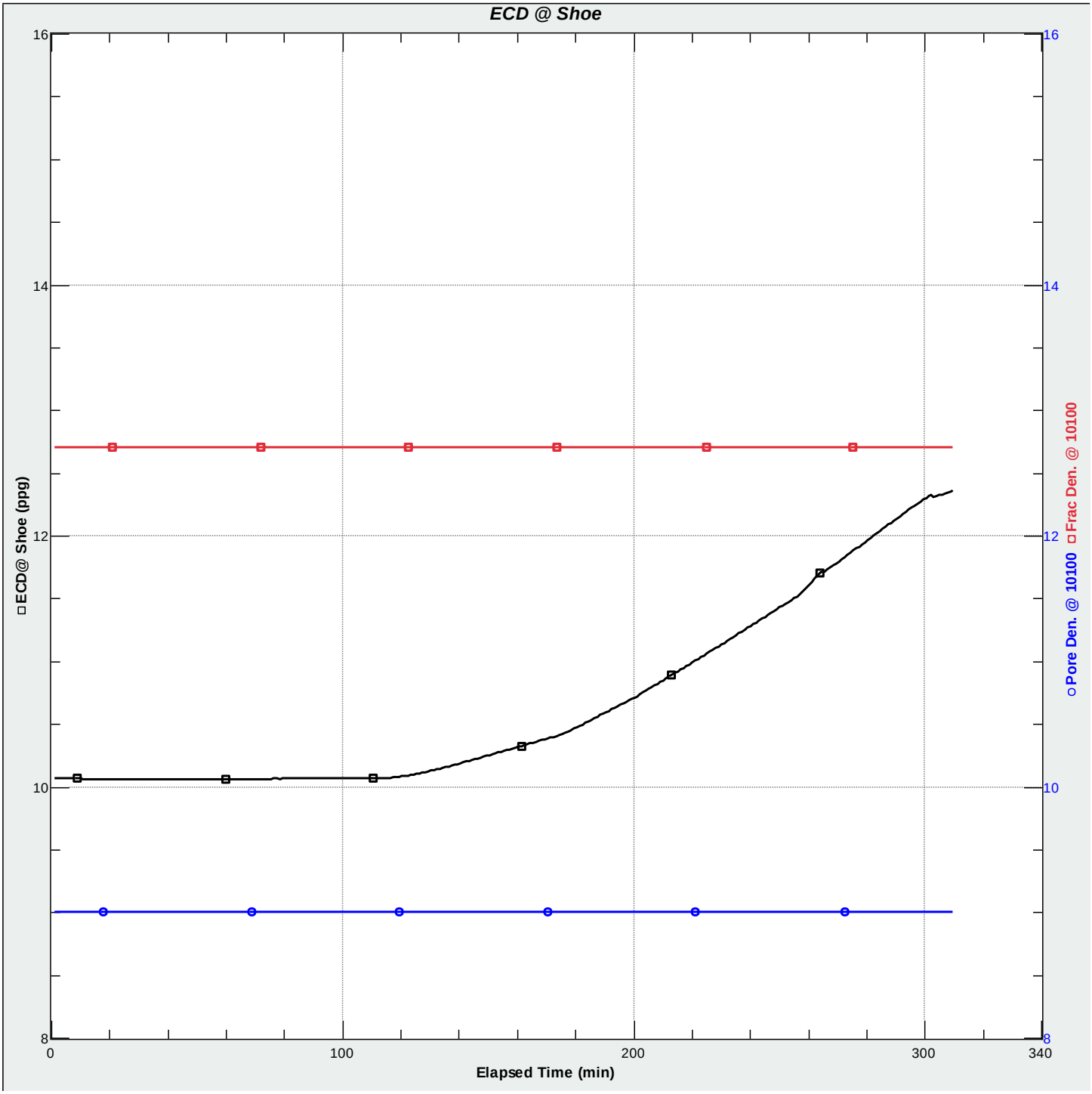
Fluid	***Volume***	***Cement***	***From***	***To***	***Hydrostatic***	
	bbl	***sacks***	***ft***	***ft***	***psi***	
WBM	---	---	0	0	0	
UF IIA	50	---	0	0	0	
Lead Slurry	258	659	0	4000	2285	
Tail Slurry	507	2149	4000	10100	4119	
WBM	545	---	10020	0	5204	

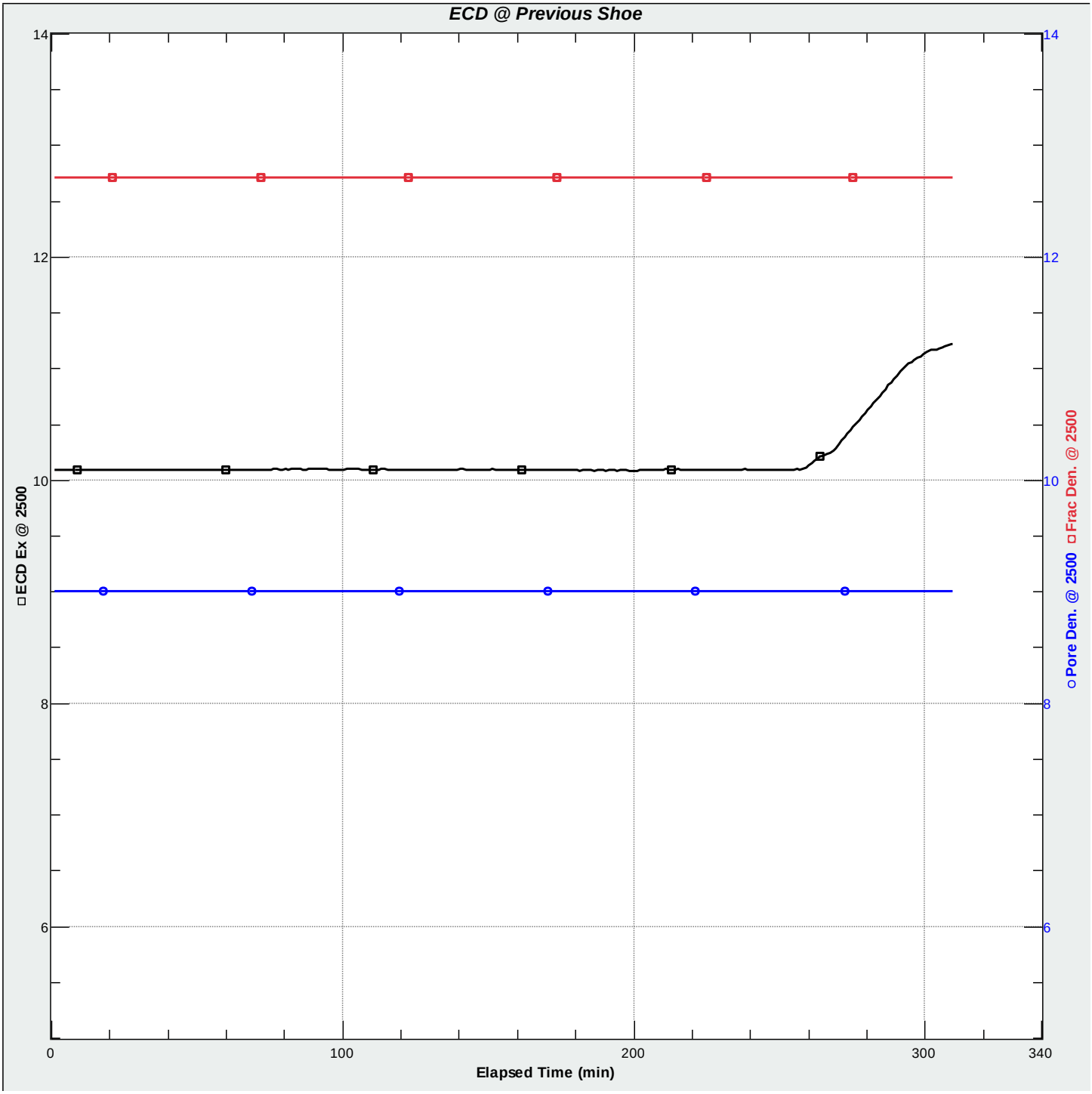
Pumping	***Volume***	***Mixing***	***Foam***	***Gas***	***Gas***	***Mix/Dsp***	***Gas***	***Ref.***	
Schedule		***Den.***	***Den.***	***Ratio***	***Total***	***Rate***	***Rate***	***Pres***	
	bbl	***ppg***	***ppg***	***scf/bbl***	***scf***	***bpm***	***scf/min***	***psi***	
UF IIA	50	10.50	---	---	---	5.00	---	---	
Lead Slurry	258	11.00	---	---	---	4.00	---	---	
Tail Slurry	507	13.00	---	---	---	4.00	---	---	
WBM	380	10.00	---	---	---	6.00	---	---	
WBM	150	10.00	---	---	---	4.00	---	---	
WBM	15	10.00	---	---	---	2.00	---	---	

