



DRILL STEM TEST REPORT

Prepared For: **TDI, Inc.**

1310 Bison Rd.
Hays, KS 67601

ATTN: Herb Deines

Engel South #2

21-15S-18W Ellis,KS

Start Date: 2017.07.31 @ 16:46:05

End Date: 2017.07.31 @ 23:32:41

Job Ticket #: 63285 DST #: 1

Trilobite Testing, Inc
1515 Commerce Parkway Hays, KS 67601
ph: 785-625-4778 fax: 785-625-5620

Printed: 2017.08.04 @ 08:40:50

TDI, Inc. 21-15S-18W Ellis,KS Engel South #2 DST # 1 Topoka - Oread 2017.07.31



**TRILOBITE
TESTING, INC.**

DRILL STEM TEST REPORT

TDI, Inc.
1310 Bison Rd.
Hays, KS 67601
ATTN: Herb Deines

21-15S-18W Ellis, KS
Engel South #2
Job Ticket: 63285 **DST#: 1**
Test Start: 2017.07.31 @ 16:46:05

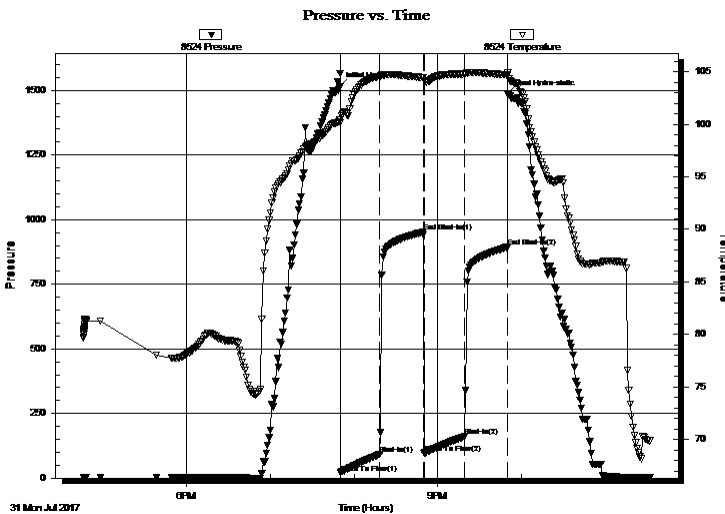
GENERAL INFORMATION:

Formation: **Topeka - Oread**
 Deviated: No Whipstock: ft (KB)
 Time Tool Opened: 19:50:11
 Time Test Ended: 23:32:41
 Interval: **3182.00 ft (KB) To 3199.00 ft (KB) (TVD)**
 Total Depth: 3199.00 ft (KB) (TVD)
 Hole Diameter: 7.88 inches Hole Condition: Fair
 Test Type: Conventional Bottom Hole (Initial)
 Tester: Brannan Lonsdale
 Unit No: 73
 Reference Elevations: 2019.00 ft (KB)
 2009.00 ft (CF)
 KB to GR/CF: 10.00 ft

Serial #: 8524 Outside
 Press@RunDepth: 160.70 psig @ 3183.00 ft (KB) Capacity: 8000.00 psig
 Start Date: 2017.07.31 End Date: 2017.07.31 Last Calib.: 2017.07.31
 Start Time: 16:46:06 End Time: 23:32:41 Time On Btm: 2017.07.31 @ 19:49:41
 Time Off Btm: 2017.07.31 @ 21:50:11

TEST COMMENT: 30- IF- BOB 13 mins
 30- IS- No blow
 30- FF- BOB 17 mins
 30- FS- No blow

PRESSURE SUMMARY



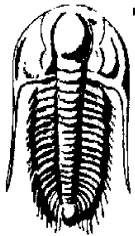
Time (Min.)	Pressure (psig)	Temp (deg F)	Annotation
0	1515.87	100.38	Initial Hydro-static
1	19.88	100.13	Open To Flow (1)
29	92.95	104.55	Shut-In(1)
60	951.41	104.43	End Shut-In(1)
61	96.91	104.15	Open To Flow (2)
90	160.70	104.76	Shut-In(2)
120	892.76	104.69	End Shut-In(2)
121	1485.52	104.88	Final Hydro-static

Recovery

Length (ft)	Description	Volume (bbl)
285.00	MW, 20%M 80%W	4.04

Gas Rates

	Choke (inches)	Pressure (psig)	Gas Rate (Mcf/d)



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DRILL STEM TEST REPORT

TDI, Inc.
1310 Bison Rd.
Hays, KS 67601
ATTN: Herb Deines

21-15S-18W Ellis, KS
Engel South #2
Job Ticket: 63285 **DST#: 1**
Test Start: 2017.07.31 @ 16:46:05

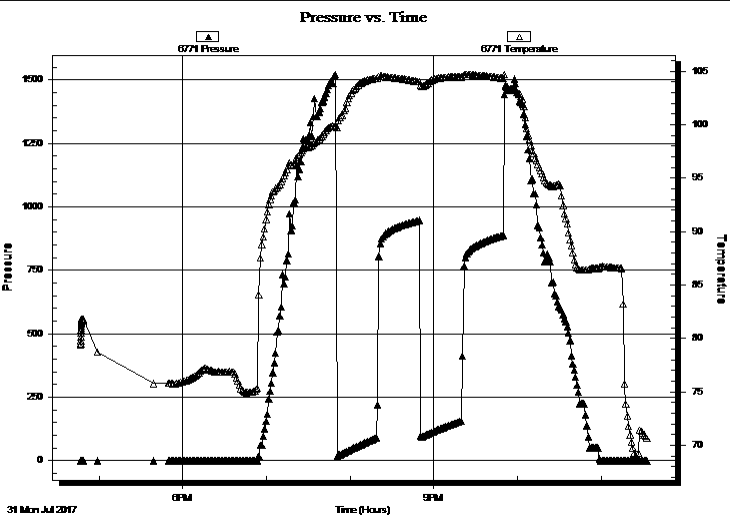
GENERAL INFORMATION:

Formation: **Topeka - Oread**
 Deviated: No Whipstock: ft (KB)
 Time Tool Opened: 19:50:11
 Time Test Ended: 23:32:41
 Interval: **3182.00 ft (KB) To 3199.00 ft (KB) (TVD)**
 Total Depth: 3199.00 ft (KB) (TVD)
 Hole Diameter: 7.88 inches Hole Condition: Fair

Test Type: Conventional Bottom Hole (Initial)
 Tester: Brannan Lonsdale
 Unit No: 73
 Reference Elevations: 2019.00 ft (KB)
 2009.00 ft (CF)
 KB to GR/CF: 10.00 ft

Serial #: 6771 Inside
 Press@RunDepth: psig @ 3183.00 ft (KB)
 Start Date: 2017.07.31 End Date: 2017.07.31
 Start Time: 16:46:47 End Time: 23:33:07
 Capacity: 8000.00 psig
 Last Calib.: 2017.07.31
 Time On Btm:
 Time Off Btm:

TEST COMMENT: 30- IF- BOB 13 mins
 30- IS- No blow
 30- FF- BOB 17 mins
 30- FS- No blow



PRESSURE SUMMARY			
Time (Min.)	Pressure (psig)	Temp (deg F)	Annotation

Recovery		
Length (ft)	Description	Volume (bbl)
285.00	MW, 20%M 80%W	4.04

Gas Rates			
	Choke (inches)	Pressure (psig)	Gas Rate (Mcf/d)



**TRILOBITE
TESTING, INC.**

DRILL STEM TEST REPORT

TOOL DIAGRAM

TDI, Inc.
1310 Bison Rd.
Hays, KS 67601
ATTN: Herb Deines

21-15S-18W Ellis,KS
Engel South #2
Job Ticket: 63285 **DST#: 1**
Test Start: 2017.07.31 @ 16:46:05

Tool Information

Drill Pipe:	Length: 3172.00 ft	Diameter: 3.82 inches	Volume: 44.96 bbl	Tool Weight: 2000.00 lb
Heavy Wt. Pipe:	Length: ft	Diameter: inches	Volume: - bbl	Weight set on Packer: 25000.00 lb
Drill Collar:	Length: 0.00 ft	Diameter: 2.25 inches	Volume: 0.00 bbl	Weight to Pull Loose: 55000.00 lb
			<u>Total Volume: - bbl</u>	Tool Chased 0.00 ft
Drill Pipe Above KB:	10.00 ft			String Weight: Initial 41000.00 lb
Depth to Top Packer:	3182.00 ft			Final 44000.00 lb
Depth to Bottom Packer:	ft			
Interval between Packers:	17.00 ft			
Tool Length:	37.00 ft			
Number of Packers:	2	Diameter: 6.75 inches		

Tool Comments:

Tool Description	Length (ft)	Serial No.	Position	Depth (ft)	Accum. Lengths
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Change Over Sub	1.00			3163.00	
Shut In Tool	5.00			3168.00	
Hydraulic tool	5.00			3173.00	
Packer	5.00			3178.00	20.00 Bottom Of Top Packer
Packer	4.00			3182.00	
Stubb	1.00			3183.00	
Recorder	0.00	6771	Inside	3183.00	
Recorder	0.00	8524	Outside	3183.00	
Perforations	13.00			3196.00	
Bullnose	3.00			3199.00	17.00 Bottom Packers & Anchor
Total Tool Length:	37.00				



**TRILOBITE
TESTING, INC.**

DRILL STEM TEST REPORT

FLUID SUMMARY

TDI, Inc.

21-15S-18W Ellis,KS

1310 Bison Rd.
Hays, KS 67601

Engel South #2

Job Ticket: 63285

DST#: 1

ATTN: Herb Deines

Test Start: 2017.07.31 @ 16:46:05

Mud and Cushion Information

Mud Type: Gel Chem

Cushion Type:

Oil API:

deg API

Mud Weight: 9.00 lb/gal

Cushion Length:

ft

Water Salinity:

75000 ppm

Viscosity: 55.00 sec/qt

Cushion Volume:

bbbl

Water Loss: 6.39 in³

Gas Cushion Type:

