

**JAMES C. MUSGROVE**

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Mai Oil Operations  
Morgenstern-Herres Unit #1  
NW-SW-SW-SW (438' FSL & 107' FWL)  
Section 34-17s-13w  
Barton County, Kansas

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**5 1/2" Production Casing Set**

- Contractor:** Southwind Drilling Co. (rig #3)
- Commenced:** September 18, 2017
- Completed:** September 24, 2017
- Elevation:** 1875' K.B., 1873' D.F., 1867' G.L.
- Casing program:** Surface; 8 5/8" @ 453'  
Production, 5 1/2" @ 3434'
- Sample:** Samples saved and examined 2700' to the Rotary Total Depth.
- Drilling time:** One (1) foot drilling time recorded and kept 2700' to the Rotary Total Depth.
- Measurements:** All depths measured from the Kelly Bushing.
- Drill Stem Tests:** There were five (5) Drill Stem Tests ran by Trilobite Testing Co.
- Electric Log:** By Eli Wireline Services, Dual Induction, Compensated Density/Neutron and Micro Log.

<u>Formation</u>	<u>Log Depth</u>	<u>Sub-Sea Datum</u>
Anhydrite	777	+1098
Base Anhydrite	801	+1074
Topeka	2745	-870
Heebner	3027	-1152
Toronto	3041	-1166
Douglas	3056	-1181
Brown Lime	3115	-1240
Lansing	3129	-1254
Base Kansas City	3343	-1468
Arbuckle	3354	-1479
Rotary Total Depth	3435	-1560
Log Total Depth	3435	-1560

(All tops and zones corrected to Electric Log Measurement)

**SAMPLE ANALYSIS, SHOWS OF OIL, TESTING DATA, ETC.**

**TOPEKA SECTION**

- 2906-2918' Limestone, gray, slightly cherty (dense)
- 2926-2930' Limestone, gray tan, fossiliferous, slightly cherty, plus abundant loose fossil fragments, no shows.

- 2948-2957' Limestone, tan, buff, finely crystalline, slightly cherty, poor visible porosity, no show.
- 2973-2980' Limestone, tan, fossiliferous, plus tan, fossiliferous, opaque, chert, no shows.
- 2988-3010' Limestone, tan, gray, fine to medium crystalline, fossiliferous in part, scattered porosity, plus gray boney chert.

**TORONTO SECTION**

- 3041-3050' Limestone, white, gray, chalky, few fossiliferous, no shows.

**LANSING SECTION**

- 3133-3140' Limestone, gray, slightly fossiliferous, chalky; poor visible porosity, brown edge staining, no free oil and no odor.
- 3149-3155' Limestone, as above, few with pinpoint type porosity, gray stain, show of free oil and no odor in fresh samples.
- 3160-3166' Limestone, gray, white, fine to medium crystalline, fossiliferous, poor visible porosity, brown and gray stain, trace of free oil and no odor in fresh samples.
- 3178-3181' Limestone, gray, white, oolitic, poor visible porosity, poor stain, no free oil and no odor.
- 3194-3200' Limestone, white, fossiliferous, scattered fossil cast porosity, brown and gray to black stain, show of free oil and faint odor in fresh samples.

**Drill Stem Test #1**

**3118-3200**

**Times: 30-30-45-60**

**Blow: Strong; G.T.S. 45 mins into final flow; T.S.T.M.**

**Recovery: 169' gassy muddy oil  
(30% gas; 40% oil; 30% mud)  
124' gassy muddy oil  
(15% gas; 60% oil; 55% water; 25% mud)  
124' gassy muddy oil  
(25% gas; 65% oil; 10% mud)**

**Pressures: ISIP 772 psi  
FSIP 782 psi  
IFP 21-100 psi  
FFP 112-174 psi  
HSH 1501-1466 psi**

- 3203-3211' Limestone, tan, oolitic, chalky, trace stain, weak show of free oil and questionable odor in fresh samples.

- 3216-3226' Limestone, cream, white, oomoldic, chalky, poor to fair porosity, no shows.
- 3231-3246' Limestone, tan, brown, finely crystalline, slightly cherty, poorly developed porosity, no shows.
- 3255-3265' Limestone, tan, gray, oolitic, sub-oomoldic, golden brown and gray stain, show of free oil and faint odor in fresh samples.

**Drill Stem Test #2 3238-3276**

**Times: 30-30-45-60**

**Blow: Strong**

**Recovery: 390' gas in pipe**  
**40' very heavily oil and gas cut mud**  
**(20% gas; 30% oil; 50% mud)**  
**62' heavily oil and gas cut watery mud**  
**(20% gas; 30% oil; 40% mud' 10% water)**  
**62' muddy water**

**Pressures:** ISIP 681 psi  
FSIP 630 psi  
IFP 25-54 psi  
FFP 58-85 psi  
HSH 1558-1527 psi

- 3276-3282' Limestone; white, gray, oolitic, scattered porosity; brown and dark brown spotty stain, trace of free oil and faint odor in fresh samples.
- 3285-3305' Limestone, white, gray fossiliferous, poor to fair vuggy type porosity, dark brown stain, trace of free oil and faint odor in fresh samples.
- 3321-3325' Limestone, gray, white, oolitic, fair porosity, good golden brown stain, show of free oil and faint odor in fresh samples.

**Drill Stem Test #3 3270-3325**

**Times: 30-30-45-60**

**Blow: Strong**

**Recovery: 340' gas in pipe**  
**20' clean oil**  
**72' very slightly oil water**  
**(1% oil; 79% water; 20% mud)**  
**124' water**

**Pressures:** ISIP 718 psi  
FSIP 683 psi  
IFP 24-85 psi  
FFP 89-149 psi  
HSH 1571-1544 psi

**ARBUCKLE SECTION**

3354-3361' Dolomite, cream, white, medium crystalline, fair inter-crystalline porosity, brown and black stain, (gilsonitic) show of free oil and fair to good odor in fresh samples.