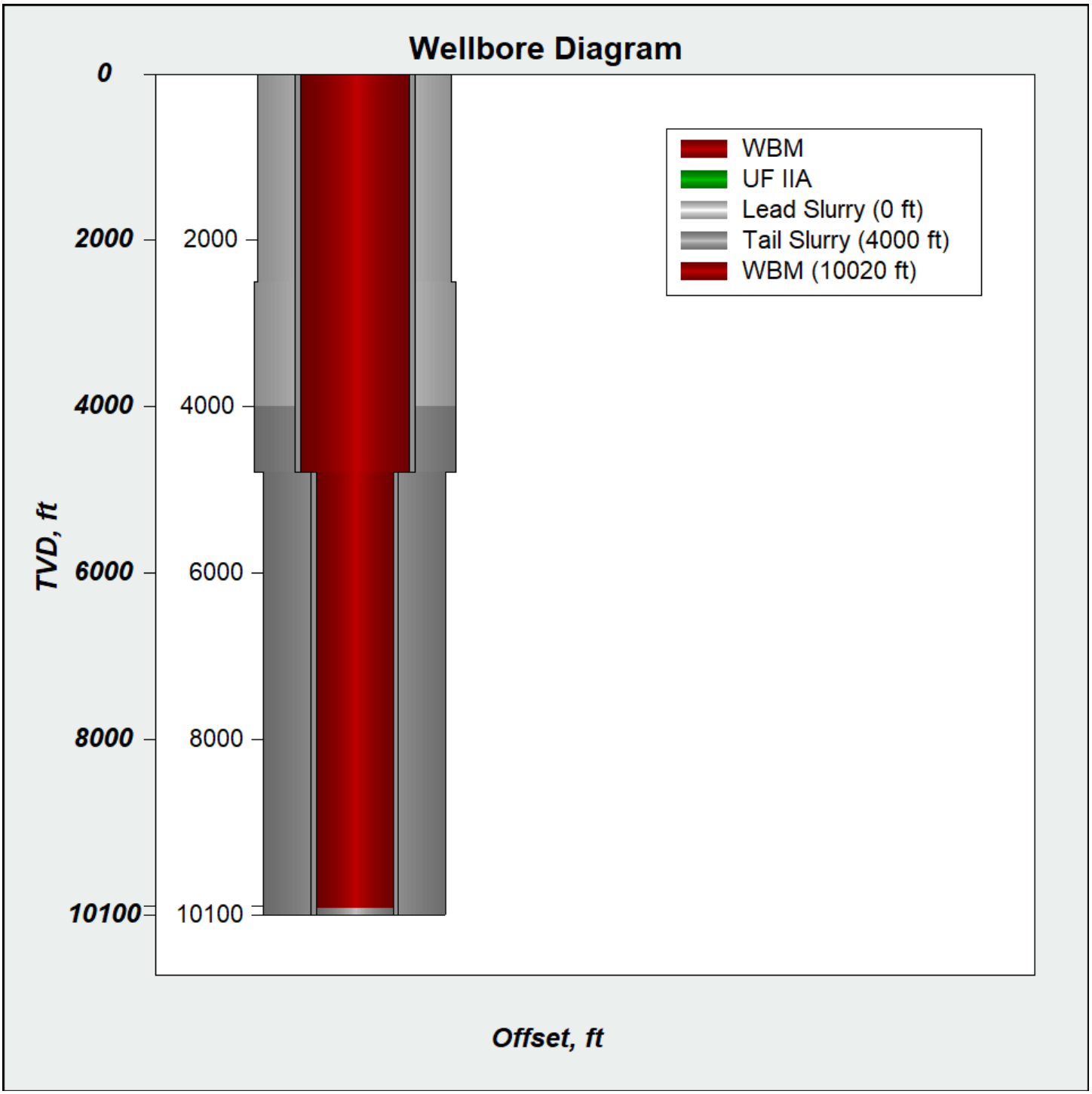


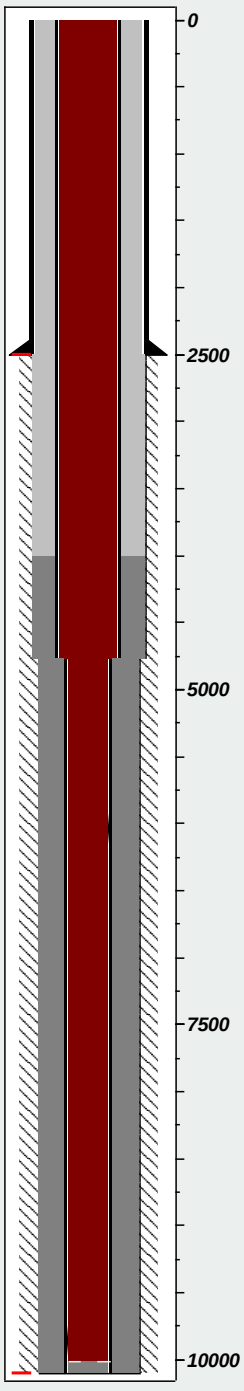












MD=10100 ft, Volumes in bbl

Design		Actual	Stage
1360		1360 1359	Slurry Total Return Total
50 258 507 380 150 15		50 258 507 380 150 15	01. UF IIA 02. Lead Slurry 03. Tail Slurry 04. WBM 05. WBM 06. WBM

Elapsed Time (min)	*Design Den (ppg)*	*Slurry Rate (bpm)*	*Pressure (psi)*	*ECD@ Shoe (ppg)*	*ECD Ex @ 2500*
1.0	10.50	5.00	251	10.06	10.09
2.0	10.50	5.00	250	10.06	10.09
3.0	10.50	5.00	248	10.06	10.09
4.0	10.50	5.00	246	10.06	10.09
5.0	10.50	5.00	244	10.06	10.09
6.0	10.50	5.00	242	10.06	10.09
7.0	10.50	5.00	241	10.06	10.09
8.0	10.50	5.00	239	10.06	10.09
9.0	10.50	5.00	237	10.06	10.09
10.0	10.50	5.00	235	10.06	10.09
11.0	11.00	4.00	178	10.06	10.09
12.0	11.00	4.00	175	10.06	10.09
13.0	11.00	4.00	173	10.06	10.09
14.0	11.00	4.00	170	10.06	10.09
15.0	11.00	4.00	167	10.06	10.09
16.0	11.00	4.00	165	10.06	10.09
17.0	11.00	4.00	162	10.06	10.09
18.0	11.00	4.00	159	10.06	10.09
19.0	11.00	4.00	157	10.06	10.09
20.0	11.00	4.00	154	10.06	10.09
21.0	11.00	4.00	151	10.06	10.09
22.0	11.00	4.00	150	10.06	10.09
23.0	11.00	4.00	150	10.06	10.09
24.0	11.00	4.00	150	10.06	10.09
25.0	11.00	4.00	150	10.06	10.09
26.0	11.00	4.00	150	10.06	10.09
27.0	11.00	4.00	150	10.06	10.09
28.0	11.00	4.00	150	10.06	10.09
29.0	11.00	4.00	150	10.06	10.09
30.0	11.00	4.00	150	10.06	10.09
31.0	11.00	4.00	150	10.06	10.09
32.0	11.00	4.00	150	10.06	10.09
33.0	11.00	4.00	150	10.06	10.09
34.0	11.00	4.00	150	10.06	10.09
35.0	11.00	4.00	150	10.06	10.09
36.0	11.00	4.00	150	10.06	10.09
37.0	11.00	4.00	150	10.06	10.09
38.0	11.00	4.00	150	10.06	10.09
39.0	11.00	4.00	150	10.06	10.09
40.0	11.00	4.00	150	10.06	10.09

Elapsed Time (min)	*Design Den (ppg)*	*Slurry Rate (bpm)*	*Pressure (psi)*	*ECD@ Shoe (ppg)*	*ECD Ex @ 2500*
41.0	11.00	4.00	150	10.06	10.09
42.0	11.00	4.00	150	10.06	10.09
43.0	11.00	4.00	150	10.06	10.09
44.0	11.00	4.00	150	10.06	10.09
45.0	11.00	4.00	150	10.06	10.09
46.0	11.00	4.00	150	10.06	10.09
47.0	11.00	4.00	150	10.06	10.09
48.0	11.00	4.00	150	10.06	10.09
49.0	11.00	4.00	150	10.06	10.09
50.0	11.00	4.00	150	10.06	10.09
51.0	11.00	4.00	150	10.06	10.09
52.0	11.00	4.00	150	10.06	10.09
53.0	11.00	4.00	150	10.06	10.09
54.0	11.00	4.00	150	10.06	10.09
55.0	11.00	4.00	150	10.06	10.09
56.0	11.00	4.00	150	10.06	10.09
57.0	11.00	4.00	150	10.06	10.09
58.0	11.00	4.00	150	10.06	10.09
59.0	11.00	4.00	150	10.06	10.09
60.0	11.00	4.00	150	10.06	10.09
61.0	11.00	4.00	150	10.06	10.09
62.0	11.00	4.00	150	10.06	10.09
63.0	11.00	4.00	150	10.06	10.09
64.0	11.00	4.00	150	10.06	10.09
65.0	11.00	4.00	150	10.06	10.09
66.0	11.00	4.00	150	10.06	10.09
67.0	11.00	4.00	150	10.06	10.09
68.0	11.00	4.00	150	10.06	10.09
69.0	11.00	4.00	150	10.06	10.09
70.0	11.00	4.00	150	10.06	10.09
71.0	11.00	4.00	150	10.06	10.09
72.0	11.00	4.00	150	10.06	10.09
73.0	11.00	4.00	150	10.06	10.09
74.0	11.00	4.00	150	10.06	10.09
74.5	11.00	4.00	150	10.06	10.09
75.5	13.00	4.00	254	10.06	10.09
76.5	13.00	4.00	254	10.06	10.09
77.5	13.00	4.00	254	10.06	10.10
78.5	13.00	4.00	254	10.06	10.09