Resistivity: ohm.m

Gas Cushion Pressure:

psig

Salinity: 2800.00 ppm

Filter Cake: inches

Recovery Information

Recovery Table

Length ft	Description	Volume bbl
285.00	MW, 20%M 80%W	4.040

Total Length: 285.00 ft Total Volume: 4.040 bbl

Num Fluid Samples: 0

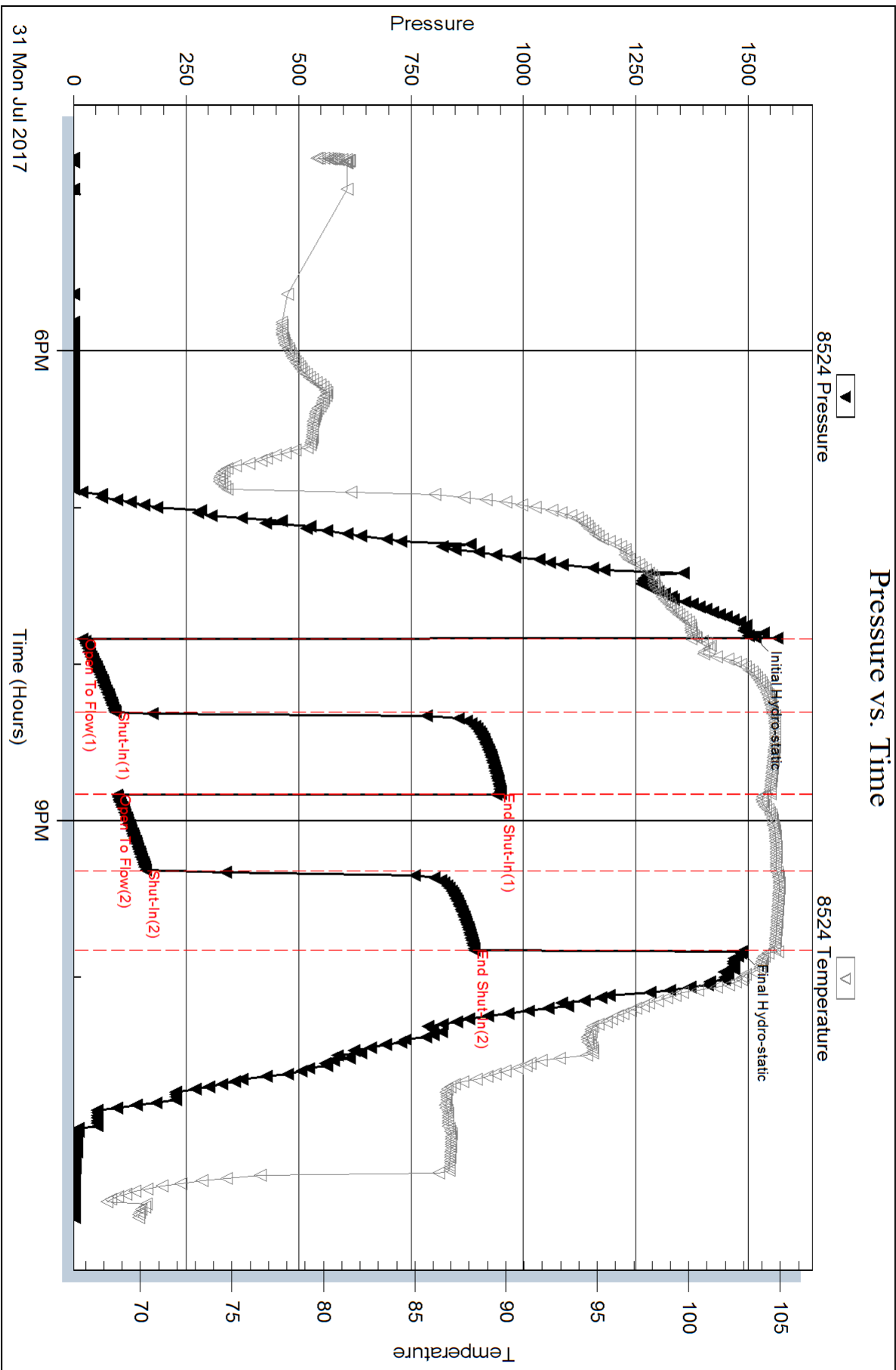
Num Gas Bombs: 0

Serial #:

Laboratory Name:

Laboratory Location:

Recovery Comments: RW: .09@67deg



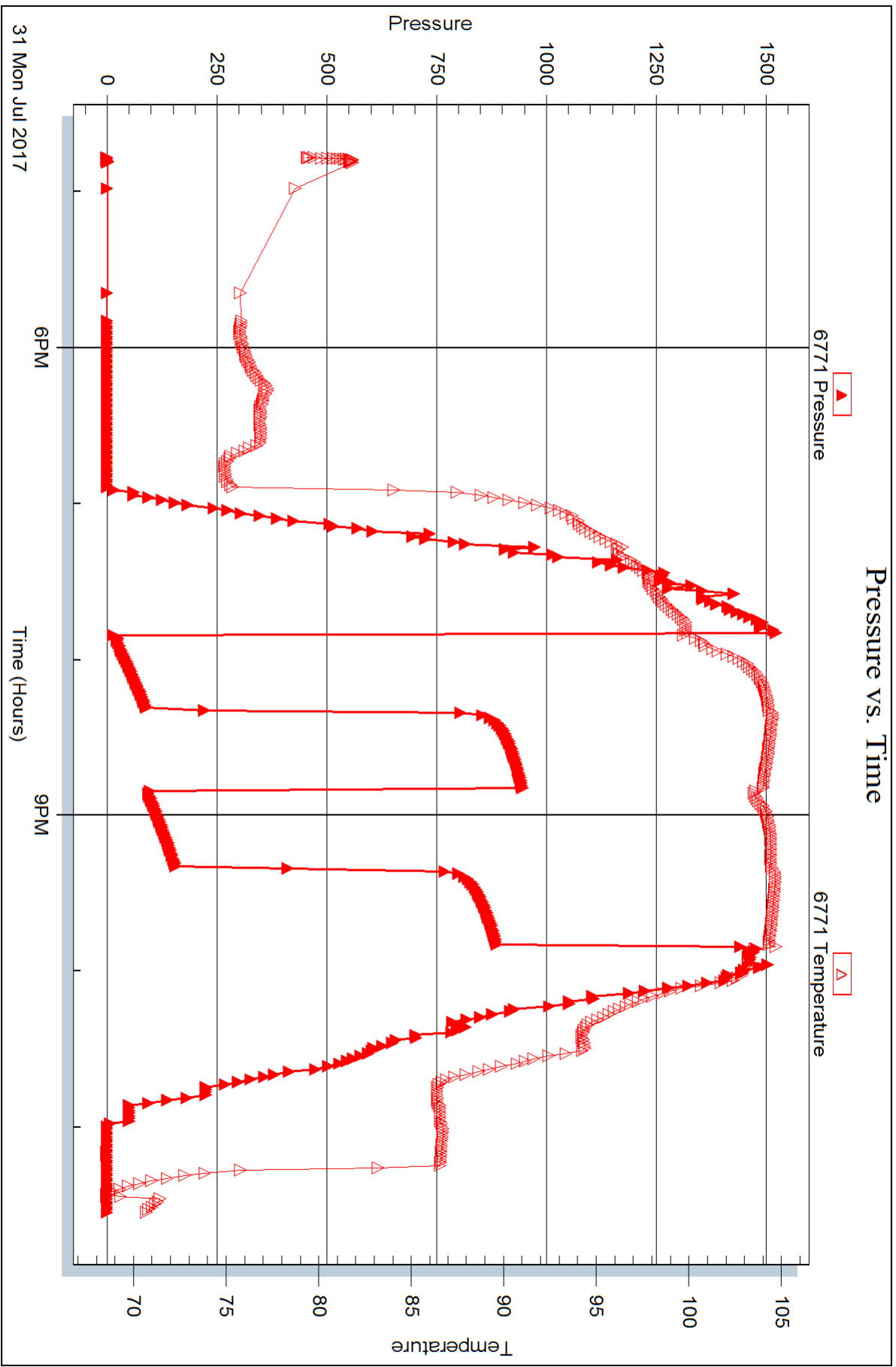
Serial #: 6771

Inside

TDI, Inc.

Engel South #2

DST Test Number: 1



Trilobite Testing, Inc

Ref. No: 63285

Printed: 2017.08.04 @ 08:40:51



DRILL STEM TEST REPORT

Prepared For: **TDI, Inc.**

1310 Bison Rd.
Hays, KS 67601

ATTN: Herb Deines

Engel South #2

21-15S-18W Ellis,KS

Start Date: 2017.08.02 @ 07:20:55

End Date: 2017.08.02 @ 14:11:16

Job Ticket #: 63286 DST #: 2

Trilobite Testing, Inc
1515 Commerce Parkway Hays, KS 67601
ph: 785-625-4778 fax: 785-625-5620

Printed: 2017.08.04 @ 08:40:23



TRILOBITE TESTING, INC.

DRILL STEM TEST REPORT

TDI, Inc.
1310 Bison Rd.
Hays, KS 67601
ATTN: Herb Deines

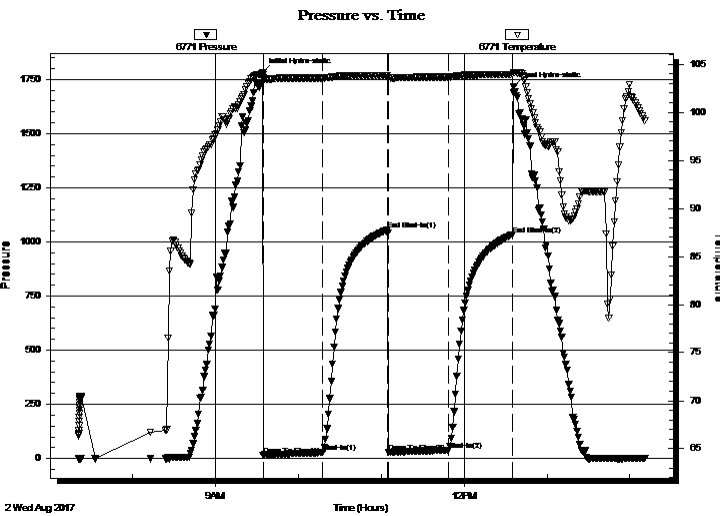
21-15S-18W Ellis, KS
Engel South #2
Job Ticket: 63286 **DST#: 2**
Test Start: 2017.08.02 @ 07:20:55

GENERAL INFORMATION:

Formation: **Conglomerate Sand**
Deviated: No Whipstock: ft (KB)
Time Tool Opened: 09:34:31
Time Test Ended: 14:11:16
Interval: **3529.00 ft (KB) To 3590.00 ft (KB) (TVD)**
Total Depth: 3590.00 ft (KB) (TVD)
Hole Diameter: 7.88 inches Hole Condition: Fair
Test Type: Conventional Bottom Hole (Reset)
Tester: Brannan Lonsdale
Unit No: 73
Reference Elevations: 2019.00 ft (KB)
2009.00 ft (CF)
KB to GR/CF: 10.00 ft

Serial #: 6771 Inside
Press@RunDepth: 37.96 psig @ 3530.00 ft (KB) Capacity: 8000.00 psig
Start Date: 2017.08.02 End Date: 2017.08.02 Last Calib.: 2017.08.02
Start Time: 07:20:56 End Time: 14:11:16 Time On Btm: 2017.08.02 @ 09:34:16
Time Off Btm: 2017.08.02 @ 12:36:01

TEST COMMENT: 45- IF- Built very slow ly to 2 1/2"
45- IS- No blow
45- FF- No blow
45- FSI- No blow



PRESSURE SUMMARY

Time (Min.)	Pressure (psig)	Temp (deg F)	Annotation
0	1782.41	103.95	Initial Hydro-static
1	16.04	103.56	Open To Flow (1)
44	27.54	103.56	Shut-In(1)
91	1056.08	103.85	End Shut-In(1)
92	28.40	103.59	Open To Flow (2)
135	37.96	103.67	Shut-In(2)
181	1033.75	103.93	End Shut-In(2)
182	1716.98	104.13	Final Hydro-static

Recovery

Length (ft)	Description	Volume (bbl)
15.00	M	0.07
55.00	CO	0.64

* Recovery from multiple tests

Gas Rates

Choke (inches)	Pressure (psig)	Gas Rate (Mcf/d)



TRILOBITE TESTING, INC.