3361-3365' Dolomite, as above, plus dolomite, tan, sucrosic, scattered pinpoint porosity, brown stain, show of free oil and fair to good odor in fresh samples.

**Drill Stem Test #4** **3327-3365**

**Times:** 30-30-30-30

**Blow:** Weak

**Recovery:** 10' clean oil  
10' very slightly oil cut mud  
(6% oil; 94% mud)

**Pressures:** ISIP 909 psi  
FSIP 875 psi  
IFP 18-19 psi  
FFP 23-25 psi  
HSH 1605-1583 psi

3365-3376' Dolomite, as above, fair brown to black (gilsonitic stain) show of free oil and good odor in fresh samples.

**Drill Stem Test #5** **3358-3376**

**Times:** 45-30-45-45

**Blow:** Fair

**Recovery:** 90' clean oil  
60' heavily oil  
(40% oil; 60% mud)

**Pressures:** ISIP 1039 psi  
FSIP 1065 psi  
IFP 16-37 psi  
FFP 41-62 psi  
HSH 1575-1575 psi

3326-3384' Dolomite, as above, plus yellow, white chert; trace black and brown stain, show of free oil and odor in fresh samples.

3384-3400' Dolomite, tan, gray, medium crystalline, slightly cherty, poor to fair inter-crystalline porosity, no show of free oil; and faint to fair odor in fresh samples.

Mai Oil Operations  
Morgenstern-Herres Unit #1  
NW-SW-SW-SW (438' FSL & 107' FWL)  
Section 34-17s-13w  
Barton County, Kansas

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3400-3420' Dolomite, as above, plus chert, white, clear, translucent, opaque; no shows.

3420-3435' Dolomite, as above, poor visible porosity, no shows.

Rotary Total Depth        3435  
Log Total Depth         3435

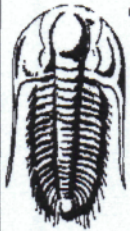
**Recommendations:**

5 1/2' production casing was set and cemented on the Mai Oil Operations, Morgenstern-Herres Unit #1.

Respectfully yours,

*James C. Musgrove*  
James C. Musgrove  
Petroleum Geologist





**TRILOBITE  
TESTING, INC.**

## DRILL STEM TEST REPORT

Mai Oil Operations Inc  
8411 Preston Rd STE 800  
Dallas TX 75225-5520  
ATTN: Jim Musgrove

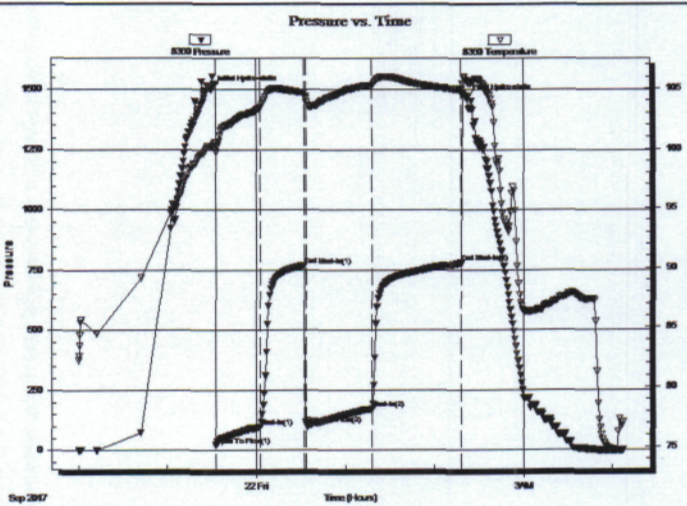
**Morgenstern-Herres Unit #1**  
**34-17s-13w Barton,KS**  
Job Ticket: 63080      **DST#: 1**  
Test Start: 2017.09.21 @ 22:00:21

### GENERAL INFORMATION:

Formation: **LKC A-E**  
Deviated: No Whipstock: ft (KB)  
Time Tool Opened: 23:32:46  
Time Test Ended: 04:07:15  
Interval: **3118.00 ft (KB) To 3200.00 ft (KB) (TVD)**  
Total Depth: 3200.00 ft (KB) (TVD)  
Hole Diameter: 7.88 inches Hole Condition: Fair  
Test Type: Conventional Bottom Hole (Initial)  
Tester: Ray Schwager  
Unit No: 77  
Reference Elevations: 1875.00 ft (KB)  
1867.00 ft (CF)  
KB to GR/CF: 8.00 ft

**Serial #: 8360**      **Inside**  
Press@RunDepth: 174.46 psig @ 3120.00 ft (KB)      Capacity: 8000.00 psig  
Start Date: 2017.09.21      End Date: 2017.09.22  
Start Time: 22:00:21      End Time: 04:07:15      Time On Btm: 2017.09.21 @ 23:30:16  
Time Off Btm: 2017.09.22 @ 02:21:45

**TEST COMMENT:** 30-IFP-BOB in 3 min  
30-ISIP-No bl bk  
45-FFP-BOB in 4 min ,GTS in 45 min  
60-FSIP-BOB in 5 min after bleeding off bl



### PRESSURE SUMMARY

Time (Min.)	Pressure (psig)	Temp (deg F)	Annotation
0	1501.65	100.20	Initial Hydro-static
3	21.08	99.69	Open To Flow (1)
33	100.00	103.37	Shut-In(1)
63	772.22	104.61	End Shut-In(1)
64	112.12	104.16	Open To Flow (2)
108	174.46	105.27	Shut-In(2)
168	782.29	104.92	End Shut-In(2)
172	1466.57	105.59	Final Hydro-static

### Recovery

Length (ft)	Description	Volume (bbl)
169.00	GMO 30%G30%M40%O	2.37
124.00	GMO 15%G25%M60%O	1.74
124.00	GMO 25%G10%M65%O	1.74
0.00	GTS No gauge	0.00