Elapsed Time (min)	***Design Den (ppg)***	***Slurry Rate (bpm)***	***Pressure (psi)***	***ECD@ Shoe (ppg)***	***ECD Ex @ 2500***
79.5	13.00	4.00	254	10.06	10.09
80.5	13.00	4.00	254	10.06	10.10
81.5	13.00	4.00	254	10.06	10.09
82.5	13.00	4.00	254	10.06	10.09
83.5	13.00	4.00	254	10.06	10.10
84.5	13.00	4.00	254	10.06	10.10
85.5	13.00	4.00	254	10.06	10.10
86.5	13.00	4.00	254	10.06	10.09
87.5	13.00	4.00	254	10.06	10.09
88.5	13.00	4.00	254	10.06	10.10
89.5	13.00	4.00	254	10.06	10.10
90.5	13.00	4.00	254	10.06	10.10
91.5	13.00	4.00	254	10.06	10.10
92.5	13.00	4.00	254	10.06	10.10
93.5	13.00	4.00	254	10.07	10.10
94.5	13.00	4.00	254	10.06	10.09
95.5	13.00	4.00	254	10.06	10.09
96.5	13.00	4.00	254	10.06	10.09
97.5	13.00	4.00	254	10.06	10.09
98.5	13.00	4.00	254	10.06	10.09
99.5	13.00	4.00	254	10.06	10.09
100.5	13.00	4.00	254	10.06	10.09
101.5	13.00	4.00	254	10.06	10.09
102.5	13.00	4.00	254	10.06	10.10
103.5	13.00	4.00	254	10.06	10.10
104.5	13.00	4.00	254	10.06	10.10
105.5	13.00	4.00	254	10.06	10.09
106.5	13.00	4.00	254	10.06	10.09
107.5	13.00	4.00	254	10.06	10.09
108.5	13.00	4.00	254	10.06	10.09
109.5	13.00	4.00	254	10.06	10.09
110.5	13.00	4.00	254	10.06	10.09
111.5	13.00	4.00	254	10.06	10.09
112.5	13.00	4.00	254	10.06	10.09
113.5	13.00	4.00	254	10.06	10.09
114.5	13.00	4.00	254	10.07	10.10
115.5	13.00	4.00	254	10.07	10.09
116.5	13.00	4.00	254	10.07	10.09
117.5	13.00	4.00	254	10.07	10.09

Elapsed Time (min)	***Design Den (ppg)***	***Slurry Rate (bpm)***	***Pressure (psi)***	***ECD@ Shoe (ppg)***	***ECD Ex @ 2500***
118.5	13.00	4.00	254	10.08	10.09
119.5	13.00	4.00	254	10.08	10.09
120.5	13.00	4.00	254	10.08	10.09
121.5	13.00	4.00	254	10.09	10.09
122.5	13.00	4.00	254	10.09	10.09
123.5	13.00	4.00	254	10.09	10.09
124.5	13.00	4.00	254	10.09	10.09
125.5	13.00	4.00	254	10.10	10.09
126.5	13.00	4.00	254	10.11	10.09
127.5	13.00	4.00	254	10.11	10.09
128.5	13.00	4.00	254	10.12	10.09
129.5	13.00	4.00	254	10.12	10.09
130.5	13.00	4.00	254	10.13	10.09
131.5	13.00	4.00	254	10.13	10.09
132.5	13.00	4.00	254	10.14	10.09
133.5	13.00	4.00	254	10.14	10.09
134.5	13.00	4.00	254	10.15	10.09
135.5	13.00	4.00	254	10.15	10.09
136.5	13.00	4.00	254	10.16	10.09
137.5	13.00	4.00	254	10.17	10.09
138.5	13.00	4.00	254	10.17	10.09
139.5	13.00	4.00	254	10.18	10.09
140.5	13.00	4.00	254	10.19	10.10
141.5	13.00	4.00	254	10.19	10.09
142.5	13.00	4.00	254	10.20	10.09
143.5	13.00	4.00	254	10.21	10.09
144.5	13.00	4.00	254	10.21	10.09
145.5	13.00	4.00	254	10.22	10.09
146.5	13.00	4.00	254	10.23	10.09
147.5	13.00	4.00	254	10.23	10.09
148.5	13.00	4.00	254	10.24	10.09
149.5	13.00	4.00	254	10.25	10.09
150.5	13.00	4.00	254	10.25	10.09
151.5	13.00	4.00	254	10.26	10.09
152.5	13.00	4.00	254	10.27	10.09
153.5	13.00	4.00	254	10.27	10.09
154.5	13.00	4.00	254	10.28	10.09
155.5	13.00	4.00	254	10.29	10.09
156.5	13.00	4.00	254	10.29	10.09

Elapsed Time (min)	***Design Den (ppg)***	***Slurry Rate (bpm)***	***Pressure (psi)***	***ECD@ Shoe (ppg)***	***ECD Ex @ 2500***
157.5	13.00	4.00	254	10.30	10.09
158.5	13.00	4.00	254	10.30	10.09
159.5	13.00	4.00	254	10.31	10.09
160.5	13.00	4.00	254	10.32	10.09
161.5	13.00	4.00	254	10.32	10.09
162.5	13.00	4.00	254	10.33	10.09
163.5	13.00	4.00	254	10.34	10.09
164.5	13.00	4.00	254	10.34	10.09
165.5	13.00	4.00	254	10.35	10.09
166.5	13.00	4.00	254	10.36	10.09
167.5	13.00	4.00	254	10.36	10.09
168.5	13.00	4.00	254	10.37	10.09
169.5	13.00	4.00	254	10.38	10.09
170.5	13.00	4.00	254	10.38	10.09
171.5	13.00	4.00	254	10.39	10.09
172.5	13.00	4.00	254	10.40	10.09
173.5	13.00	4.00	254	10.40	10.09
174.5	13.00	4.00	254	10.41	10.09
175.5	13.00	4.00	254	10.42	10.09
176.5	13.00	4.00	254	10.42	10.09
177.5	13.00	4.00	254	10.44	10.09
178.5	13.00	4.00	254	10.45	10.09
179.5	13.00	4.00	254	10.46	10.09
180.5	13.00	4.00	254	10.47	10.09
181.5	13.00	4.00	254	10.48	10.08
182.5	13.00	4.00	254	10.50	10.09
183.5	13.00	4.00	254	10.51	10.09
184.5	13.00	4.00	254	10.52	10.09
185.5	13.00	4.00	254	10.53	10.08
186.5	13.00	4.00	254	10.54	10.08
187.5	13.00	4.00	254	10.56	10.09
188.5	13.00	4.00	254	10.57	10.09
189.5	13.00	4.00	254	10.58	10.08
190.5	13.00	4.00	254	10.59	10.08
191.5	13.00	4.00	254	10.60	10.09
192.5	13.00	4.00	254	10.62	10.09
193.5	13.00	4.00	254	10.63	10.08
194.5	13.00	4.00	254	10.64	10.08
195.5	13.00	4.00	254	10.65	10.09

Elapsed Time (min)	***Design Den (ppg)***	***Slurry Rate (bpm)***	***Pressure (psi)***	***ECD@ Shoe (ppg)***	***ECD Ex @ 2500***
196.5	13.00	4.00	254	10.66	10.08
197.5	13.00	4.00	254	10.68	10.08
198.5	13.00	4.00	254	10.69	10.08
199.5	13.00	4.00	254	10.70	10.08
200.5	13.00	4.00	254	10.71	10.08
201.2	13.00	4.00	254	10.72	10.08
202.2	10.00	6.00	253	10.74	10.09
203.2	10.00	6.00	253	10.75	10.09
204.2	10.00	6.00	253	10.76	10.09
205.2	10.00	6.00	253	10.78	10.09
206.2	10.00	6.00	253	10.79	10.09
207.2	10.00	6.00	253	10.81	10.09
208.2	10.00	6.00	253	10.82	10.09
209.2	10.00	6.00	253	10.83	10.09
210.2	10.00	6.00	253	10.85	10.09
211.2	10.00	6.00	253	10.86	10.09
212.2	10.00	6.00	253	10.88	10.09
213.2	10.00	6.00	253	10.89	10.09
214.2	10.00	6.00	253	10.90	10.09
215.2	10.00	6.00	253	10.92	10.09
216.2	10.00	6.00	253	10.93	10.09
217.2	10.00	6.00	253	10.95	10.09
218.2	10.00	6.00	253	10.96	10.09
219.2	10.00	6.00	253	10.97	10.09
220.2	10.00	6.00	253	10.99	10.09
221.2	10.00	6.00	253	11.00	10.09
222.2	10.00	6.00	253	11.02	10.09
223.2	10.00	6.00	253	11.03	10.09
224.2	10.00	6.00	253	11.05	10.09
225.2	10.00	6.00	253	11.06	10.09
226.2	10.00	6.00	253	11.08	10.09
227.2	10.00	6.00	253	11.09	10.09
228.2	10.00	6.00	253	11.10	10.09
229.2	10.00	6.00	253	11.12	10.09
230.2	10.00	6.00	253	11.13	10.09
231.2	10.00	6.00	253	11.15	10.09
232.2	10.00	6.00	253	11.16	10.09
233.2	10.00	6.00	253	11.18	10.09
234.2	10.00	6.00	253	11.19	10.09