DRILL STEM TEST REPORT

TDI, Inc.
1310 Bison Rd.
Hays, KS 67601
ATTN: Herb Deines

21-15S-18W Ellis, KS
Engel South #2
Job Ticket: 63286 **DST#: 2**
Test Start: 2017.08.02 @ 07:20:55

GENERAL INFORMATION:

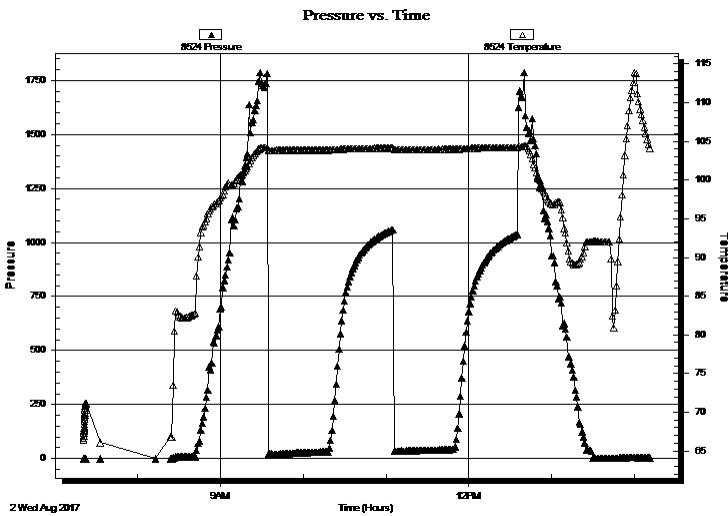
Formation: **Conglomerate Sand**
Deviated: No Whipstock: ft (KB) Test Type: Conventional Bottom Hole (Reset)
Time Tool Opened: 09:34:31 Tester: Brannan Lonsdale
Time Test Ended: 14:11:16 Unit No: 73
Interval: 3529.00 ft (KB) To 3590.00 ft (KB) (TVD) Reference Elevations: 2019.00 ft (KB)
Total Depth: 3590.00 ft (KB) (TVD) 2009.00 ft (CF)
Hole Diameter: 7.88 inches Hole Condition: Fair KB to GR/CF: 10.00 ft

Serial #: 8524 Outside

Press@RunDepth: psig @ 3530.00 ft (KB) Capacity: 8000.00 psig
Start Date: 2017.08.02 End Date: 2017.08.02 Last Calib.: 2017.08.02
Start Time: 07:21:08 End Time: 14:11:43 Time On Btm:
Time Off Btm:

TEST COMMENT: 45- IF- Built very slow ly to 2 1/2"
45- IS- No blow
45- FF- No blow
45- FS- No blow

PRESSURE SUMMARY



Time (Min.)	Pressure (psig)	Temp (deg F)	Annotation

Recovery

Length (ft)	Description	Volume (bbl)
15.00	M	0.07
55.00	CO	0.64

* Recovery from multiple tests

Gas Rates

Choke (inches)	Pressure (psig)	Gas Rate (Mcf/d)



**TRILOBITE
TESTING, INC.**

DRILL STEM TEST REPORT

TOOL DIAGRAM

TDI, Inc.
1310 Bison Rd.
Hays, KS 67601
ATTN: Herb Deines

21-15S-18W Ellis,KS
Engel South #2
Job Ticket: 63286 **DST#: 2**
Test Start: 2017.08.02 @ 07:20:55

Tool Information

Drill Pipe:	Length: 3490.00 ft	Diameter: 3.82 inches	Volume: 49.47 bbl	Tool Weight: 2000.00 lb
Heavy Wt. Pipe:	Length: ft	Diameter: inches	Volume: - bbl	Weight set on Packer: 25000.00 lb
Drill Collar:	Length: 30.00 ft	Diameter: 2.25 inches	Volume: 0.15 bbl	Weight to Pull Loose: 66000.00 lb
			<u>Total Volume: - bbl</u>	Tool Chased 0.00 ft
Drill Pipe Above KB:	11.00 ft			String Weight: Initial 48000.00 lb
Depth to Top Packer:	3529.00 ft			Final 49000.00 lb
Depth to Bottom Packer:	ft			
Interval between Packers:	61.00 ft			
Tool Length:	81.00 ft			
Number of Packers:	2	Diameter: 6.75 inches		

Tool Comments:

Tool Description	Length (ft)	Serial No.	Position	Depth (ft)	Accum. Lengths
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Change Over Sub	1.00			3510.00	
Shut In Tool	5.00			3515.00	
Hydraulic tool	5.00			3520.00	
Packer	5.00			3525.00	20.00 Bottom Of Top Packer
Packer	4.00			3529.00	
Stubb	1.00			3530.00	
Recorder	0.00	6771	Inside	3530.00	
Recorder	0.00	8524	Outside	3530.00	
Perforations	24.00			3554.00	
Change Over Sub	1.00			3555.00	
Drill Pipe	31.00			3586.00	
Change Over Sub	1.00			3587.00	
Bullnose	3.00			3590.00	61.00 Bottom Packers & Anchor

Total Tool Length: 81.00



**TRILOBITE
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DRILL STEM TEST REPORT

FLUID SUMMARY

TDI, Inc.
1310 Bison Rd.
Hays, KS 67601
ATTN: Herb Deines

21-15S-18W Ellis,KS
Engel South #2
Job Ticket: 63286 **DST#: 2**
Test Start: 2017.08.02 @ 07:20:55

Mud and Cushion Information

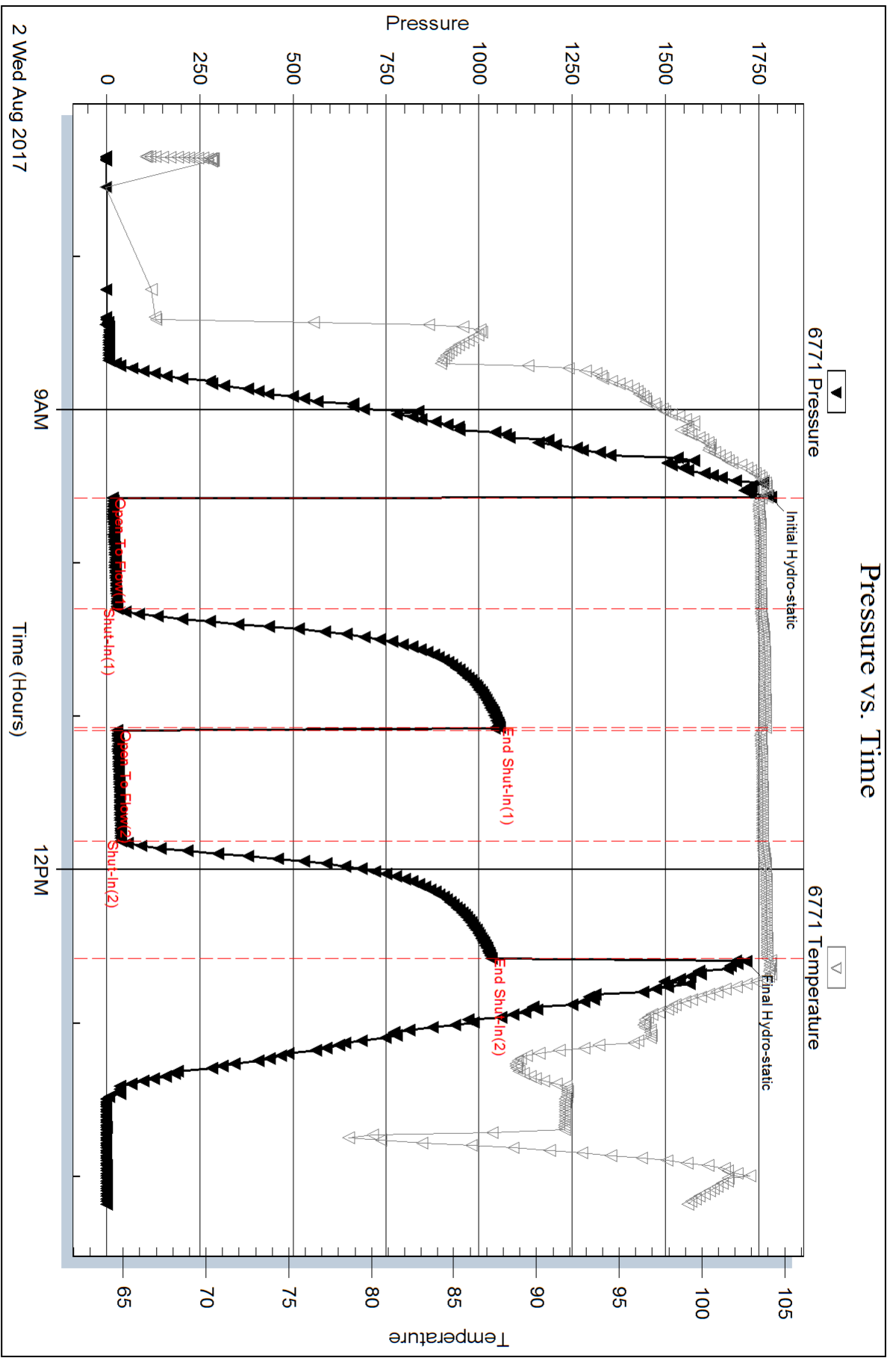
Mud Type: Gel Chem	Cushion Type:	Oil API: 30 deg API
Mud Weight: 9.00 lb/gal	Cushion Length: ft	Water Salinity: ppm
Viscosity: 56.00 sec/qt	Cushion Volume: bbl	
Water Loss: 6.79 in ³	Gas Cushion Type:	
Resistivity: ohm.m	Gas Cushion Pressure: psig	
Salinity: 7300.00 ppm		
Filter Cake: inches		

Recovery Information

Recovery Table

Length ft	Description	Volume bbl
15.00	M	0.074
55.00	CO	0.641

Total Length: 70.00 ft Total Volume: 0.715 bbl
 Num Fluid Samples: 0 Num Gas Bombs: 0 Serial #:
 Laboratory Name: Laboratory Location:
 Recovery Comments: Gravity: 35 @ 110deg