### Gas Rates

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



**TRILOBITE TESTING, INC.**

**DRILL STEM TEST REPORT**

**TOOL DIAGRAM**

Mai Oil Operations Inc  
 8411 Preston Rd STE 800  
 Dallas TX 75225-5520  
 ATTN: Jim Musgrove

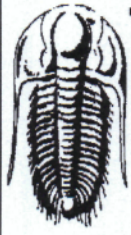
**Morgenstern-Herres Unit #1**  
**34-17s-13w Barton,KS**  
 Job Ticket: 63080 **DST#: 1**  
 Test Start: 2017.09.21 @ 22:00:21

**Tool Information**

Drill Pipe: Length: 3108.00 ft	Diameter: 3.80 inches	Volume: 43.60 bbl	Tool Weight: 2200.00 lb
Heavy Wt. Pipe: Length: 0.00 ft	Diameter: 0.00 inches	Volume: 0.00 bbl	Weight set on Packer: 25000.00 lb
Drill Collar: Length: 0.00 ft	Diameter: 0.00 inches	Volume: 0.00 bbl	Weight to Pull Loose: 50000.00 lb
	Total Volume: 43.60 bbl		Tool Chased 0.00 ft
Drill Pipe Above KB: 11.00 ft			String Weight: Initial 31000.00 lb
Depth to Top Packer: 3118.00 ft			Final 33000.00 lb
Depth to Bottom Packer: ft			
Interval between Packers: 82.00 ft			
Tool Length: 103.00 ft			
Number of Packers: 2	Diameter: 6.75 inches		

Tool Comments:

Tool Description	Length (ft)	Serial No.	Position	Depth (ft)	Accum. Lengths
Change Over Sub	1.00			3098.00	
Shut In Tool	5.00			3103.00	
Hydraulic tool	5.00			3108.00	
Packer	5.00			3113.00	21.00 Bottom Of Top Packer
Packer	5.00			3118.00	
Stubb	1.00			3119.00	
Perforations	1.00			3120.00	
Recorder	0.00	8360	Inside	3120.00	
Recorder	0.00	8673	Outside	3120.00	
Blank Spacing	63.00			3183.00	
Perforations	14.00			3197.00	
Bullnose	3.00			3200.00	82.00 Bottom Packers & Anchor
<b>Total Tool Length:</b>		<b>103.00</b>			



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**DRILL STEM TEST REPORT**

**FLUID SUMMARY**

Mai Oil Operations Inc  
8411 Preston Rd STE 800  
Dallas TX 75225-5520  
ATTN: Jim Musgrove

**Morgenstern-Herres Unit #1**  
**34-17s-13w Barton,KS**  
Job Ticket: 63080      **DST#: 1**  
Test Start: 2017.09.21 @ 22:00:21

**Mud and Cushion Information**

Mud Type: Gel Chem	Cushion Type:	Oil API: 40 deg API
Mud Weight: 9.00 lb/gal	Cushion Length: ft	Water Salinity: ppm
Viscosity: 52.00 sec/qt	Cushion Volume: bbl	
Water Loss: 8.69 in <sup>3</sup>	Gas Cushion Type:	
Resistivity: ohm.m	Gas Cushion Pressure: psig	
Salinity: 4600.00 ppm		
Filter Cake: 1.00 inches		