Elapsed Time (min)	*Design Den (ppg)*	*Slurry Rate (bpm)*	*Pressure (psi)*	*ECD@ Shoe (ppg)*	*ECD Ex @ 2500*
235.2	10.00	6.00	253	11.21	10.09
236.2	10.00	6.00	253	11.22	10.09
237.2	10.00	6.00	253	11.24	10.09
238.2	10.00	6.00	253	11.25	10.09
239.2	10.00	6.00	253	11.26	10.09
240.2	10.00	6.00	253	11.28	10.09
241.2	10.00	6.00	253	11.29	10.09
242.2	10.00	6.00	253	11.31	10.09
243.2	10.00	6.00	253	11.32	10.09
244.2	10.00	6.00	253	11.34	10.09
245.2	10.00	6.00	253	11.35	10.09
246.2	10.00	6.00	253	11.37	10.09
247.2	10.00	6.00	253	11.38	10.09
248.2	10.00	6.00	253	11.40	10.09
249.2	10.00	6.00	253	11.41	10.09
250.2	10.00	6.00	253	11.43	10.09
251.2	10.00	6.00	253	11.44	10.09
252.2	10.00	6.00	253	11.46	10.09
253.2	10.00	6.00	253	11.47	10.09
254.2	10.00	6.00	253	11.49	10.09
255.2	10.00	6.00	253	11.50	10.09
256.2	10.00	6.00	253	11.52	10.09
257.2	10.00	6.00	253	11.53	10.09
258.2	10.00	6.00	274	11.56	10.10
259.2	10.00	6.00	299	11.58	10.11
260.2	10.00	6.00	331	11.61	10.13
261.2	10.00	6.00	368	11.63	10.15
262.2	10.00	6.00	405	11.66	10.17
263.2	10.00	6.00	442	11.68	10.19
264.2	10.00	6.00	479	11.70	10.21
265.5	10.00	4.00	369	11.71	10.22
266.5	10.00	4.00	394	11.73	10.23
267.5	10.00	4.00	419	11.75	10.25
268.5	10.00	4.00	444	11.76	10.26
269.5	10.00	4.00	468	11.78	10.29
270.5	10.00	4.00	494	11.80	10.32
271.5	10.00	4.00	520	11.81	10.36
272.5	10.00	4.00	544	11.83	10.38
273.5	10.00	4.00	569	11.85	10.41
274.5	10.00	4.00	595	11.86	10.44

Elapsed Time (min)	*Design Den (ppg)*	*Slurry Rate (bpm)*	*Pressure (psi)*	*ECD@ Shoe (ppg)*	*ECD Ex @ 2500*
275.5	10.00	4.00	621	11.88	10.48
276.5	10.00	4.00	645	11.90	10.51
277.5	10.00	4.00	670	11.91	10.53
278.5	10.00	4.00	696	11.93	10.57
279.5	10.00	4.00	722	11.95	10.60
280.5	10.00	4.00	747	11.97	10.63
281.5	10.00	4.00	771	11.98	10.65
282.5	10.00	4.00	797	12.00	10.69
283.5	10.00	4.00	823	12.02	10.72
284.5	10.00	4.00	848	12.03	10.75
285.5	10.00	4.00	872	12.05	10.78
286.5	10.00	4.00	898	12.07	10.81
287.5	10.00	4.00	924	12.09	10.85
288.5	10.00	4.00	949	12.10	10.87
289.5	10.00	4.00	974	12.12	10.90
290.5	10.00	4.00	999	12.14	10.93
291.5	10.00	4.00	1025	12.16	10.97
292.5	10.00	4.00	1051	12.17	11.00
293.5	10.00	4.00	1077	12.19	11.02
294.5	10.00	4.00	1101	12.21	11.04
295.5	10.00	4.00	1126	12.22	11.06
296.5	10.00	4.00	1150	12.24	11.07
297.5	10.00	4.00	1175	12.25	11.09
298.5	10.00	4.00	1199	12.27	11.11
299.5	10.00	4.00	1224	12.29	11.13
300.5	10.00	4.00	1248	12.30	11.14
301.5	10.00	4.00	1273	12.32	11.16
302.0	10.00	4.00	1285	12.32	11.17
303.0	10.00	2.00	1194	12.31	11.16
304.0	10.00	2.00	1206	12.31	11.17
305.0	10.00	2.00	1219	12.32	11.18
306.0	10.00	2.00	1231	12.33	11.19
307.0	10.00	2.00	1243	12.34	11.20
308.0	10.00	2.00	1256	12.34	11.21
309.0	10.00	2.00	1268	12.35	11.21
309.6	10.00	2.00	1275	12.36	11.22

Disclaimer Notice

Baker Hughes personnel will use good faith at all times in interpreting information, making recommendations, (either written, or oral) as to the type or amount of products, equipment or services to be furnished, the manner of performance, or in predicting results to be obtained. The recommendation and projections given are estimates based on calculations produced by a computer model including various assumptions regarding the well, reservoir and treatment. Due to the uncertainty of variable well conditions and the necessity of relying on facts and supporting services provided by the Customer and its other contractors, Baker Hughes hereby disclaims the accuracy of any chart interpretation, research, analysis, job recommendation or other data furnished by Baker Hughes. Such data shall include the attached report, any similar information provided electronically and any data generated through real-time monitoring. NO WARRANTY IS GIVEN CONCERNING THE EFFECTIVENESS OF THE PRODUCTS OR EQUIPMENT USED, RECOMMENDATIONS GIVEN OR SERVICES RENDERED. NO WARRANTIES, EXPRESS OR IMPLIED ARE MADE AND ALL SUCH WARRANTIES, INCLUDING ANY WARRANTY OF MERCHANTABLITY OR FITNESS FOR A PARTICULAR PURPOSE, ARE HEREBY EXCLUDED AND DISCLAIMED BY BAKER HUGHES.

Proposal No: 1001193599A

LONQUIST FIELD SERVICE LLC

Hackberry Carbon Sequestration Well #001

TBD Rig

Black Lake Field

Cameron Parish, Louisiana
February 7, 2023

Cement Proposal

Prepared for:
Lonquist & Co LLC
CCUS Project
Lonquist & Co LLC

Prepared by:
Rodrigo Castanedo
Sales Engineer
Email: rodrigo.castanedo@bakerhughes.com
Mobile: 832-378-4975

Service Point:
PP, HOUMA
Bus Phone: 985-8791568
(800) 825-4767
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Service Representatives:
Veronica Breto
Cementing Specialist
Bus Phone: 713-879-1872
Email: veronica.breto@bakerhughes.com
Mobile: 713-408-2867

Powered by
PowerVision

Operator Name: LONQUIST FIELD SERVICE LLC
Well Name: Hackberry Carbon Sequestration Well #001
Job Description: 9 5/8" x 7" Production @ 10,100' MD/TVD_Option PermaSet
Date: February 7, 2023

Proposal No: 1001193599A

JOB AT A GLANCE

Depth (TVD)	10,100 ft
Depth (MD)	10,100 ft
Hole Size	10.75 in 12.25 in
Casing Size/Weight	9 5/8 in, 47 lbs/ft 7 in, 29 lbs/ft
Pump Via	9 5/8" O.D. (8.681" .I.D) 47 7" O.D. (6.184" .I.D) 29
Total Mix Water Required	13,583 gals
Weighted Spacer	
Ultra Flush IIA	50 bbls
Density	10.5 ppg
Lead Slurry	
PermaSet system (Lite)	658 sacks
Density	11.0 ppg
Yield	2.20 cf/sack
Tail Slurry	
PermaSet System (Lite)	2,148 sacks
Density	13.0 ppg
Yield	1.32 cf/sack
Displacement	
WBM	545 bbls
Density	10.5 ppg

Verify the pipe sizes, depths and volume calculations with the operator's representative.