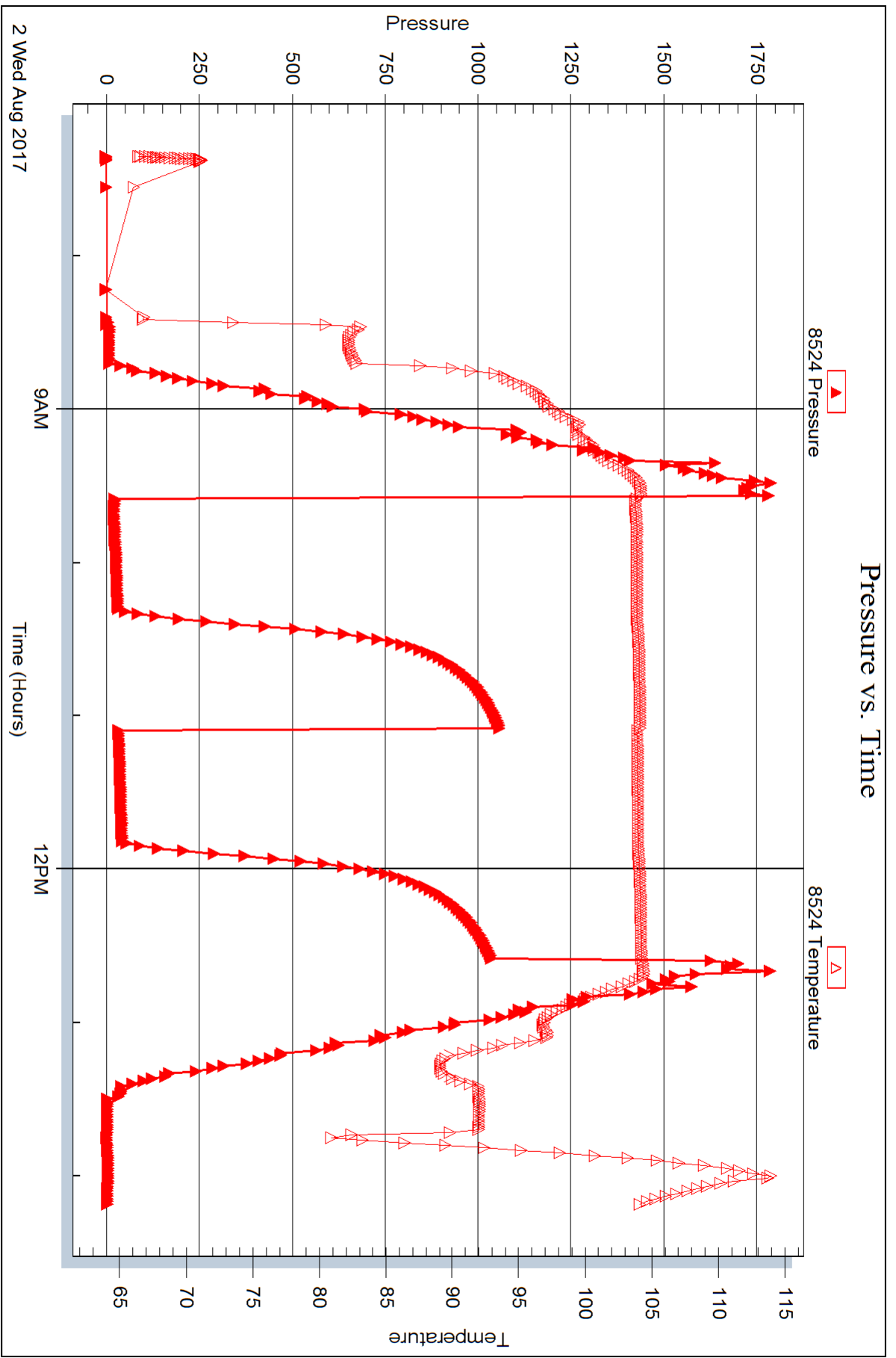


Serial #: 8524

Outside TDI, Inc.

Engel South #2

DST Test Number: 2



Trilobite Testing, Inc

Ref. No: 63286

Printed: 2017.08.04 @ 08:40:24



DRILL STEM TEST REPORT

Prepared For: **TDI, Inc.**

1310 Bison Rd.
Hays, KS 67601

ATTN: Herb Deines

Engel South #2

21-15S-18W Ellis,KS

Start Date: 2017.08.02 @ 18:27:58

End Date: 2017.08.03 @ 00:34:19

Job Ticket #: 63287 DST #: 3

Trilobite Testing, Inc
1515 Commerce Parkway Hays, KS 67601
ph: 785-625-4778 fax: 785-625-5620

Printed: 2017.08.04 @ 08:39:51



TRILOBITE TESTING, INC.

DRILL STEM TEST REPORT

TDI, Inc.
 1310 Bison Rd.
 Hays, KS 67601
 ATTN: Herb Deines

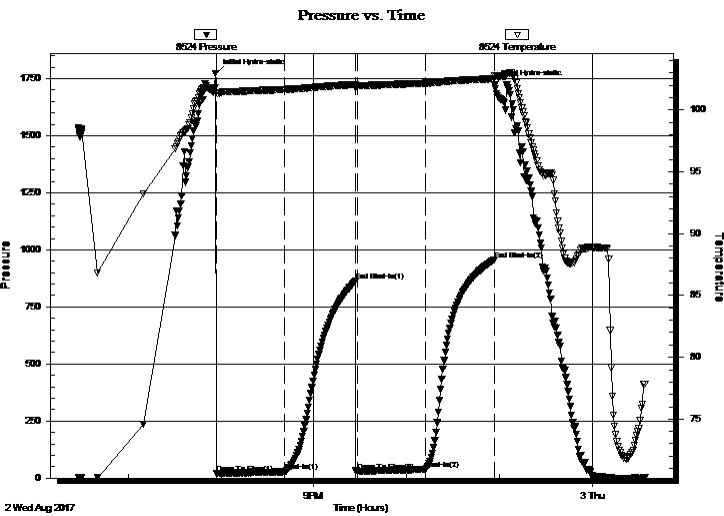
21-15S-18W Ellis, KS
Engel South #2
 Job Ticket: 63287 **DST#: 3**
 Test Start: 2017.08.02 @ 18:27:58

GENERAL INFORMATION:

Formation: **Conglomerate Sand**
 Deviated: No Whipstock: ft (KB)
 Time Tool Opened: 19:57:19
 Time Test Ended: 00:34:19
 Interval: **3508.00 ft (KB) To 3599.00 ft (KB) (TVD)**
 Total Depth: 3599.00 ft (KB) (TVD)
 Hole Diameter: 7.88 inches Hole Condition: Fair
 Test Type: Conventional Bottom Hole (Reset)
 Tester: Brannan Lonsdale
 Unit No: 73
 Reference Elevations: 2019.00 ft (KB)
 2009.00 ft (CF)
 KB to GR/CF: 10.00 ft

Serial #: 8524 Outside
 Press@RunDepth: 39.72 psig @ 3509.00 ft (KB) Capacity: 8000.00 psig
 Start Date: 2017.08.02 End Date: 2017.08.03 Last Calib.: 2017.08.03
 Start Time: 18:27:59 End Time: 00:34:19 Time On Btm: 2017.08.02 @ 19:56:49
 Time Off Btm: 2017.08.02 @ 22:57:04

TEST COMMENT: 45- IF- Built very slow ly to 2 1/2"
 45- IS- No blow
 45- FF- Built very slow ly to 1 1/2"
 45- FS- No blow



PRESSURE SUMMARY

Time (Min.)	Pressure (psig)	Temp (deg F)	Annotation
0	1772.83	101.84	Initial Hydro-static
1	21.32	101.42	Open To Flow (1)
45	27.79	101.66	Shut-In(1)
91	862.76	102.06	End Shut-In(1)
92	28.34	101.95	Open To Flow (2)
136	39.72	102.17	Shut-In(2)
180	955.64	102.53	End Shut-In(2)
181	1721.87	102.74	Final Hydro-static

Recovery

Length (ft)	Description	Volume (bbl)
30.00	M	0.43
40.00	CO	0.57

* Recovery from multiple tests

Gas Rates

Choke (inches)	Pressure (psig)	Gas Rate (Mcf/d)



TRILOBITE TESTING, INC.

DRILL STEM TEST REPORT

TDI, Inc.
 1310 Bison Rd.
 Hays, KS 67601
 ATTN: Herb Deines

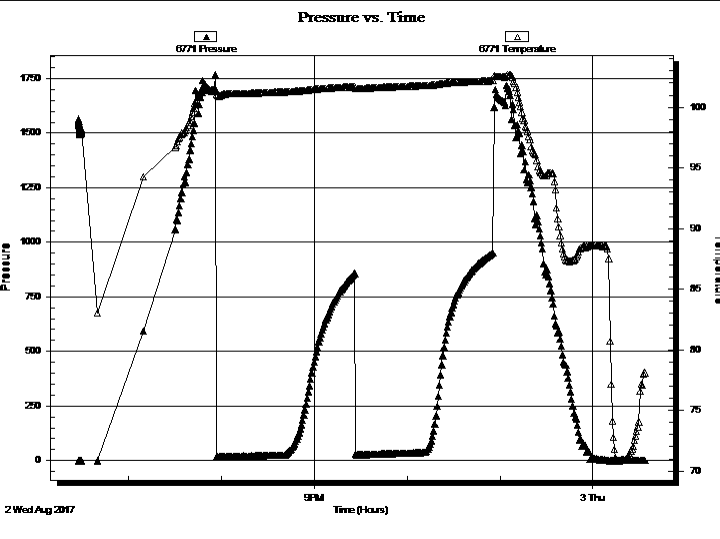
21-15S-18W Ellis, KS
Engel South #2
 Job Ticket: 63287 **DST#: 3**
 Test Start: 2017.08.02 @ 18:27:58

GENERAL INFORMATION:

Formation: **Conglomerate Sand**
 Deviated: No Whipstock: ft (KB) Test Type: Conventional Bottom Hole (Reset)
 Time Tool Opened: 19:57:19 Tester: Brannan Lonsdale
 Time Test Ended: 00:34:19 Unit No: 73
Interval: 3508.00 ft (KB) To 3599.00 ft (KB) (TVD) Reference Elevations: 2019.00 ft (KB)
 Total Depth: 3599.00 ft (KB) (TVD) 2009.00 ft (CF)
 Hole Diameter: 7.88 inches Hole Condition: Fair KB to GR/CF: 10.00 ft

Serial #: 6771 **Inside**
 Press@RunDepth: psig @ 3509.00 ft (KB) Capacity: 8000.00 psig
 Start Date: 2017.08.02 End Date: 2017.08.03 Last Calib.: 2017.08.03
 Start Time: 18:27:27 End Time: 00:33:32 Time On Btm:
 Time Off Btm:

TEST COMMENT: 45- IF- Built very slow ly to 2 1/2"
 45- IS- No blow
 45- FF- Built very slow ly to 1 1/2"
 45- FS- No blow



Time (Min.)	Pressure (psig)	Temp (deg F)	Annotation

Length (ft)	Description	Volume (bbl)
30.00	M	0.43
40.00	CO	0.57

* Recovery from multiple tests

Choke (inches)	Pressure (psig)	Gas Rate (Mcf/d)



**TRILOBITE
TESTING, INC.**

DRILL STEM TEST REPORT

TOOL DIAGRAM

TDI, Inc.
1310 Bison Rd.
Hays, KS 67601
ATTN: Herb Deines

21-15S-18W Ellis,KS
Engel South #2
Job Ticket: 63287 **DST#: 3**
Test Start: 2017.08.02 @ 18:27:58

Tool Information

Drill Pipe:	Length: 3520.00 ft	Diameter: 3.82 inches	Volume: 49.90 bbl	Tool Weight: 2000.00 lb
Heavy Wt. Pipe:	Length: ft	Diameter: inches	Volume: - bbl	Weight set on Packer: 25000.00 lb
Drill Collar:	Length: 0.00 ft	Diameter: 2.25 inches	Volume: 0.00 bbl	Weight to Pull Loose: 70000.00 lb
			<u>Total Volume: - bbl</u>	Tool Chased 0.00 ft
Drill Pipe Above KB:	32.00 ft			String Weight: Initial 48000.00 lb
Depth to Top Packer:	3508.00 ft			Final 48000.00 lb
Depth to Bottom Packer:	ft			
Interval between Packers:	91.00 ft			
Tool Length:	111.00 ft			
Number of Packers:	2	Diameter: 6.75 inches		

Tool Comments:

Tool Description	Length (ft)	Serial No.	Position	Depth (ft)	Accum. Lengths
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Change Over Sub	1.00			3489.00	
Shut In Tool	5.00			3494.00	
Hydraulic tool	5.00			3499.00	
Packer	5.00			3504.00	20.00 Bottom Of Top Packer
Packer	4.00			3508.00	
Stubb	1.00			3509.00	
Recorder	0.00	6771	Inside	3509.00	
Recorder	0.00	8524	Outside	3509.00	
Perforations	22.00			3531.00	
Change Over Sub	1.00			3532.00	
Drill Pipe	63.00			3595.00	
Change Over Sub	1.00			3596.00	
Bullnose	3.00			3599.00	91.00 Bottom Packers & Anchor

Total Tool Length: 111.00



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TESTING, INC.**

DRILL STEM TEST REPORT

FLUID SUMMARY

TDI, Inc.
1310 Bison Rd.
Hays, KS 67601
ATTN: Herb Deines

21-15S-18W Ellis,KS
Engel South #2
Job Ticket: 63287 **DST#: 3**
Test Start: 2017.08.02 @ 18:27:58