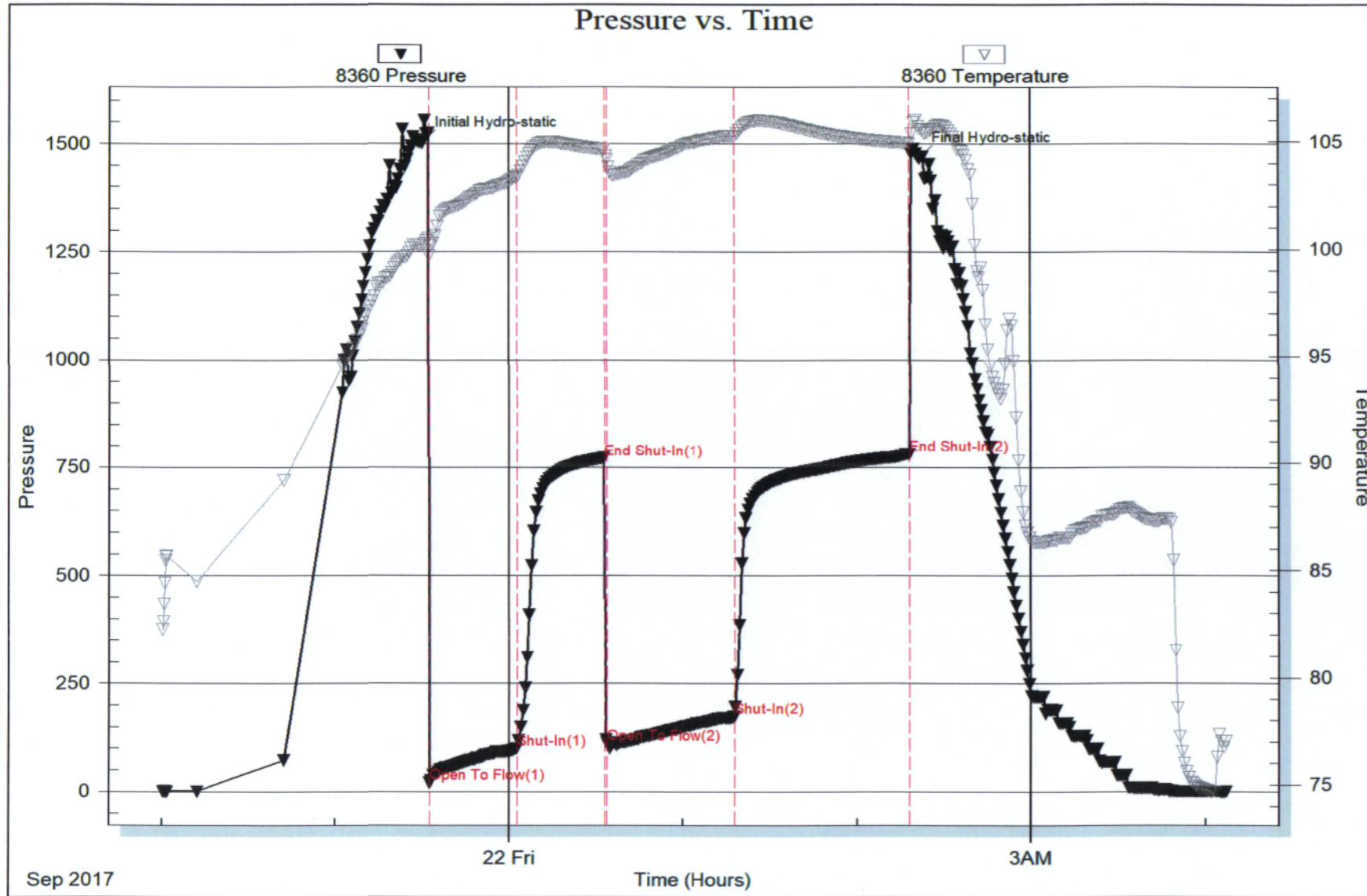
**Recovery Information**

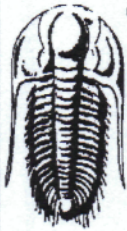
Recovery Table

Length ft	Description	Volume bbl
169.00	GMO 30%G30%M40%O	2.371
124.00	GMO 15%G25%M60%O	1.739
124.00	GMO 25%G10%M65%O	1.739
0.00	GTS No gauge	0.000

Total Length: 417.00 ft      Total Volume: 5.849 bbl  
Num Fluid Samples: 0      Num Gas Bombs: 0      Serial #:  
Laboratory Name:      Laboratory Location:  
Recovery Comments:







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**DRILL STEM TEST REPORT**

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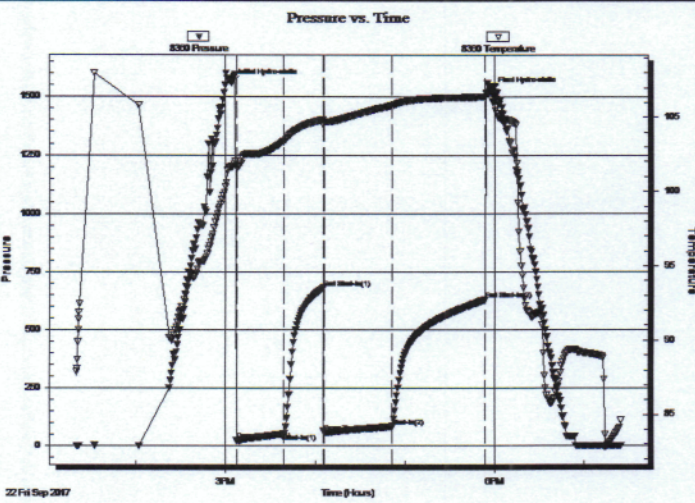
**Morgenstern-Herres Unit #1**  
**34-17s-13w Barton,KS**  
 Job Ticket: 63081      **DST#: 2**  
 Test Start: 2017.09.22 @ 13:20:07

**GENERAL INFORMATION:**

Formation: **LKC H**  
 Deviated: No Whipstock: ft (KB)  
 Test Type: Conventional Bottom Hole (Reset)  
 Time Tool Opened: 15:07:17 Tester: Ray Schwager  
 Time Test Ended: 19:24:31 Unit No: 77  
 Interval: **3238.00 ft (KB) To 3276.00 ft (KB) (TVD)** Reference Elevations: 1875.00 ft (KB)  
 Total Depth: 3276.00 ft (KB) (TVD) 1867.00 ft (CF)  
 Hole Diameter: 7.88 inches Hole Condition: Fair KB to GR/CF: 8.00 ft

**Serial #: 8360 Inside**  
 Press@RunDepth: 84.96 psig @ 3245.00 ft (KB) Capacity: 8000.00 psig  
 Start Date: 2017.09.22 End Date: 2017.09.22 Last Calib.: 2017.09.22  
 Start Time: 13:20:07 End Time: 19:24:31 Time On Btm: 2017.09.22 @ 15:04:32  
 Time Off Btm: 2017.09.22 @ 17:57:46

**TEST COMMENT:** 30-IFP-BOB in 7 min  
 30-ISIP-1/2" bl bk  
 45-FFP-1/4" to BOB in 14 min  
 60-FSIP-no bl bk



**PRESSURE SUMMARY**

Time (Min.)	Pressure (psig)	Temp (deg F)	Annotation
0	1558.48	101.68	Initial Hydro-static
3	25.06	101.60	Open To Flow (1)
35	53.86	103.41	Shut-In(1)
61	680.74	104.84	End Shut-In(1)
62	58.01	104.69	Open To Flow (2)
107	84.96	105.80	Shut-In(2)
170	629.71	106.39	End Shut-In(2)
174	1526.77	106.71	Final Hydro-static

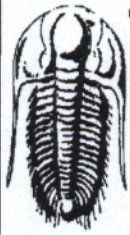
**Recovery**

Length (ft)	Description	Volume (bbl)
0.00	390' GIP	0.00
40.00	HO&GCM 20%G30%O50%M	0.56
62.00	HO&GCM 20%G10%W30%O40%M	0.87
62.00	MW 10%M90%W	0.87

\* Recovery from multiple tests

**Gas Rates**

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



**TRILOBITE  
TESTING, INC.**

**DRILL STEM TEST REPORT**

**TOOL DIAGRAM**

Mai Oil Operations Inc  
8411 Preston Rd STE 800  
Dallas TX 75225-5520  
ATTN: Jim Musgrove

**Morgenstern-Herres Unit #1**  
**34-17s-13w Barton,KS**  
Job Ticket: 63081      DST#: 2  
Test Start: 2017.09.22 @ 13:20:07