WELL DATA

ANNULAR GEOMETRY

ANNULAR I.D. (in)	DEPTH(ft)	
	MEASURED	TRUE VERTICAL
12.415 CASING	2,500	2,500
12.250 HOLE	4,780	4,780
10.750 HOLE	10,100	10,100

SUSPENDED PIPES

DIAMETER (in)		WEIGHT (lbs/ft)	DEPTH(ft)	
O.D.	I.D.		MEASURED	TRUE VERTICAL
9.625	8.681	47	4,780	4,780
7.000	6.184	29	10,100	10,100

Float/Landing Collar set @	10,020 ft
Mud Density	10.00 ppg
Mud Type	Water Based
Est. Static Temp.	199 ° F
Est. Circ. Temp.	152 ° F

VOLUME CALCULATIONS

2,500 ft	x	0.3354 cf/ft	with	0 %	excess	=	838.5 cf
1,500 ft	x	0.3132 cf/ft	with	30 %	excess	=	611.1 cf
780 ft	x	0.3132 cf/ft	with	30 %	excess	=	317.6 cf
5,320 ft	x	0.3630 cf/ft	with	30 %	excess	=	2511.3 cf
80 ft	x	0.2086 cf/ft	with	0 %	excess	=	16.7 cf (inside pipe)
			TOTAL SLURRY VOLUME			=	4295.2 cf
						=	766 bbls

TD =10,100' MD/TVD

Single Stage Job
Top of Lead = Surface with 30% excess in OH
Top of Tail = 4,000' with 30% excess in OH

Note: To be able to pump in single stage we need to pump 11ppg Lead + 13ppg Tail slurries (PermaSet System) assuming FG of 0.66psi/ft

FLUID SPECIFICATIONS

Weighted Spacer — 50.0 bbls Ultra Flush IIA + 120 lbs/bbl Barite - Sacked @ 10.5 ppg

FLUID	VOLUME CU-FT		VOLUME FACTOR		AMOUNT AND TYPE OF CEMENT
Lead Slurry	1450	/	2.2	=	**658 sacks PermaSet System** + 1 gps BA-86L + 0.05 gps Ultra 7L, 260 gl tote + 0.02 gps CD-33L + 0.3 gps A-3L, Sodium Silicate, 330 gl tote + 0.07% bwoc Static Free + 0.02 gps FP-6L + 10% bwoc LW-7-8 + 0.01% bwoc ASA-301LA, 330 gl tote + 0.02 gps FP-13L + 90.5% Fresh Water
Tail Slurry	2846	/	1.32	=	**2148 sacks PermaSet System**+ 7% bwoc LW-7-8 + 0.02 gps FP-6L + 0.02 gps FP-13L + 1 gps BA-86L + 0.05 gps Ultra 7L, 260 gl tote + 0.01 gps ASA-301LA, 330 gl tote + 0.035 gps R-21L, 275 gl tote + 0.07% bwoc Static Free + 35% Fresh Water

Displacement — 544.6 bbls WBM @ 10.5 ppg

CEMENT PROPERTIES

	SLURRY NO.1	SLURRY NO.2
Slurry Weight (ppg)	11.00	13.00
Slurry Yield (cf/sack)	2.20	1.32
Amount of Mix Water (gps)	9.12	3.53
Amount of Mix Fluid (gps)	10.53	4.66
Estimated Pumping Time - 70 BC (HH:MM)	6:00	5:00

* All slurries are to be optimized and tested by the Region Laboratory prior to cementing.
* The above slurries are only estimates at the time the proposal was written.
* Temperature Gradient used: 1.18 F/100ft

PRODUCT DESCRIPTIONS

BA-86L
A latex cement additive that provides excellent fluid loss control, low viscosity, enhanced bonding and acid resistance. When used with the proper stabilizers, it has a wide temperature range.

Barite - Sacked
A naturally occuring mineral (Barium Sulfate). It is widely used as a weighting material in cement spacers and occasionally in cement slurries. It can yield a slurry density in excess of 19 lbs/gal.

CD-33L
P092

Class H Cement
Class H cement is an API type, all purpose oil well cement which is used without modification in wells up to 8,000 ft. It possesses a moderate sulfate resistance. With the use of accelerators or retarders, it can be used in a wide range of well depths and temperatures.

FP-13L
FP-13L is a clear liquid organic phosphate antifoaming agent used in cementing operations. It is very effective minimizing air entrapment and preventing foaming tendencies of latex systems.

FP-6L
A clear liquid that decreases foaming in slurries during mixing.

PermaSET Cement System
A fit-for-purpose, carbon dioxide (CO2)- and hydrogen sulphide (H2S)-resistant cement systems for use in virtually any well condition around the world. These blends have excellent free fluid control and are compatible with most Baker Hughes additives

LW-7-8
LW-7-8 is an unicellular silicate microsphere(hollow glass spheres.) It Lowers slurry density for cementing across weak or lost circulation formations with hydrostatic pressures <8000 psi.

Liquid Sodium Silicate, 330 gl tote
A liquid extender used to increase slurry yield, lower slurry density and give relatively high compressive

R-21L, 275 gl tote
A low to medium temperature liquid retarder used to control thickening time of cement slurries.

Static Free
An anti-static additive used to prevent air entrainment due to agglomerated particles. Can be used in Cementing and Fracturing operations to aid in the flow of dry materials.

End of Report

Lightweight PermaSET Testing Update

December 28, 2022

11 ppg PermaSET Design

Slurry Properties		Fluid Loss Test	Free Fluid Test		SGS
Density:	11 ppg		Free Fluid (2hr):	0 cc	
Yield:	1.94 ft³/sack				
Mix Water:	6.96 gal/sack		Deviation Angle:	90°	
Mix Fluid:	7.39 gal/sack				

Rheology:		300 rpm	200 rpm	100 rpm	60 rpm	30 rpm	20 rpm	10 rpm	6 rpm	3 rpm	PV	YP	Gel Strength	
													10 sec	10 min
@71 °F		168.0	134.0	116.5	88.0	71.0	60.0	42.5	30.5	20.5	136	47	16.0	79.0
@96 °F		124.0	96.0	65.0	52.0	38.5	33.0	22.5	19.5	14.0	107	24	15.0	16.0

Thickening Time:						70 bc		Mix Time	
@						13:03 hh:mm		60 sec	

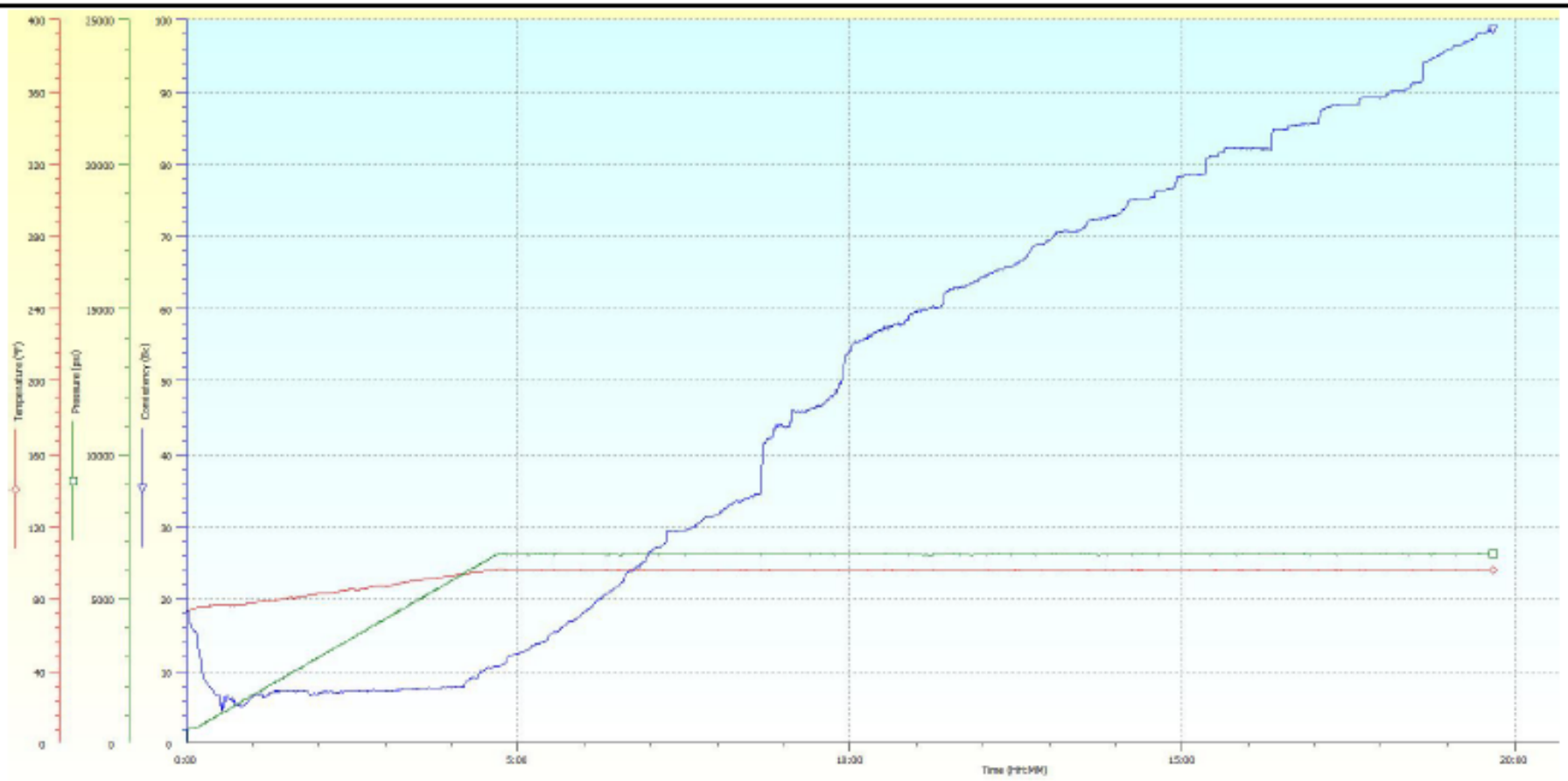
Compressive Strength:

Temp.	5:20 hh:mm	10:28 hh:mm				12 hours	24 hours	48 hours		
@132 °F	50 psi	500 psi				595 PSI	1281 PSI	1600 PSI		

11 ppg PermaSET Design

Consistometer Recording of Bearden Consistency:

Temp: Ramp to 96F in 280min, Press: 300 - 6500psi in 300min, run until set



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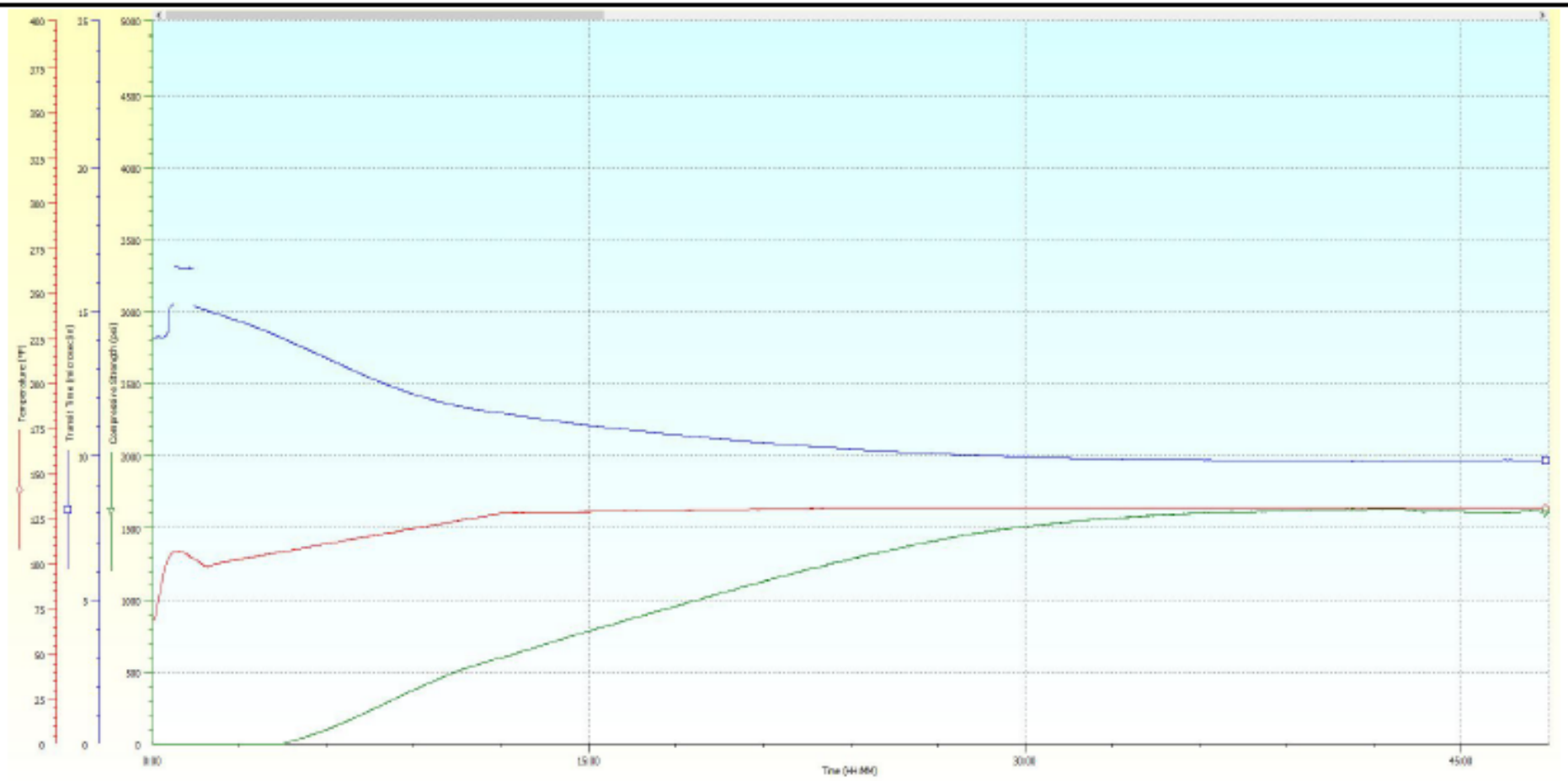
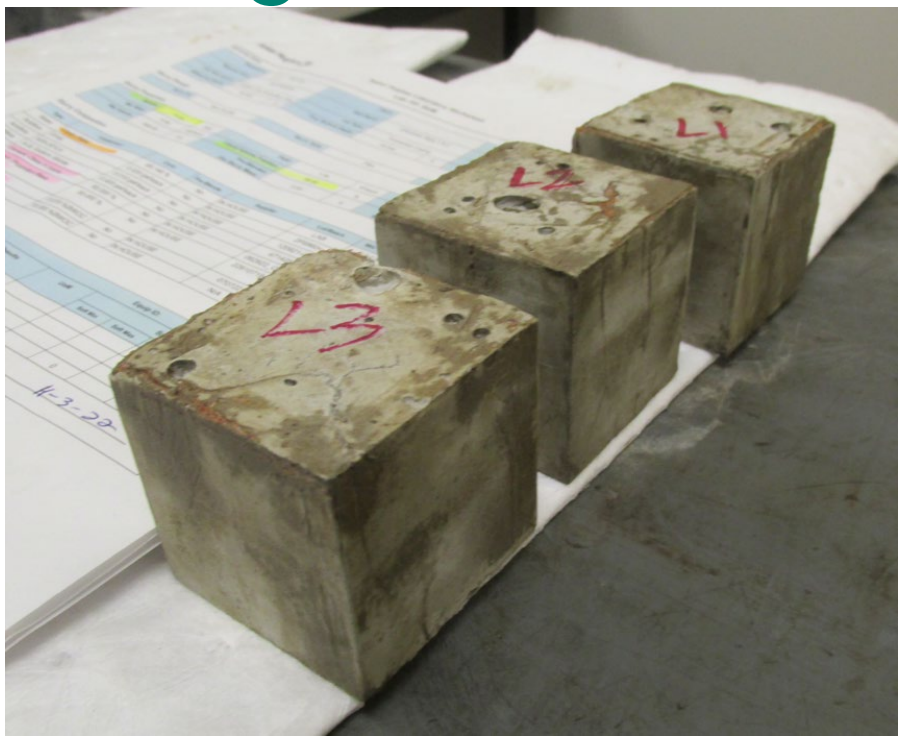
11 ppg PermaSET Design

Ultrasonic Cement Analyzer Data Chart:

Condition as per TT for 120min / 96F in 10min, 129F in 710min. 132F in 720min. 6500 psi



11 ppg PermaSET Design



342179-008 | LEAD

Results:	Compressive Strength - Destructive - Temp 1	Analyst:	LEAPBRAC
		Equipment:	N/A
Test Temperature		132.0 °F	
Curing Time		48:00 hh:mm	
48 hr		1623 psi	

13 ppg PermaSET Design

Slurry Properties		Fluid Loss Test		Free Fluid Test		SGS
Density:	13 ppg					
Yield:	1.30 ft³/sack			Free Fluid (2hr):	0 cc	
Mix Water:	4.01 gal/sack	API Fluid Loss (30min):	32 cc			
Mix Fluid:	4.23 gal/sack			Deviation Angle:	90°	

Rheology:		300 rpm	200 rpm	100 rpm	60 rpm	30 rpm	20 rpm	10 rpm	6 rpm	3 rpm	PV	YP	Gel Strength	
													10 sec	10 min
@70 °F		460.0	335.0	192.0	122.0	63.0	42.0	22.0	16.0	9.0	462	16	12.0	56.0
@134 °F		338.0	249.0	146.0	97.0	56.0	44.0	28.0	22.0	15.0	328	23	16.0	62.0