Mud and Cushion Information

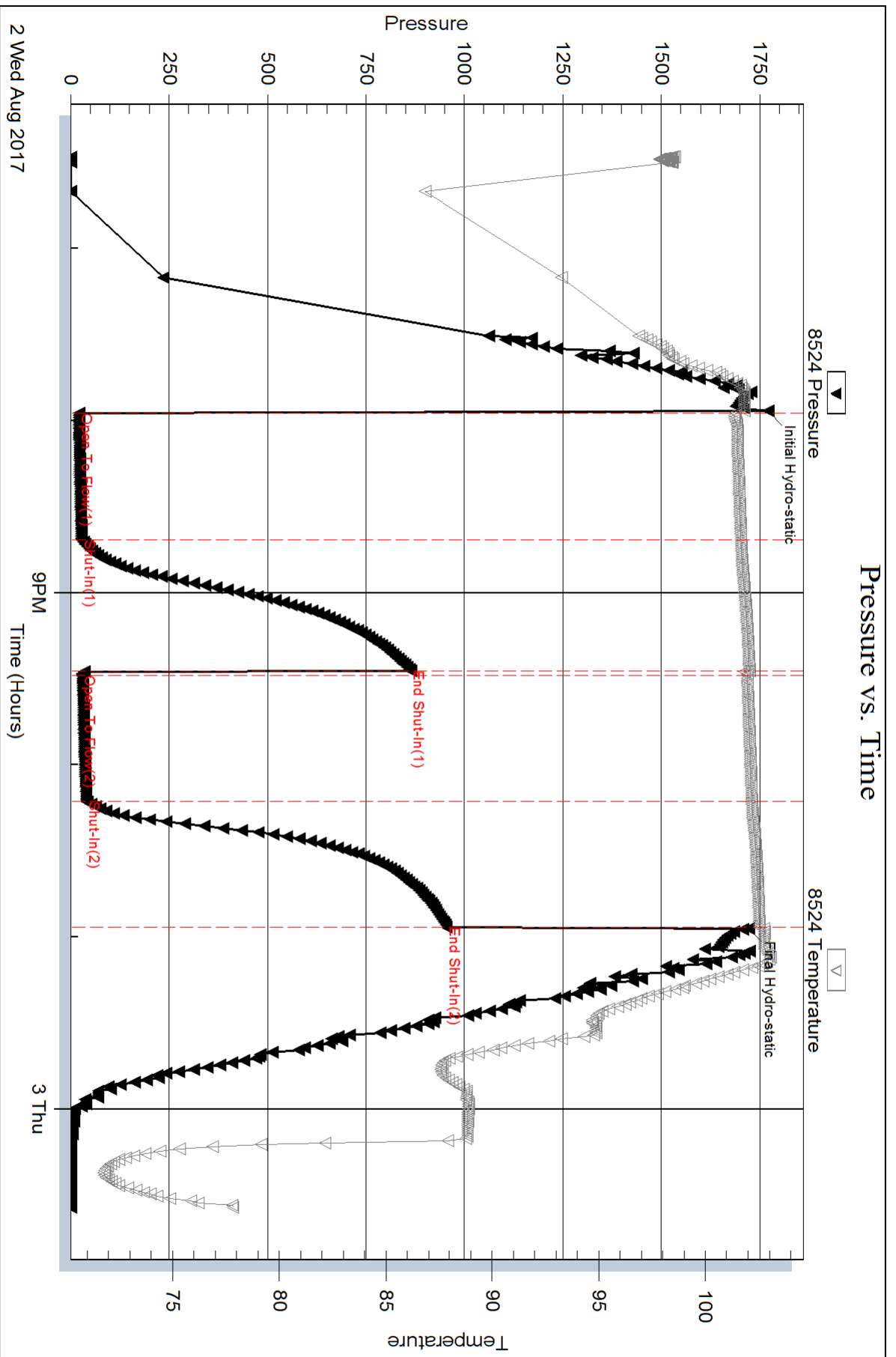
Mud Type: Gel Chem	Cushion Type:	Oil API: 30 deg API
Mud Weight: 9.00 lb/gal	Cushion Length: ft	Water Salinity: ppm
Viscosity: 56.00 sec/qt	Cushion Volume: bbl	
Water Loss: 6.79 in ³	Gas Cushion Type:	
Resistivity: ohm.m	Gas Cushion Pressure: psig	
Salinity: 7300.00 ppm		
Filter Cake: inches		

Recovery Information

Recovery Table

Length ft	Description	Volume bbl
30.00	M	0.425
40.00	CO	0.567

Total Length: 70.00 ft Total Volume: 0.992 bbl
 Num Fluid Samples: 0 Num Gas Bombs: 0 Serial #:
 Laboratory Name: Laboratory Location:
 Recovery Comments:



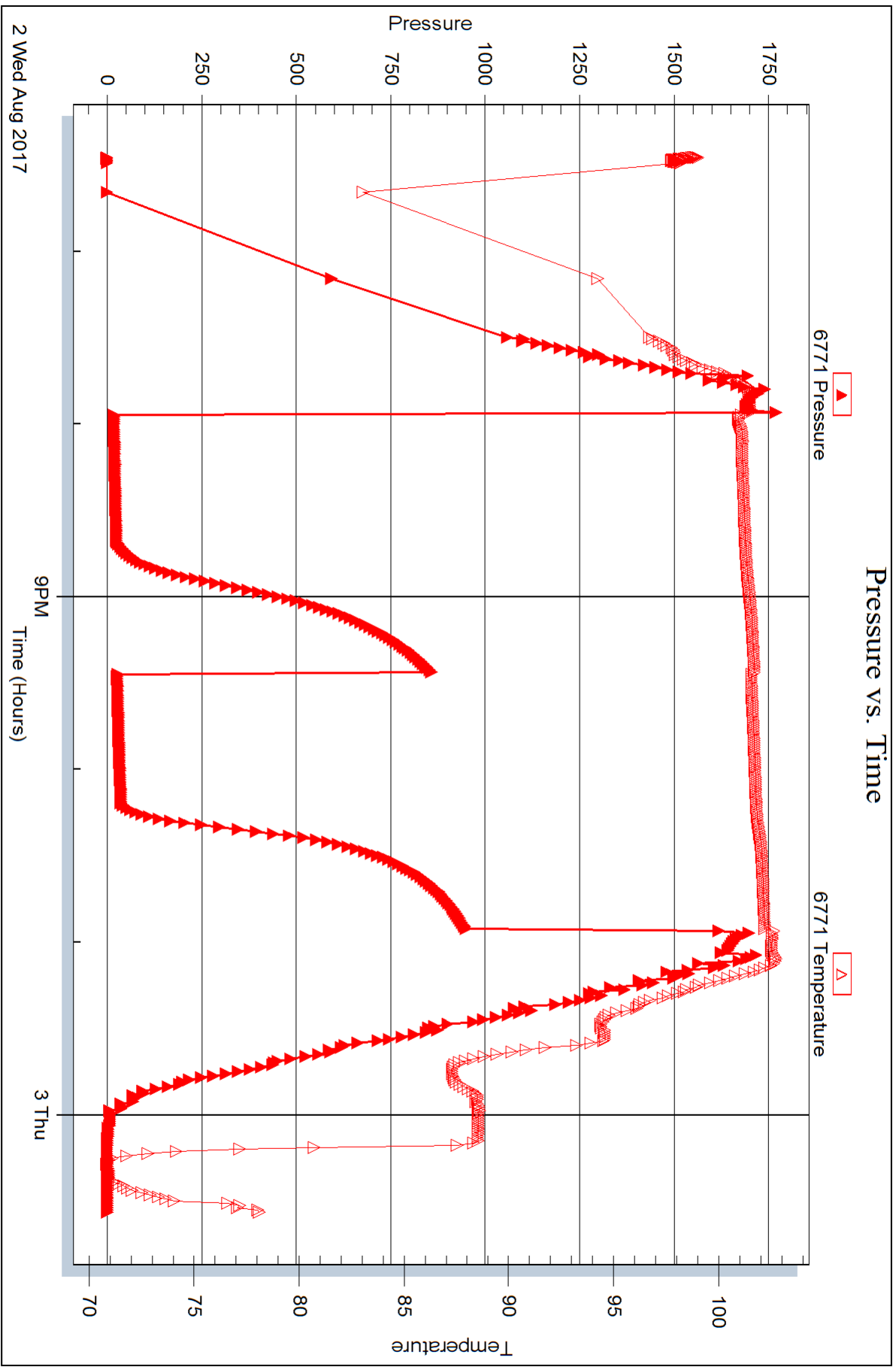
Serial #: 6771

Inside

TDI, Inc.

Engel South #2

DST Test Number: 3



Trilobite Testing, Inc

Ref. No: 63287

Printed: 2017.08.04 @ 08:39:53



DRILL STEM TEST REPORT

Prepared For: **TDI, Inc.**

1310 Bison Rd.
Hays, KS 67601

ATTN: Herb Deines

Engel South #2

21-15S-18W Ellis,KS

Start Date: 2017.08.03 @ 12:30:26

End Date: 2017.08.03 @ 18:28:02

Job Ticket #: 63288 DST #: 4

Trilobite Testing, Inc
1515 Commerce Parkway Hays, KS 67601
ph: 785-625-4778 fax: 785-625-5620

Printed: 2017.08.04 @ 08:38:50



TRILOBITE TESTING, INC.

DRILL STEM TEST REPORT

TDI, Inc.
 1310 Bison Rd.
 Hays, KS 67601
 ATTN: Herb Deines

21-15S-18W Ellis, KS
Engel South #2
 Job Ticket: 63288 **DST#: 4**
 Test Start: 2017.08.03 @ 12:30:26

GENERAL INFORMATION:

Formation: **LKC "C - D"**
 Deviated: No Whipstock: ft (KB)
 Time Tool Opened: 14:48:17
 Time Test Ended: 18:28:02
 Interval: **3299.00 ft (KB) To 3345.00 ft (KB) (TVD)**
 Total Depth: 3670.00 ft (KB) (TVD)
 Hole Diameter: 7.88 inches Hole Condition: Fair
 Test Type: Conventional Straddle (Reset)
 Tester: Brannan Lonsdale
 Unit No: 73
 Reference Elevations: 2019.00 ft (KB)
 2009.00 ft (CF)
 KB to GR/CF: 10.00 ft

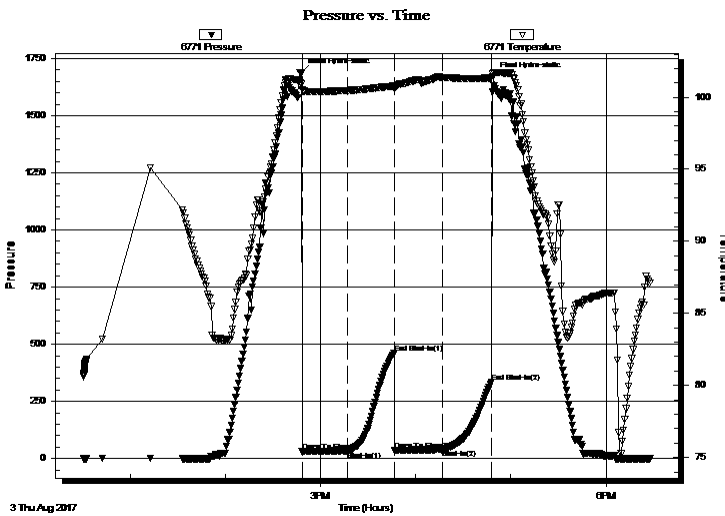
Serial #: 6771

Inside

Press@RunDepth: 39.24 psig @ 3300.00 ft (KB) Capacity: 8000.00 psig
 Start Date: 2017.08.03 End Date: 2017.08.03 Last Calib.: 2017.08.03
 Start Time: 12:30:27 End Time: 18:28:02 Time On Btm: 2017.08.03 @ 14:48:02
 Time Off Btm: 2017.08.03 @ 16:48:47

TEST COMMENT: 30- IF- Surface blow died in 7 mins
 30- IS- No blow
 30- FF- No blow
 30- FSI- No blow

PRESSURE SUMMARY



Time (Min.)	Pressure (psig)	Temp (deg F)	Annotation
0	1688.92	100.90	Initial Hydro-static
1	29.57	100.53	Open To Flow (1)
29	33.70	100.47	Shut-In(1)
59	460.46	100.77	End Shut-In(1)
59	35.18	100.57	Open To Flow (2)
89	39.24	101.36	Shut-In(2)
120	334.75	101.34	End Shut-In(2)
121	1671.01	101.65	Final Hydro-static

Recovery

Length (ft)	Description	Volume (bbl)
3.00	Mw / few oil spots	0.01

* Recovery from multiple tests

Gas Rates

Choke (inches)	Pressure (psig)	Gas Rate (Mcf/d)



TRILOBITE TESTING, INC.