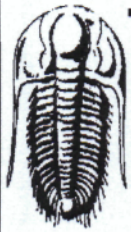
**Tool Information**

Drill Pipe:	Length: 3232.00 ft	Diameter: 3.80 inches	Volume: 45.34 bbl	Tool Weight: 2200.00 lb
Heavy Wt. Pipe:	Length: 0.00 ft	Diameter: 0.00 inches	Volume: 0.00 bbl	Weight set on Packer: 25000.00 lb
Drill Collar:	Length: 0.00 ft	Diameter: 0.00 inches	Volume: 0.00 bbl	Weight to Pull Loose: 45000.00 lb
			<u>Total Volume: 45.34 bbl</u>	Tool Chased 0.00 ft
Drill Pipe Above KB:	15.00 ft			String Weight: Initial 31000.00 lb
Depth to Top Packer:	3238.00 ft			Final 32000.00 lb
Depth to Bottom Packer:	ft			
Interval between Packers:	38.00 ft			
Tool Length:	59.00 ft			
Number of Packers:	2	Diameter: 6.75 inches		

Tool Comments:

Tool Description	Length (ft)	Serial No.	Position	Depth (ft)	Accum. Lengths
Change Over Sub	1.00			3218.00	
Shut In Tool	5.00			3223.00	
Hydraulic tool	5.00			3228.00	
Packer	5.00			3233.00	21.00      Bottom Of Top Packer
Packer	5.00			3238.00	
Stubb	1.00			3239.00	
Perforations	6.00			3245.00	
Recorder	0.00	8360	Inside	3245.00	
Recorder	0.00	8673	Outside	3245.00	
Perforations	28.00			3273.00	
Bullnose	3.00			3276.00	38.00      Bottom Packers & Anchor

**Total Tool Length: 59.00**



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**FLUID SUMMARY**

Mai Oil Operations Inc  
8411 Preston Rd STE 800  
Dallas TX 75225-5520  
ATTN: Jim Musgrove

**Morgenstern-Herres Unit #1**  
**34-17s-13w Barton,KS**  
Job Ticket: 63081      **DST#: 2**  
Test Start: 2017.09.22 @ 13:20:07

**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: 52.00 sec/qt	Cushion Volume: bbl		
Water Loss: 8.68 in <sup>3</sup>	Gas Cushion Type:		
Resistivity: ohm.m	Gas Cushion Pressure: psig		
Salinity: 4600.00 ppm			
Filter Cake: 1.00 inches			

**Recovery Information**

Recovery Table

Length ft	Description	Volume bbl
0.00	390' GIP	0.000
40.00	HO&GCM 20%G30%O50%M	0.561
62.00	HO&GCM 20%G10%W30%O40%M	0.870
62.00	MW 10%M90%W	0.870

Total Length: 164.00 ft      Total Volume: 2.301 bbl  
 Num Fluid Samples: 0      Num Gas Bombs: 0      Serial #:  
 Laboratory Name:      Laboratory Location:  
 Recovery Comments: RW.11@65F