Thickening Time:						70 bc		Mix Time	
@						5:05 hh:mm		60 sec	

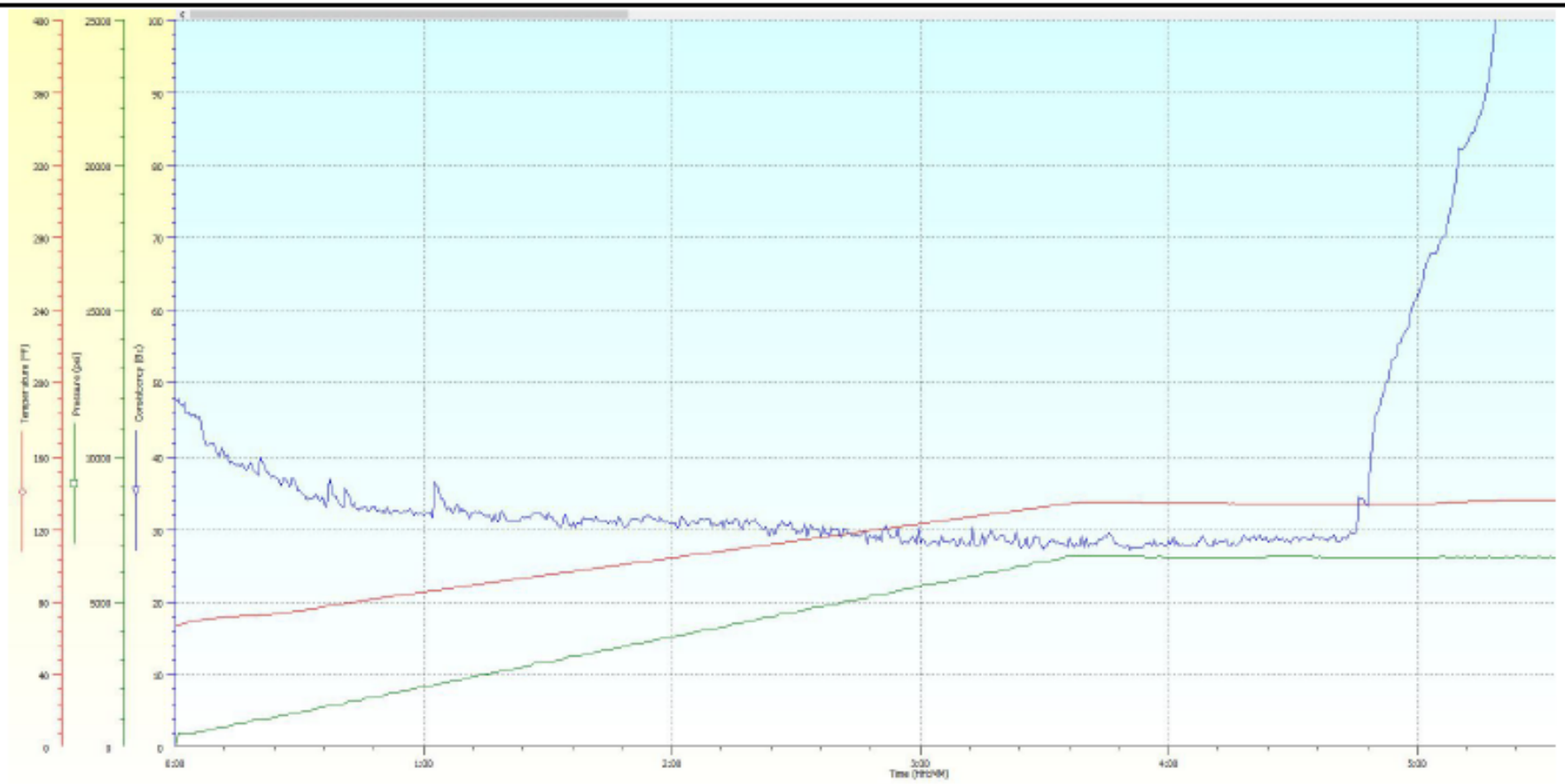
Compressive Strength:

Temp.	4:54 hh:mm	5:33 hh:mm				12 hours	24 hours	48 hours		
@188 °F	50 psi	500 psi				2940 PSI	3495 PSI	3520 PSI		

13 ppg PermaSET Design

Consistometer Recording of Bearden Consistency:

Temp: Ramp to 134F in 215min, Press: 300 - 6500psi in 215min, run until set



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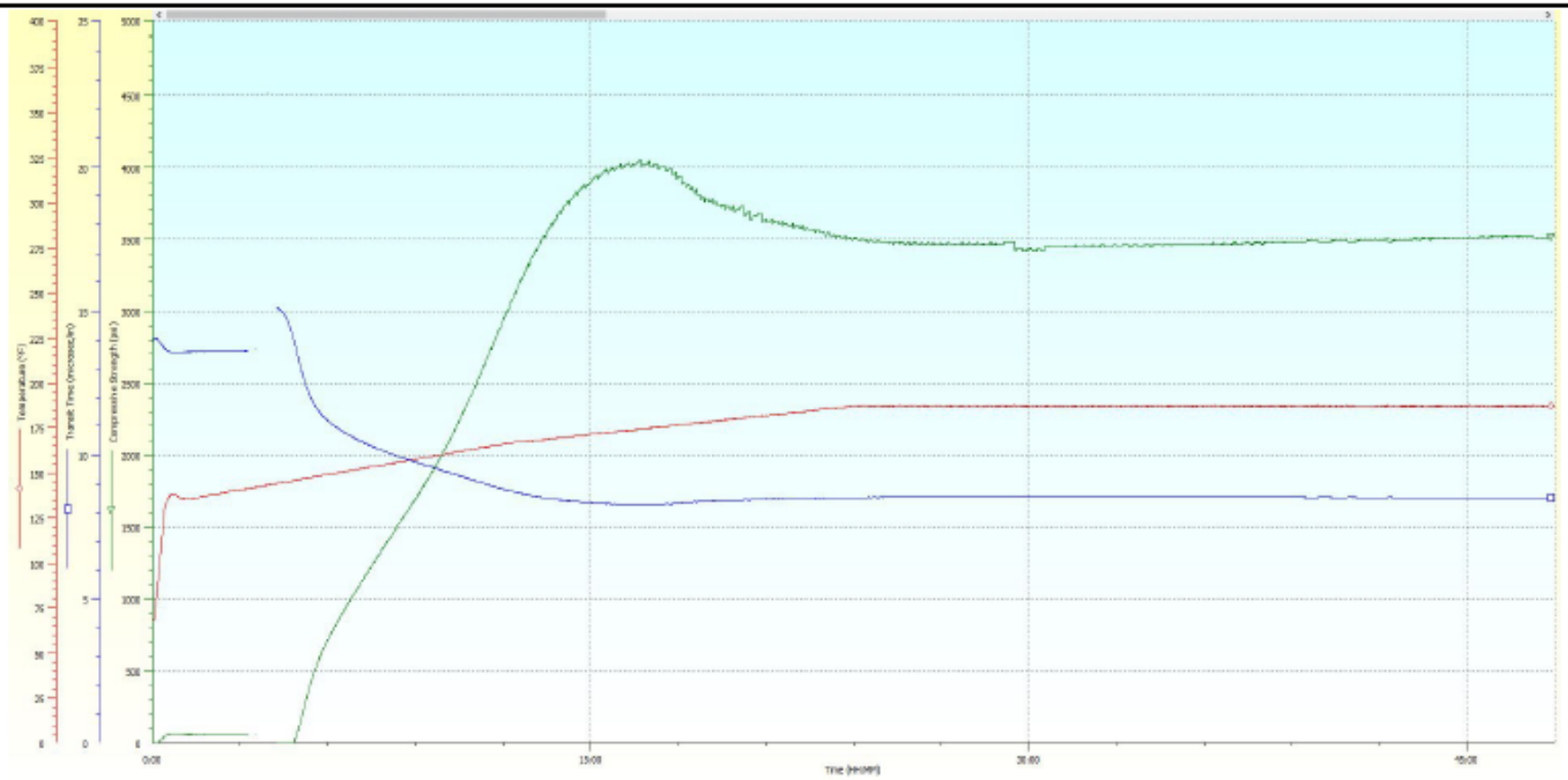
13 ppg PermaSET Design

Ultrasonic Cement Analyzer Data Chart:

Condition as per TT for 60min / 134F in 20min, 167F in 710min. 188F in 720min. 6500 psi



Baker Hughes

13 ppg PermaSET Design

342179-011 | TAIL

Results:	Compressive Strength - Destructive - Temp 1	Analyst:	LEAPBRAC
		Equipment:	N/A
Test Temperature		188.0 °F	
Curing Time		48:00 hh:mm	
48 hr		4477 psi	

Baker Hughes

PermaSet cement system

Applications

Conventional Primary and remedial cementing operations in CO_2 and H_2S environments

Features and Benefits

- Improves the cement's resistance to attacks from CO_2, H_2S, magnesium, and sulfate
- Provides minimal permeability and improved mechanical properties
- Offers fit-for-purpose designs for specific applications
- Zero Portlandite content eliminates weak points and reduces carbonation (see Fig. 1)
- Lower heat evolution during setting (less shrinkage and cracking)
- Good mechanical properties
- Real-time well conditions determine the final slurry composition
- Compatible with virtually all API and ASTM cements and most Baker Hughes cement additives

The Baker Hughes **PermaSet™ cement slurries** are fit-for-purpose, carbon dioxide (CO_2)- and hydrogen sulphide (H_2S)-resistant cement systems for use in virtually any well condition around the world. These blends have excellent free fluid control and are compatible with most Baker Hughes additives.

Baker Hughes prides itself on solving potential problems at the wellhead, understanding that a single slurry does not fit all applications. This approach allows unlimited design flexibility and takes CO_2- and H_2S-resistant cement systems out of the lab and into the real world. Our cementing philosophy utilizes state-of-the-art cement pumping equipment, such as the Baker Hughes **Seahawk™ cement unit**, to help ensure a quality cement job.

PermaSet cement slurries are part of the Baker Hughes **Set for Life™ family of cement systems**, which are designed to isolate and protect the targeted zone for the life of the well. These slurries can be blended with other systems in this family to help ensure long-term zonal isolation.