DRILL STEM TEST REPORT

TDI, Inc.
1310 Bison Rd.
Hays, KS 67601

ATTN: Herb Deines

21-15S-18W Ellis, KS

Engel South #2

Job Ticket: 63288

DST#: 4

Test Start: 2017.08.03 @ 12:30:26

GENERAL INFORMATION:

Formation: **LKC "C - D"**

Deviated: No Whipstock: ft (KB)

Time Tool Opened: 14:48:17

Time Test Ended: 18:28:02

Test Type: Conventional Straddle (Reset)

Tester: Brannan Lonsdale

Unit No: 73

Interval: 3299.00 ft (KB) To 3345.00 ft (KB) (TVD)

Reference Elevations: 2019.00 ft (KB)

Total Depth: 3670.00 ft (KB) (TVD)

2009.00 ft (CF)

Hole Diameter: 7.88 inches Hole Condition: Fair

KB to GR/CF: 10.00 ft

Serial #: 6753 Outside

Press@RunDepth: psig @ 3300.00 ft (KB)

Start Date: 2017.08.03

End Date:

2017.08.03

Start Time: 12:30:14

End Time:

18:27:38

Capacity: 8000.00 psig

Last Calib.: 2017.08.03

Time On Btm:

Time Off Btm:

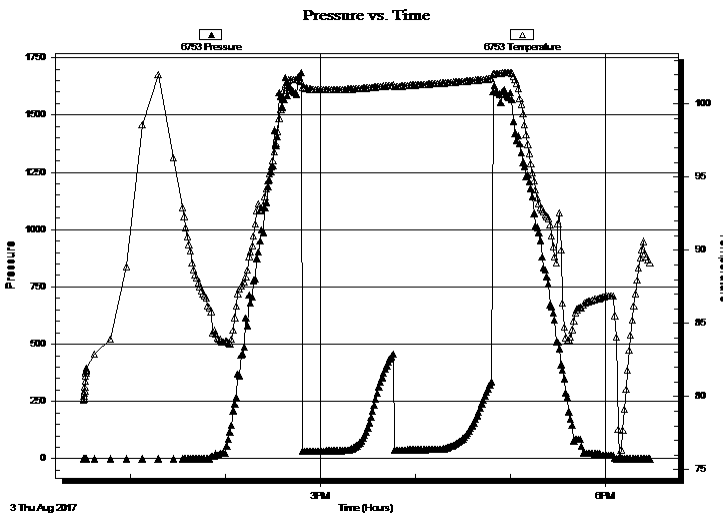
TEST COMMENT: 30- IF- Surface blow died in 7 mins

30- IS- No blow

30- FF- No blow

30- FSI- No blow

PRESSURE SUMMARY



Time (Min.)	Pressure (psig)	Temp (deg F)	Annotation

Recovery

Length (ft)	Description	Volume (bbl)
3.00	Mw/ few oil spots	0.01

Gas Rates

Choke (inches)	Pressure (psig)	Gas Rate (Mcf/d)

* Recovery from multiple tests



**TRILOBITE
TESTING, INC.**

DRILL STEM TEST REPORT

TDI, Inc.
1310 Bison Rd.
Hays, KS 67601
ATTN: Herb Deines

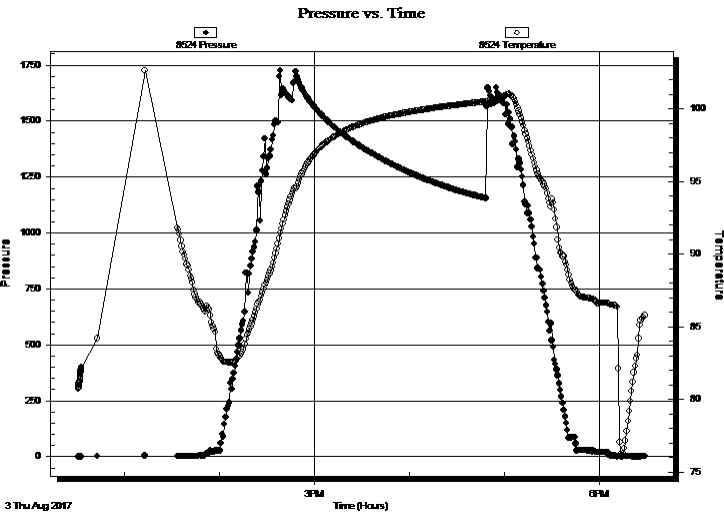
21-15S-18W Ellis, KS
Engel South #2
Job Ticket: 63288 **DST#: 4**
Test Start: 2017.08.03 @ 12:30:26

GENERAL INFORMATION:

Formation: **LKC "C - D"**
Deviated: No Whipstock: ft (KB) Test Type: Conventional Straddle (Reset)
Time Tool Opened: 14:48:17 Tester: Brannan Lonsdale
Time Test Ended: 18:28:02 Unit No: 73
Interval: 3299.00 ft (KB) To 3345.00 ft (KB) (TVD) Reference Elevations: 2019.00 ft (KB)
Total Depth: 3670.00 ft (KB) (TVD) 2009.00 ft (CF)
Hole Diameter: 7.88 inches Hole Condition: Fair KB to GR/CF: 10.00 ft

Serial #: 8524 Below (Straddle)
Press@RunDepth: psig @ 3347.00 ft (KB) Capacity: 8000.00 psig
Start Date: 2017.08.03 End Date: 2017.08.03 Last Calib.: 2017.08.03
Start Time: 12:30:50 End Time: 18:28:40 Time On Btm:
Time Off Btm:

TEST COMMENT: 30- IF- Surface blow died in 7 mins
30- IS- No blow
30- FF- No blow
30- FS- No blow



PRESSURE SUMMARY

Time (Min.)	Pressure (psig)	Temp (deg F)	Annotation

Recovery

Length (ft)	Description	Volume (bbl)
3.00	Mw/ few oil spots	0.01

Gas Rates

Choke (inches)	Pressure (psig)	Gas Rate (Mcf/d)

* Recovery from multiple tests



**TRILOBITE
TESTING, INC.**

DRILL STEM TEST REPORT

TOOL DIAGRAM

TDI, Inc.
1310 Bison Rd.
Hays, KS 67601
ATTN: Herb Deines

21-15S-18W Ellis,KS
Engel South #2
Job Ticket: 63288 **DST#: 4**
Test Start: 2017.08.03 @ 12:30:26

Tool Information

Drill Pipe:	Length: 3266.00 ft	Diameter: 3.82 inches	Volume: 46.30 bbl	Tool Weight:	2000.00 lb
Heavy Wt. Pipe:	Length: ft	Diameter: inches	Volume: - bbl	Weight set on Packer:	25000.00 lb
Drill Collar:	Length: 30.00 ft	Diameter: 2.25 inches	Volume: 0.15 bbl	Weight to Pull Loose:	53000.00 lb
			<u>Total Volume: - bbl</u>	Tool Chased	0.00 ft
Drill Pipe Above KB:	17.00 ft			String Weight: Initial	51000.00 lb
Depth to Top Packer:	3299.00 ft			Final	51000.00 lb
Depth to Bottom Packer:	3345.00 ft				
Interval between Packers:	46.00 ft				
Tool Length:	391.00 ft				
Number of Packers:	3	Diameter: 6.75 inches			

Tool Comments:

Tool Description	Length (ft)	Serial No.	Position	Depth (ft)	Accum. Lengths
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Change Over Sub	1.00			3280.00	
Shut In Tool	5.00			3285.00	
Hydraulic tool	5.00			3290.00	
Packer	5.00			3295.00	20.00 Bottom Of Top Packer
Packer	4.00			3299.00	
Stubb	1.00			3300.00	
Recorder	0.00	6771	Inside	3300.00	
Recorder	0.00	6753	Outside	3300.00	
Perforations	2.00			3302.00	
Change Over Sub	1.00			3303.00	
Drill Pipe	32.00			3335.00	
Change Over Sub	1.00			3336.00	
Perforations	5.00			3341.00	
Blank Off Sub	1.00			3342.00	
Blank Spacing	3.00			3345.00	46.00 Tool Interval
Packer	1.00			3346.00	
Stubb	1.00			3347.00	
Recorder	0.00	8524	Below	3347.00	
Change Over Sub	1.00			3348.00	
Drill Pipe	318.00			3666.00	
Change Over Sub	1.00			3667.00	
Bullnose	3.00			3670.00	325.00 Bottom Packers & Anchor

Total Tool Length: 391.00



**TRILOBITE
TESTING, INC.**

DRILL STEM TEST REPORT

FLUID SUMMARY

TDI, Inc.