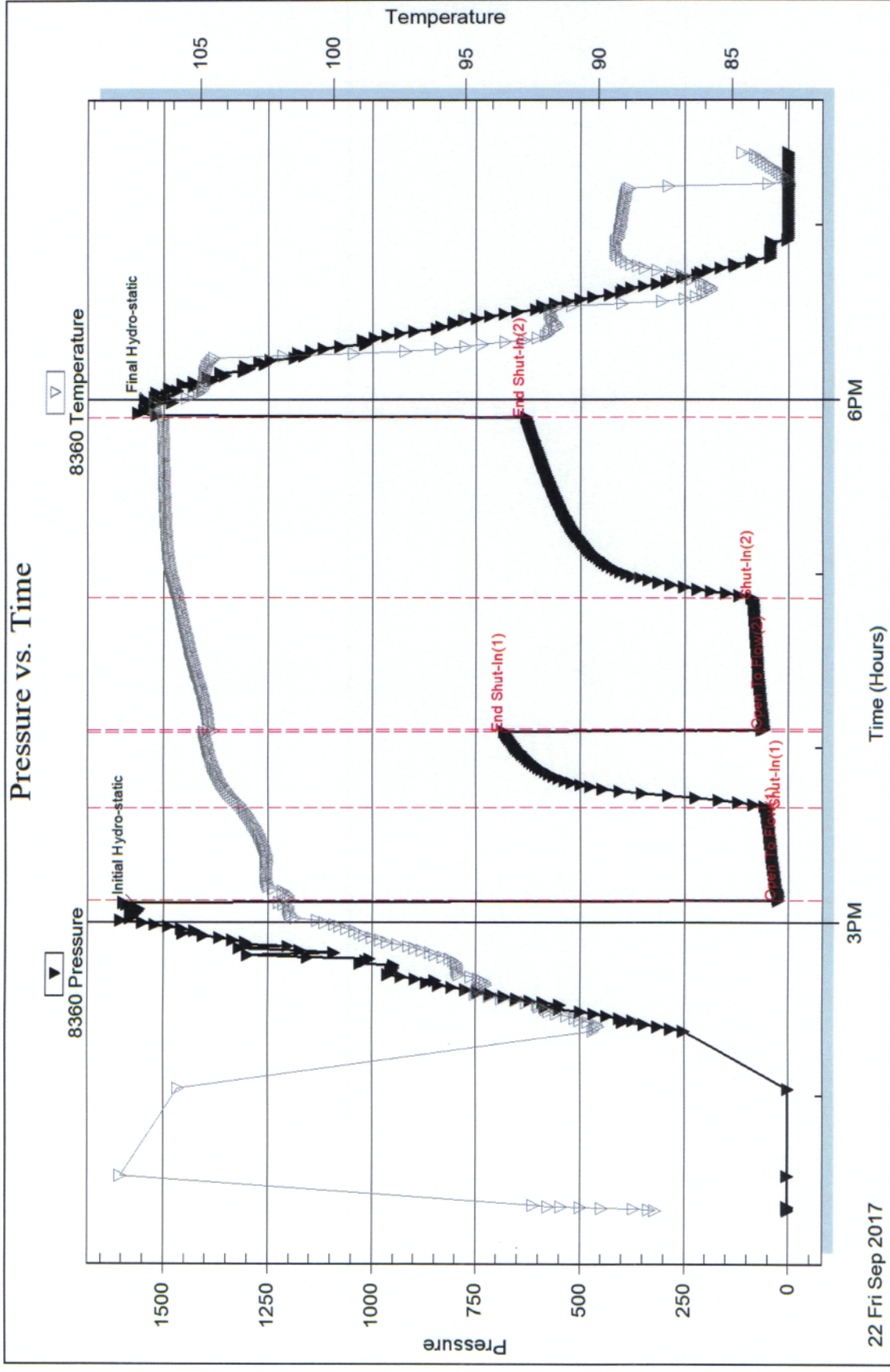
Serial #: 8360

Inside

Mai Oil Operations Inc

34-17s-13w Barton,KS

DST Test Number: 2



Trilobite Testing, Inc

Ref. No: 63081

Printed: 2017.09.25 @ 16:31:16



**TRILOBITE TESTING, INC.**

**DRILL STEM TEST REPORT**

Mai Oil Operations Inc  
 8411 Preston Rd STE 800  
 Dallas TX 75225-5520  
 ATTN: Jim Musgrove

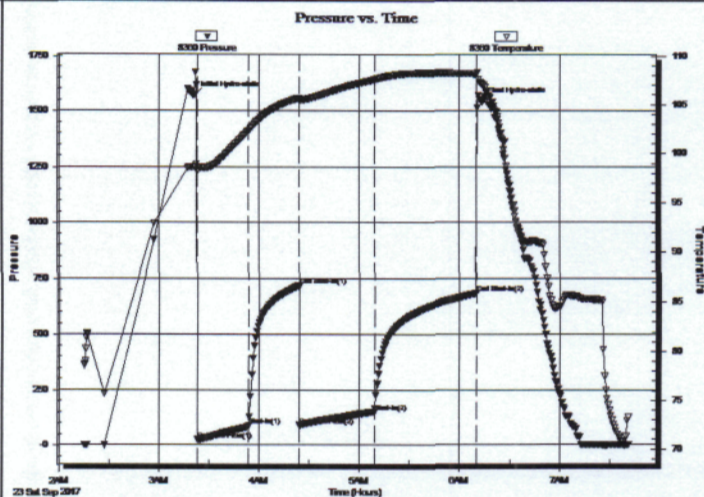
**Morgenstern-Herres Unit #1**  
**34-17s-13w Barton,KS**  
 Job Ticket: 63082 **DST#: 3**  
 Test Start: 2017.09.23 @ 02:15:07

**GENERAL INFORMATION:**

Formation: **LKC I-K**  
 Deviated: No Whipstock: ft (KB)  
 Time Tool Opened: 03:23:17  
 Time Test Ended: 07:41:46  
 Interval: **3270.00 ft (KB) To 3325.00 ft (KB) (TVD)**  
 Total Depth: 3325.00 ft (KB) (TVD)  
 Hole Diameter: 7.88 inches Hole Condition: Fair  
 Test Type: Conventional Bottom Hole (Reset)  
 Tester: Ray Schwager  
 Unit No: 77  
 Reference Elevations: 1875.00 ft (KB)  
 1867.00 ft (CF)  
 KB to GR/CF: 8.00 ft

**Serial #: 8360** Inside  
 Press@RunDepth: 149.97 psig @ 3272.00 ft (KB) Capacity: 8000.00 psig  
 Start Date: 2017.09.23 End Date: 2017.09.23 Last Calib.: 2017.09.23  
 Start Time: 02:15:07 End Time: 07:41:46 Time On Btm: 2017.09.23 @ 03:21:02  
 Time Off Btm: 2017.09.23 @ 06:13:02

TEST COMMENT: 30-IFP-1/2" to BOB in 12 min  
 30-ISIP-no bl bk  
 45-FFP-1/4" to BOB in 20 min  
 60-FSIP-no bl bk



**PRESSURE SUMMARY**

Time (Min.)	Pressure (psig)	Temp (deg F)	Annotation
0	1570.44	98.65	Initial Hydro-static
3	24.23	98.27	Open To Flow (1)
33	85.80	102.30	Shut-In(1)
63	718.09	105.64	End Shut-In(1)
64	89.79	105.44	Open To Flow (2)
108	149.97	107.55	Shut-In(2)
169	683.03	108.15	End Shut-In(2)
172	1543.99	107.13	Final Hydro-static

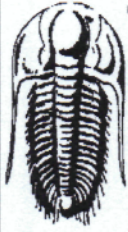
**Recovery**

Length (ft)	Description	Volume (bbl)
0.00	340' GIP	0.00
20.00	CO	0.28
72.00	SOCMW 1%O20%M79%W	1.01
124.00	Water	1.74

\* Recovery from multiple tests

**Gas Rates**

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



**TRILOBITE  
TESTING, INC.**

**DRILL STEM TEST REPORT**

**TOOL DIAGRAM**

Mai Oil Operations Inc  
8411 Preston Rd STE 800  
Dallas TX 75225-5520  
ATTN: Jim Musgrove

**Morgenstern-Herres Unit #1**  
**34-17s-13w Barton,KS**  
Job Ticket: 63082      **DST#: 3**  
Test Start: 2017.09.23 @ 02:15:07