Safety Precautions

Refer to system component material safety data sheets (MSDS) for handling, transport, environmental information, and first aid.

References

- MSDS
- Set for Life systems brochure
- Set for Life cement systems overview

Set API Class G

PermaSet System

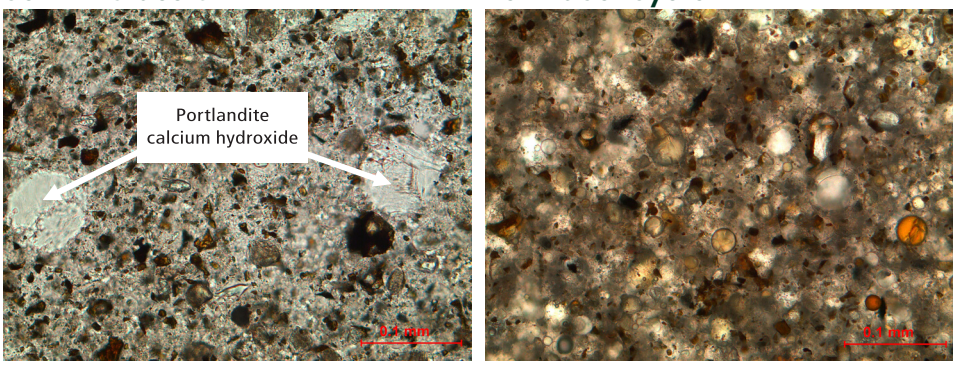


Fig. 1: Thin sections of set samples at 15.8 ppg (1893 kg/m³) under a light microscope.

Technical data

Typical Properties

Typical temperature range	70 to 450°F (21 to 232°C) BHCT
Typical slurry density range	9 to 20 ppg (1078 to 2397 kg/m³)

API Class G versus PermaSet cement slurries	Slurry density		Water permeability** (microdarcy)	$Ca(OH)_2$ Portlandite Content*** (%)	Compressive strength		Tensile strength	
	ppg	kg/m³			psi	MPa	psi	MPa
Set API Class G*	15.8	1893	2.1	9.5	4,807	33.14	378	2.61
PermaSet system*	15.8	1893	0.002	Not detectable	4,674	32.23	459	3.16
Set API Class G* extended with 4% bwoc bentonite	14.0	1678	10.8	9.2	1,633	11.26	170	1.17
PermaSet system* extended	14.0	1678	0.15	Not detectable	2,529	17.44	272	1.88

* Cement slurries were prepared according to API specification 10B using fresh water. Cement specimens were cured at 200°F (93°C) and 3,000 psi (20.68 MPa) for 72 hrs.

** Water permeabilities were measured under a confining pressure of 4,500 psi (31.03 MPa) with a water injection pressure of 3,000 psi (20.68 MPa) at 200°F (93°C).

*** Quantities were determined by X-ray powder diffraction using the reference intensity ratio method.

Baker Hughes

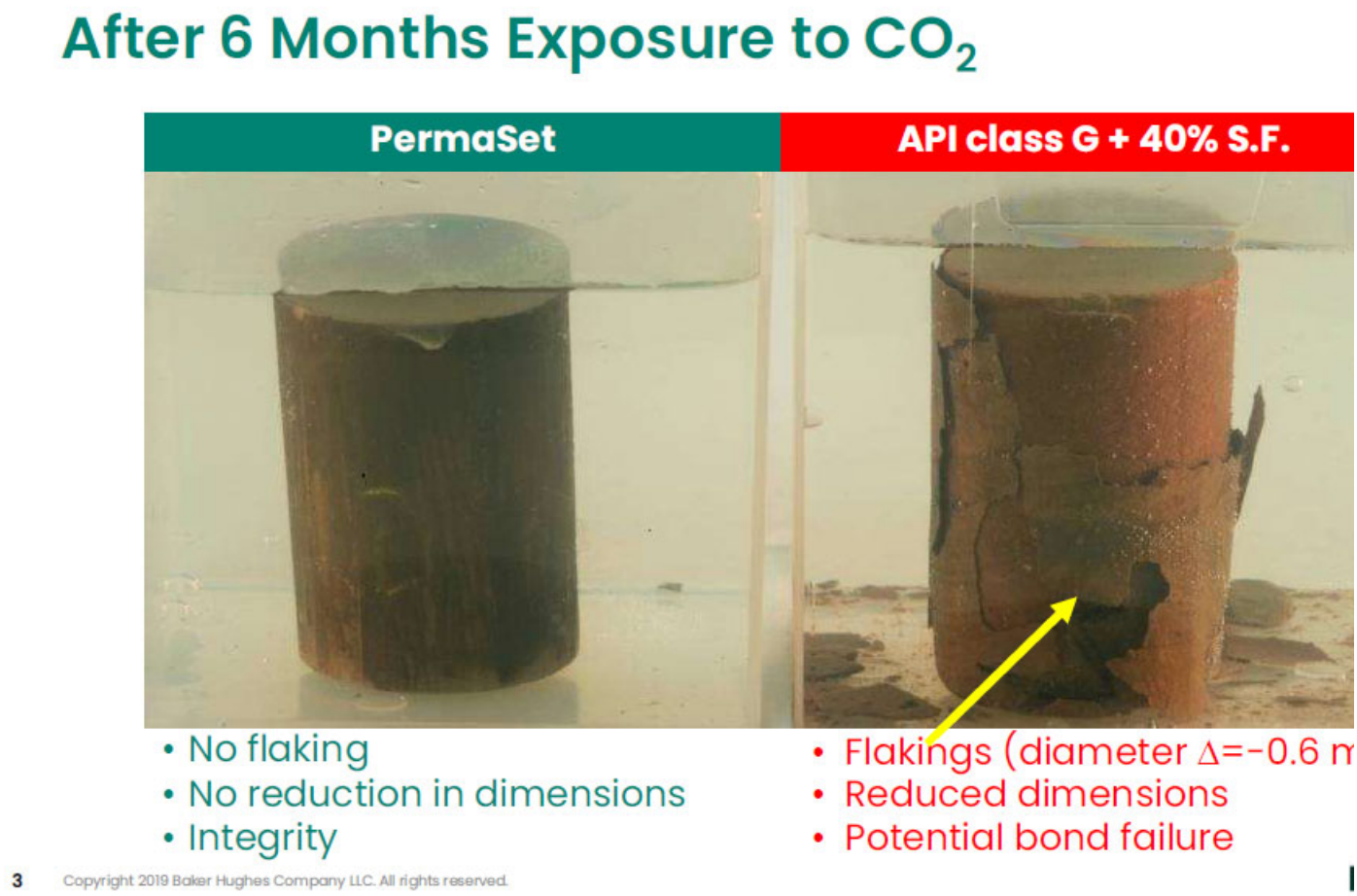
Ramona Hovey

From: Breto, Veronica <Veronica.Breto@bakerhughes.com>
Sent: Monday, August 28, 2023 11:45 PM
To: Will George
Cc: Watts, Alan
Subject: RE: Permaset vs. Class G

Good evening Will,

Apologies for the delay on the response.

This is the best way to see the comparison between Class G vs PermaSet systems. They were both exposed to carbonic acid under the same conditions, and after that they were compared side by side and you can also see visually the difference between the systems.



The table below mentions the difference on the properties measured after the exposure time between neat Class G cement slurry both at 15.8ppg and then the comparison between the slurries extended to 14 ppg.

API Class G versus PermaSet cement slurries	Slurry density		Water permeability** (microdarcy)	$Ca(OH)^2$ Portlandite Content*** (%)	Compressiv strength	
	ppg	kg/m³			psi	M
Set API Class G*	15.8	1893	2.1	9.5	4,807	33
PermaSet system*	15.8	1893	0.002	Not detectable	4,674	32
Set API Class G* extended with 4% bwoc bentonite	14.0	1678	10.8	9.2	1,633	11.
PermaSet system* extended	14.0	1678	0.15	Not detectable	2,529	17.

* Cement slurries were prepared according to API specification 10B using fresh water. Cement specimens were cured c 3,000 psi (20.68 MPa) for 72 hrs.

** Water permeabilities were measured under a confining pressure of 4,500 psi (31.03 MPa) with a water injection press at 200°F (93°C).

*** Quantities were determined by X-ray powder diffraction using the reference intensity ratio method.

Please let us know if you have any further questions on this and will gladly provide additional information.

Thanks and kind regards,

Veronica Breto
Sr Sales Staff Manager – Cementing Services
Pressure Pumping Services – NAO
Oilfield Services
Baker Hughes

T +1 713 879 1872 M +1 713 408 2867

From: Will George <will@lonquist.com>
Sent: Monday, August 21, 2023 10:39 AM
To: Breto, Veronica <Veronica.Breto@bakerhughes.com>
Subject: Re: Permaset vs. Class G

Veronica,

We have a client that is proposing Class G Neat cement for cementing production casing in carbon sequestration wells. Can you provide a comparison of Class G Neat vs. Permaset?

Regards,

William H. George, P.E.
Vice President / Principal Engineer

LONQUIST & CO. LLC
PETROLEUM ENGINEERS | ENERGY ADVISORS

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--[-External Sender-]--