21-15S-18W Ellis,KS

1310 Bison Rd.
Hays, KS 67601

Engel South #2

Job Ticket: 63288

DST#: 4

ATTN: Herb Deines

Test Start: 2017.08.03 @ 12:30:26

Mud and Cushion Information

Mud Type: Gel Chem

Cushion Type:

Oil API:

deg API

Mud Weight: 9.00 lb/gal

Cushion Length:

ft

Water Salinity:

ppm

Viscosity: 51.00 sec/qt

Cushion Volume:

bbbl

Water Loss: 6.38 in³

Gas Cushion Type:

Resistivity: ohm.m

Gas Cushion Pressure:

psig

Salinity: 6700.00 ppm

Filter Cake: inches

Recovery Information

Recovery Table

Length ft	Description	Volume bbl
3.00	Mw / few oil spots	0.015

Total Length: 3.00 ft Total Volume: 0.015 bbl

Num Fluid Samples: 0

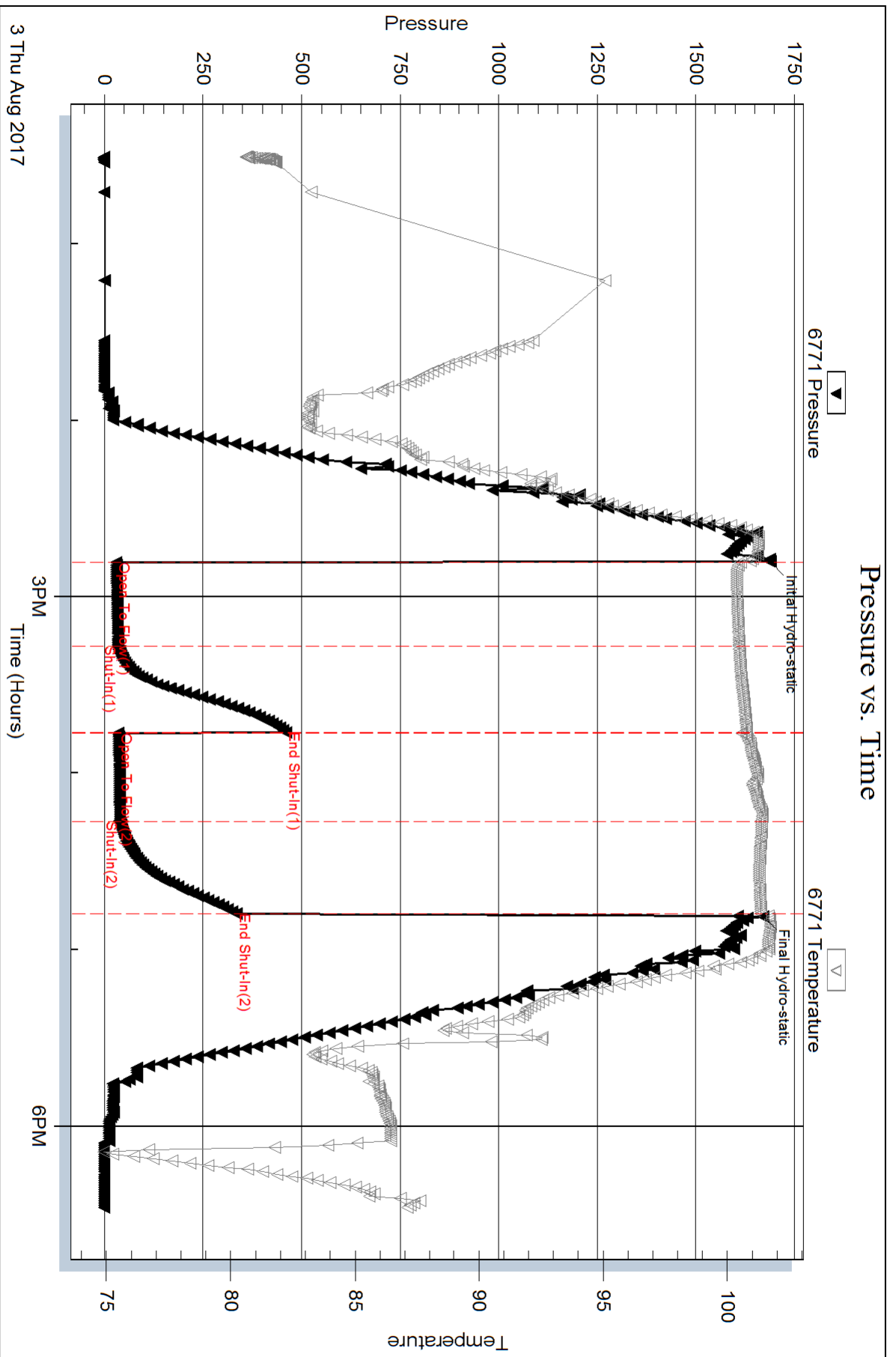
Num Gas Bombs: 0

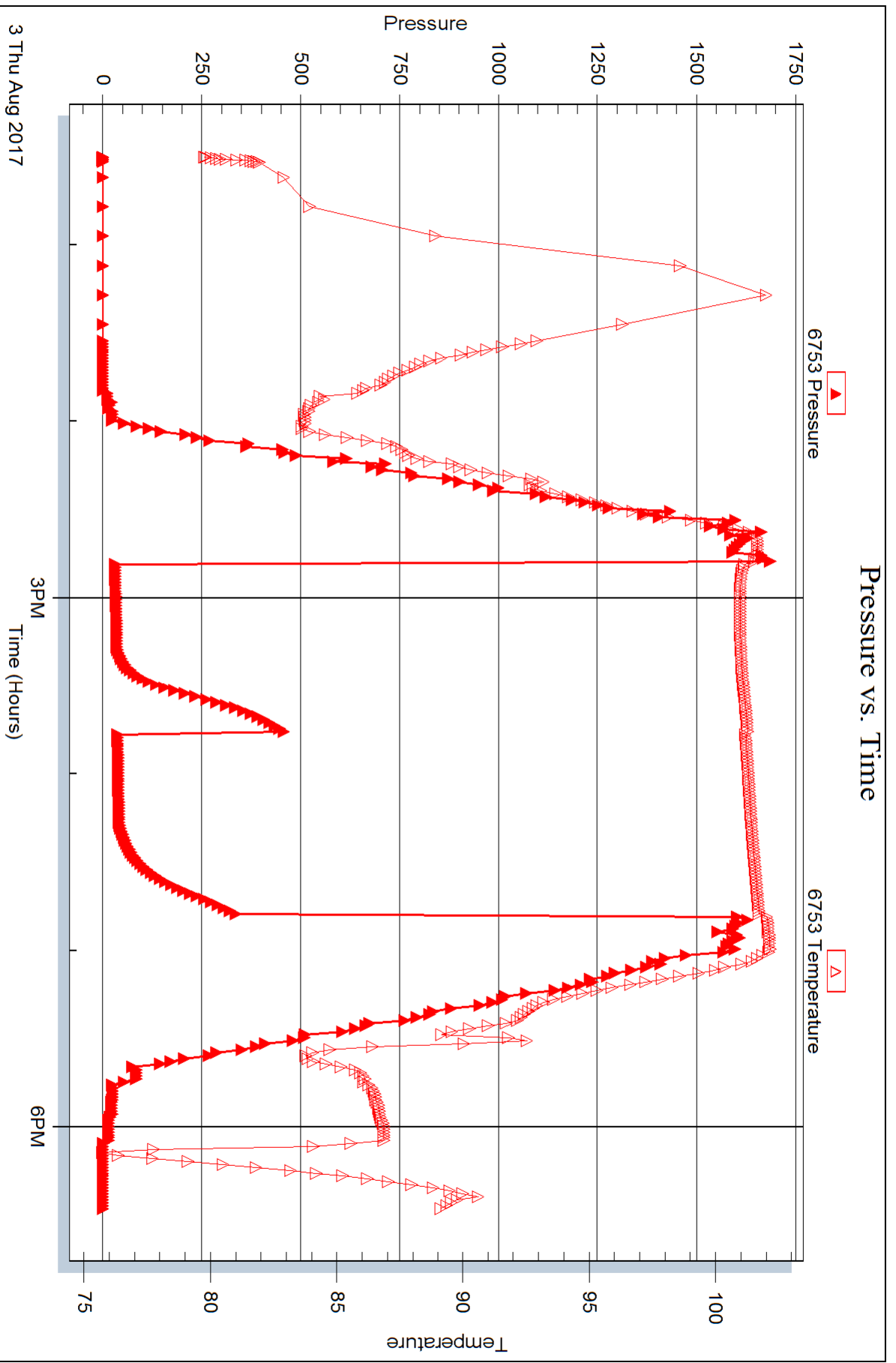
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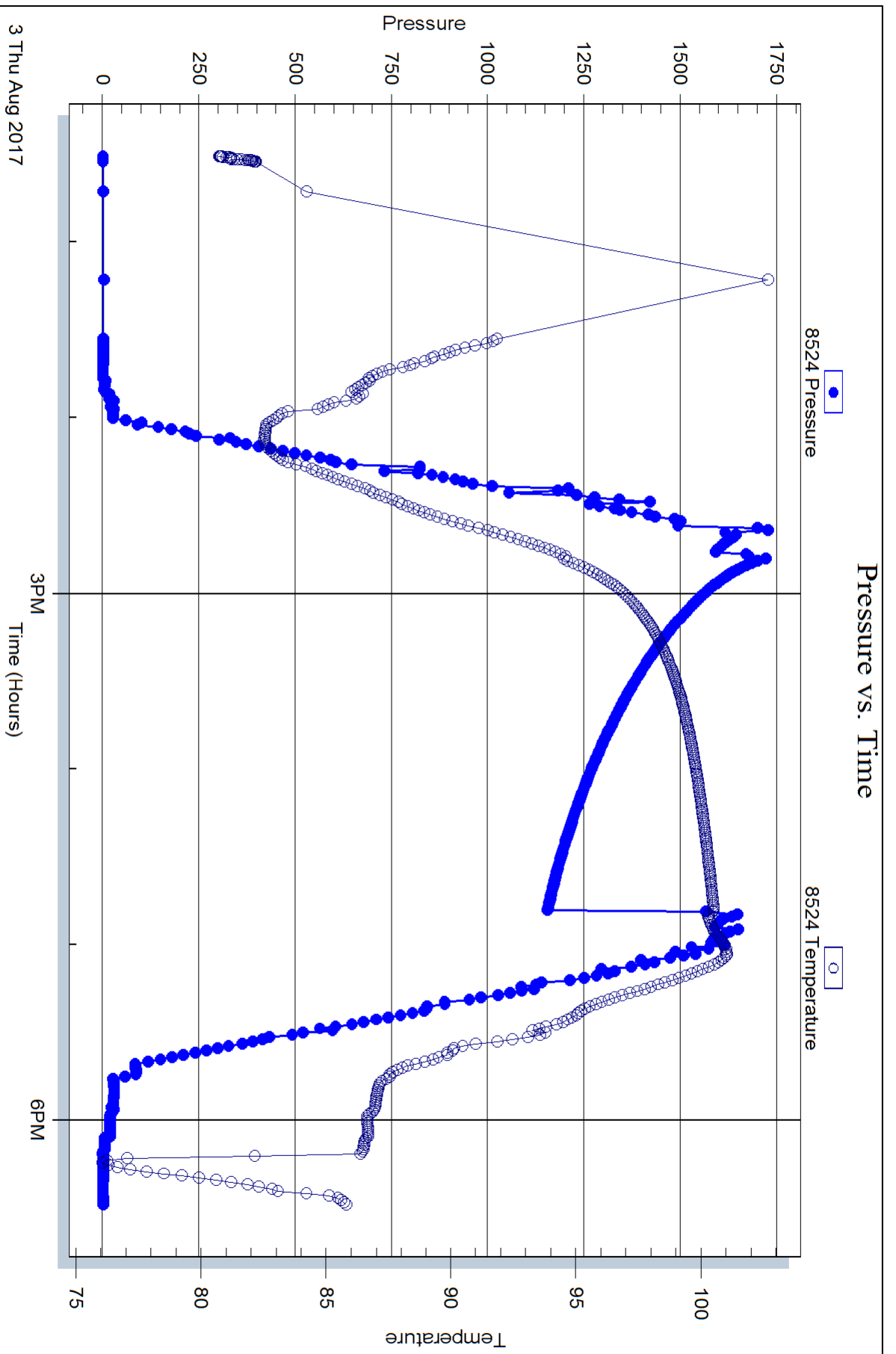
Laboratory Name:

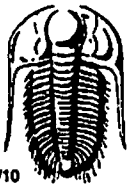
Laboratory Location:

Recovery Comments:









TRILOBITE TESTING INC.

1515 Commerce Parkway • Hays, Kansas 67601

Test Ticket

NO. 63285

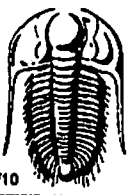
Well Name & No. Engel South #2 Test No. 1 Date 7/31/17
 Company TDI, Inc. Elevation 2019 KB 2009 GL
 Address 1310 Bison Rd Hays, KS 67601
 Co. Rep / Geo. Herb Deines Rig Southwell #B
 Location: Sec. 21 Twp. 15 S Rge. 18 W Co. E/15 State KS

Interval Tested 3182-3199 Zone Tested Topeka + Oread
 Anchor Length 17' Drill Pipe Run 3172 Mud Wt. 8.6
 Top Packer Depth 3177 Drill Collars Run — Vis 55
 Bottom Packer Depth 3182 Wt. Pipe Run — WL 6.4
 Total Depth 3199 Chlorides 2800 ppm System LCM 2#
 Blow Description IF - BOB 13 mins
ESI - No blow
FF - BOB 17 mins
ESI - No blow

Rec	Feet of	%gas	%oil	%water	%mud
<u>285</u>	<u>MW</u>			<u>80</u>	<u>20</u>
Rec	Feet of	%gas	%oil	%water	%mud
Rec	Feet of	%gas	%oil	%water	%mud
Rec	Feet of	%gas	%oil	%water	%mud

Rec Total 285' BHT 105° Gravity — API RW .09 @ 67° F Chlorides 25000 ppm
 (A) Initial Hydrostatic 1516 Test 1050 T-On Location 1645
 (B) First Initial Flow 20 Jars — T-Started 1646
 (C) First Final Flow 93 Safety Joint — T-Open 1950
 (D) Initial Shut-In 951 Circ Sub — T-Pulled 2150
 (E) Second Initial Flow 97 Hourly Standby — T-Out 2333
 (F) Second Final Flow 161 Mileage 24 RT 18
 (G) Final Shut-In 893 Sampler —
 (H) Final Hydrostatic 1486 Straddle —
 Shale Packer —
 Shale Packer —
 Extra Packer —
 Extra Recorder —
 Day Standby —
 Accessibility —
 Initial Open 30
 Initial Shut-In 30
 Final Flow 30
 Final Shut-In 30
 Sub Total 0
 Total 1068
 MP/DST Disc't —
 Sub Total 1068

Approved By _____ Our Representative Bannan Lonsdale
 TriLOBITE TESTING Inc. shall not be liable for damaged of any kind of the property or personnel of the one for whom a test is made, or for any loss suffered or sustained, directly or indirectly, through the use of its equipment, or its statements or opinion concerning the results of any test, tools lost or damaged in the hole shall be paid for at cost by the party for whom the test is made.



TRILOBITE TESTING INC.

1515 Commerce Parkway • Hays, Kansas 67601

Test Ticket

NO. 63286

Well Name & No. Engel South #2 Test No. 2 Date 8/2/17
 Company TDI, Inc. Elevation 2019 KB 2609 GL
 Address 1310 Bison Rd. Hays, KS 67601
 Co. Rep / Geo. Herb Deines Rig Southwind #1
 Location: Sec. 21 Twp. 15 S Rge. 18 W Co. Ellis State KS

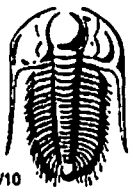
Interval Tested 3529-3590 Zone Tested Cong. Sand
 Anchor Length 61' Drill Pipe Run 3520 Mud Wt. 9.1
 Top Packer Depth 3524 Drill Collars Run --- Vis 56
 Bottom Packer Depth 3529 Wt. Pipe Run --- WL 6.8
 Total Depth 3590 Chlorides 7,300 ppm System LCM 1#
 Blow Description IF- Built very slowly to 2 1/2"
FSI- No blow
FF- No blow
FSI- No blow

Rec	Feet of	%gas	%oil	%water	%mud
<u>15</u>	<u>M</u>				
<u>55</u>	<u>CO</u>				

Rec Total 20' BHT 104° Gravity 30 API RW --- @ ---° F Chlorides --- ppm

(A) Initial Hydrostatic <u>1782</u>	<input checked="" type="checkbox"/> Test <u>1050</u>	T-On Location <u>0715</u>
(B) First Initial Flow <u>16</u>	<input type="checkbox"/> Jars <u>---</u>	T-Started <u>0721</u>
(C) First Final Flow <u>28</u>	<input type="checkbox"/> Safety Joint <u>---</u>	T-Open <u>0934</u>
(D) Initial Shut-In <u>1056</u>	<input type="checkbox"/> Circ Sub <u>---</u>	T-Pulled <u>1234</u>
(E) Second Initial Flow <u>28</u>	<input type="checkbox"/> Hourly Standby <u>---</u>	T-Out <u>1411</u>
(F) Second Final Flow <u>38</u>	<input checked="" type="checkbox"/> Mileage <u>24 RT</u> 18	Comments <u>---</u>
(G) Final Shut-In <u>1034</u>	<input type="checkbox"/> Sampler <u>---</u>	
(H) Final Hydrostatic <u>1717</u>	<input type="checkbox"/> Straddle <u>---</u>	
	<input type="checkbox"/> Shale Packer <u>---</u>	<input type="checkbox"/> Ruined Shale Packer <u>---</u>
	<input type="checkbox"/> Extra Packer <u>---</u>	<input type="checkbox"/> Ruined Packer <u>---</u>
	<input type="checkbox"/> Extra Recorder <u>---</u>	<input type="checkbox"/> Extra Copies <u>---</u>
Initial Open <u>45</u>	<input type="checkbox"/> Day Standby <u>---</u>	Sub Total <u>0</u>
Initial Shut-In <u>45</u>	<input type="checkbox"/> Accessibility <u>---</u>	Total <u>1068</u>
Final Flow <u>45</u>		MP/DST Disc't <u>---</u>
Final Shut-In <u>45</u>		
	Sub Total <u>1068</u>	

Approved By _____ Our Representative Branner Lonsdale
 Trilobite Testing Inc. shall not be liable for damaged of any kind of the property or personnel of the one for whom a test is made, or for any loss suffered or sustained, directly or indirectly, through the use of its equipment, or its statements or opinion concerning the results of any test, tools lost or damaged in the hole shall be paid for at cost by the party for whom the test is made.



TRILOBITE TESTING INC.

1515 Commerce Parkway • Hays, Kansas 67601

Test Ticket

NO. 63287

Well Name & No. Engel South #2 Test No. 3 Date 8/2/17
 Company TDI, Inc. Elevation 2019 KB 2009 GL
 Address 310 Bison Rd. Hays, KS 67601
 Co. Rep / Geo. Herb Deines Rig Southwind #1
 Location: Sec. 21 Twp. 15 S Rge. 18 W Co. Ellis State KS

Interval Tested 3508-3599 Zone Tested Long Sand
 Anchor Length 91' Drill Pipe Run 3520 Mud Wt. 9.1
 Top Packer Depth 3503 Drill Collars Run — Vis 56
 Bottom Packer Depth 3508 Wt. Pipe Run — WL 6.8
 Total Depth 3599 Chlorides 7300 ppm System LCM 1#
 Blow Description IF - Built very slowly to 2 1/2"
IFT - No blow
FF - Built very slowly to 1 1/2"
FST - No blow

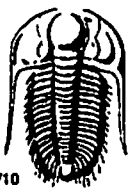
Rec	Feet of	%gas	%oil	%water	%mud
<u>30</u>	<u>M</u>				
<u>40</u>	<u>CO</u>				

Rec Total 70' BHT 103° Gravity 30 API RW — @ — °F Chlorides — ppm

(A) Initial Hydrostatic 1773 Test 1050 T-On Location 1825
 (B) First Initial Flow 21 Jars — T-Started 1827
 (C) First Final Flow 28 Safety Joint — T-Open 1956
 (D) Initial Shut-In 863 Circ Sub — T-Pulled 2256
 (E) Second Initial Flow 28 Hourly Standby — T-Out 8/3 0034
 (F) Second Final Flow 40 Mileage 24 RT 18 Comments —
 (G) Final Shut-In 956 Sampler —
 (H) Final Hydrostatic 1723 Straddle — Ruined Shale Packer —
 Shale Packer — Ruined Packer —
 Extra Packer — Extra Copies —
 Extra Recorder — Sub Total 0
 Day Standby — Total 1068
 Accessibility — MP/DST Disc't —
 Sub Total 1068

Approved By _____ Our Representative Brannan Lonsdale

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TRILOBITE TESTING INC.

1515 Commerce Parkway • Hays, Kansas 67601

Test Ticket

NO. 63288

Well Name & No. Engel South #2 Test No. 4 Date 8/3/17
 Company TDI, Inc. Elevation 2019 KB 2009GL
 Address 1310 Bison Rd. Hays, KS 67601
 Co. Rep / Geo. Herb Deines Rig Southwind #1
 Location: Sec. 21 Twp. 15 S. Rge. 18 W. Co. Ellis State KS

Interval Tested 3299-3345 Zone Tested LKC "C&D"
 Anchor Length 46' Tail: 325' Drill Pipe Run 3266 Mud Wt. 9.0
 Top Packer Depth 3294-3299 Drill Collars Run 30 Vis 51
 Bottom Packer Depth 3345 Wt. Pipe Run — WL 6.4
 Total Depth 3670 Chlorides 6760 ppm System LCM 2nd

Blow Description IF - Surface blow died in 7mins
IST - No blow
FF - No blow
FSI - No blow

Rec	Feet of	%gas	%oil	%water	%mud
<u>3'</u>	<u>M w/ few oil spots</u>				
Rec	Feet of	%gas	%oil	%water	%mud
Rec	Feet of	%gas	%oil	%water	%mud
Rec	Feet of	%gas	%oil	%water	%mud
Rec	Feet of	%gas	%oil	%water	%mud

Rec Total 3' BHT 101° Gravity — API RW — @ — °F Chlorides — ppm

(A) Initial Hydrostatic <u>1689</u>	<input checked="" type="checkbox"/> Test <u>1050</u>	T-On Location <u>1225</u>
(B) First Initial Flow <u>30</u>	<input type="checkbox"/> Jars <u>—</u>	T-Started <u>1230</u>
(C) First Final Flow <u>34</u>	<input type="checkbox"/> Safety Joint <u>—</u>	T-Open <u>1447</u>
(D) Initial Shut-In <u>460</u>	<input type="checkbox"/> Circ Sub <u>—</u>	T-Pulled <u>1647</u>
(E) Second Initial Flow <u>35</u>	<input type="checkbox"/> Hourly Standby <u>—</u>	T-Out <u>1828</u>
(F) Second Final Flow <u>39</u>	<input checked="" type="checkbox"/> Mileage <u>24 RT</u> 18	Comments <u>—</u>
(G) Final Shut-In <u>335</u>	<input type="checkbox"/> Sampler <u>—</u>	
(H) Final Hydrostatic <u>1671</u>	<input checked="" type="checkbox"/> Straddle <u>600</u>	<input type="checkbox"/> Ruined Shale Packer <u>—</u>
	<input type="checkbox"/> Shale Packer <u>—</u>	<input type="checkbox"/> Ruined Packer <u>—</u>
Initial Open <u>30</u>	<input type="checkbox"/> Extra Packer <u>—</u>	<input type="checkbox"/> Extra Copies <u>—</u>
Initial Shut-In <u>30</u>	<input type="checkbox"/> Extra Recorder <u>—</u>	Sub Total <u>0</u>
Final Flow <u>30</u>	<input type="checkbox"/> Day Standby <u>—</u>	Total <u>1668</u>
Final Shut-In <u>30</u>	<input type="checkbox"/> Accessibility <u>—</u>	MP/DST Disc't <u>—</u>
	Sub Total <u>1668</u>	

Approved By — Our Representative Brannan Lonsdale

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