**Tool Information**

Drill Pipe:	Length: 3265.00 ft	Diameter: 3.80 inches	Volume: 45.80 bbl	Tool Weight: 2200.00 lb
Heavy Wt. Pipe:	Length: 0.00 ft	Diameter: 0.00 inches	Volume: 0.00 bbl	Weight set on Packer: 25000.00 lb
Drill Collar:	Length: 0.00 ft	Diameter: 0.00 inches	Volume: 0.00 bbl	Weight to Pull Loose: 45000.00 lb
			<u>Total Volume: 45.80 bbl</u>	Tool Chased 0.00 ft
Drill Pipe Above KB:	16.00 ft			String Weight: Initial 31000.00 lb
Depth to Top Packer:	3270.00 ft			Final 33000.00 lb
Depth to Bottom Packer:	ft			
Interval between Packers:	55.00 ft			
Tool Length:	76.00 ft			
Number of Packers:	2	Diameter: 6.75 inches		

Tool Comments:

Tool Description	Length (ft)	Serial No.	Position	Depth (ft)	Accum. Lengths
Change Over Sub	1.00			3250.00	
Shut In Tool	5.00			3255.00	
Hydraulic tool	5.00			3260.00	
Packer	5.00			3265.00	21.00      Bottom Of Top Packer
Packer	5.00			3270.00	
Stubb	1.00			3271.00	
Perforations	1.00			3272.00	
Recorder	0.00	8360	Inside	3272.00	
Recorder	0.00	8673	Outside	3272.00	
Blank Spacing	33.00			3305.00	
Perforations	17.00			3322.00	
Bullnose	3.00			3325.00	55.00      Bottom Packers & Anchor

**Total Tool Length: 76.00**



**TRILOBITE  
TESTING, INC.**

**DRILL STEM TEST REPORT**

**FLUID SUMMARY**

Mai Oil Operations Inc

**Morgenstern-Herres Unit #1**

8411 Preston Rd STE 800  
Dallas TX 75225-5520

**34-17s-13w Barton,KS**

Job Ticket: 63082

**DST#: 3**

ATTN: Jim Musgrove

Test Start: 2017.09.23 @ 02:15:07

**Mud and Cushion Information**

Mud Type: Gel Chem

Cushion Type:

Oil API:

36 deg API

Mud Weight: 9.00 lb/gal

Cushion Length:

ft

Water Salinity:

75000 ppm

Viscosity: 66.00 sec/qt

Cushion Volume:

bbbl

Water Loss: 10.12 in<sup>3</sup>

Gas Cushion Type:

Resistivity: ohm.m

Gas Cushion Pressure:

psig

Salinity: 6300.00 ppm

Filter Cake: 1.00 inches

**Recovery Information**

Recovery Table

Length ft	Description	Volume bbl
0.00	340' GIP	0.000
20.00	CO	0.281
72.00	SOCMV 1%O20%M79%W	1.010
124.00	Water	1.739

Total Length: 216.00 ft      Total Volume: 3.030 bbl

Num Fluid Samples: 0

Num Gas Bombs: 0

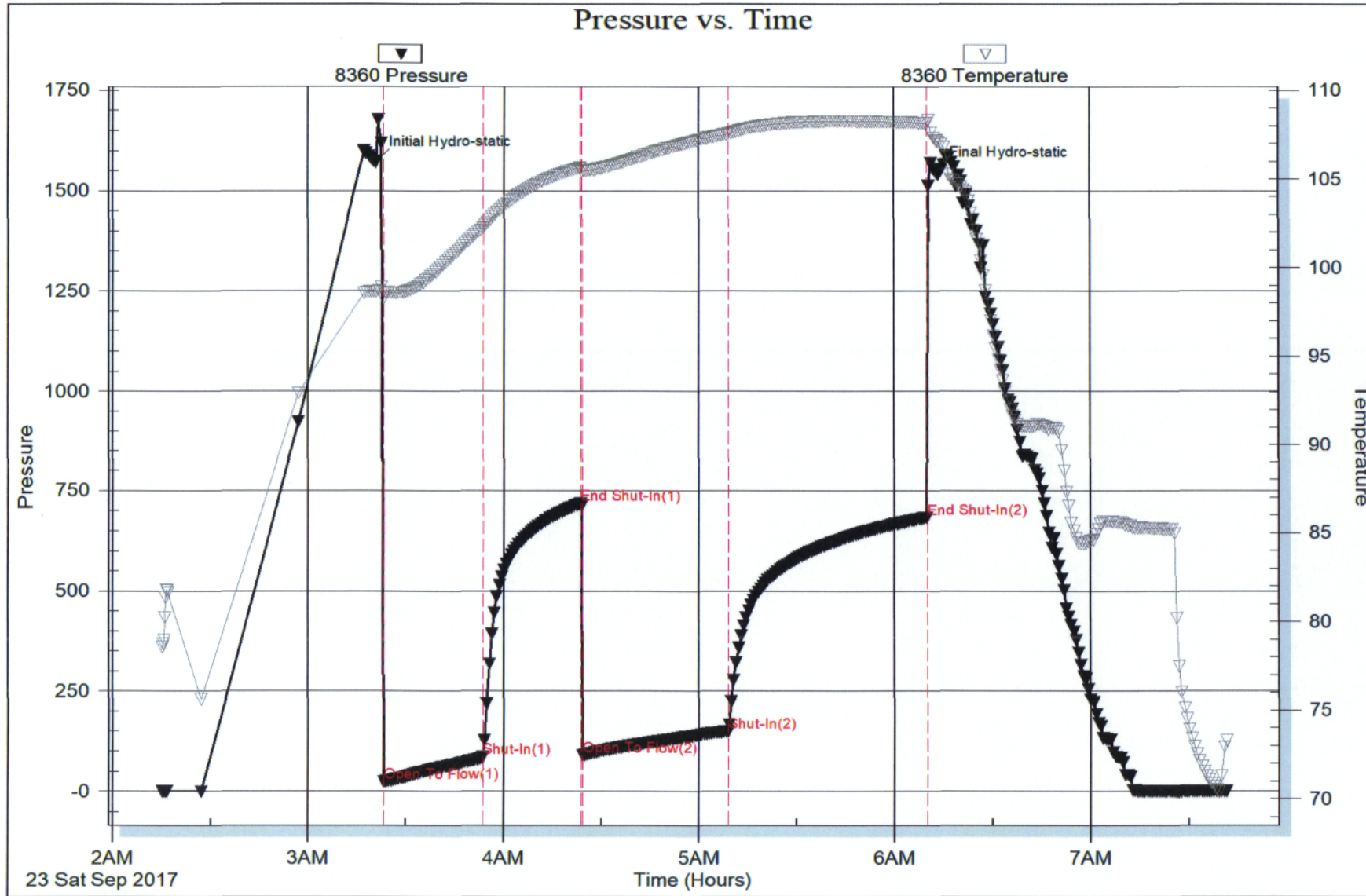
Serial #:

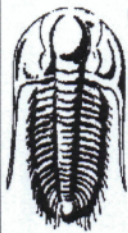
Laboratory Name:

Laboratory Location:

Recovery Comments: RW .1@70F







**TRILOBITE TESTING, INC.**

## DRILL STEM TEST REPORT

Mai Oil Operations Inc  
 8411 Preston Rd STE 800  
 Dallas TX 75225-5520  
 ATTN: Jim Musgrove

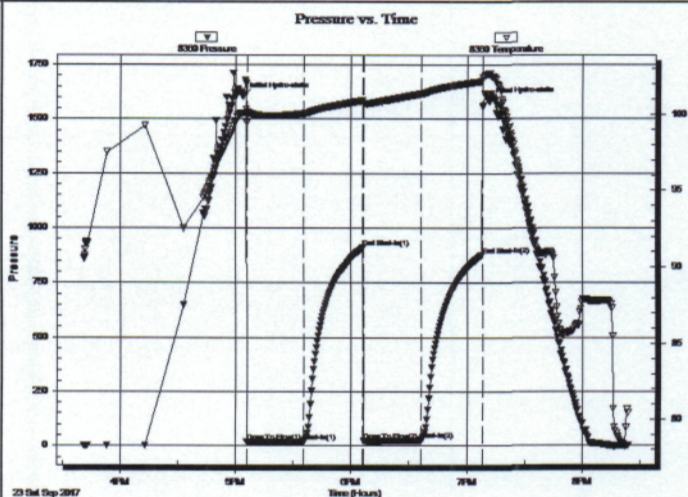
**Morgenstern-Herres Unit #1**  
**34-17s-13w Barton,KS**  
 Job Ticket: 63083      **DST#: 4**  
 Test Start: 2017.09.23 @ 15:41:03

### GENERAL INFORMATION:

Formation: **Arbuckle**  
 Deviated: No Whipstock: ft (KB)  
 Time Tool Opened: 17:05:43  
 Time Test Ended: 20:23:57  
 Interval: **3327.00 ft (KB) To 3365.00 ft (KB) (TVD)**  
 Total Depth: 3365.00 ft (KB) (TVD)  
 Hole Diameter: 7.88 inches Hole Condition: Fair  
 Test Type: Conventional Bottom Hole (Reset)  
 Tester: Ray Schwager  
 Unit No: 77  
 Reference Elevations: 1875.00 ft (KB)  
 1867.00 ft (CF)  
 KB to GR/CF: 8.00 ft

**Serial #: 8360**      **Inside**  
 Press@RunDepth: 25.97 psig @ 3334.00 ft (KB)      Capacity: 8000.00 psig  
 Start Date: 2017.09.23      End Date: 2017.09.23      Last Calib.: 2017.09.23  
 Start Time: 15:41:03      End Time: 20:23:57      Time On Btm: 2017.09.23 @ 17:03:43  
 Time Off Btm: 2017.09.23 @ 19:11:28

**TEST COMMENT:** 30-IFP-vy w k suface bl thru-out  
 30-ISIP-no bl  
 30-FFP-no bl, flushed tool, got surge  
 30-FSIP-no bl



### PRESSURE SUMMARY

Time (Min.)	Pressure (psig)	Temp (deg F)	Annotation
0	1605.16	100.08	Initial Hydro-static
2	18.58	99.48	Open To Flow (1)
32	19.54	100.05	Shut-In(1)
62	909.44	100.92	End Shut-In(1)
63	23.83	100.70	Open To Flow (2)
93	25.97	101.35	Shut-In(2)
125	875.66	102.18	End Shut-In(2)
128	1583.17	102.67	Final Hydro-static

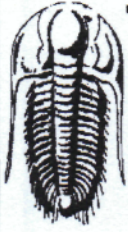
### Recovery

Length (ft)	Description	Volume (bbl)
10.00	CO	0.14
10.00	SOCM 6%O94%M	0.14

\* Recovery from multiple tests

### Gas Rates

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



**TRILOBITE  
TESTING, INC.**

**DRILL STEM TEST REPORT**

**TOOL DIAGRAM**

Mai Oil Operations Inc  
8411 Preston Rd STE 800  
Dallas TX 75225-5520  
ATTN: Jim Musgrove

**Morgenstern-Herres Unit #1**  
**34-17s-13w Barton,KS**  
Job Ticket: 63083      **DST#: 4**  
Test Start: 2017.09.23 @ 15:41:03

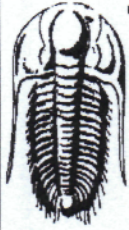
**Tool Information**

Drill Pipe:	Length: 3329.00 ft	Diameter: 3.80 inches	Volume: 46.70 bbl	Tool Weight: 2200.00 lb
Heavy Wt. Pipe:	Length: 0.00 ft	Diameter: 0.00 inches	Volume: 0.00 bbl	Weight set on Packer: 25000.00 lb
Drill Collar:	Length: 0.00 ft	Diameter: 0.00 inches	Volume: 0.00 bbl	Weight to Pull Loose: 45000.00 lb
			<u>Total Volume: 46.70 bbl</u>	Tool Chased 0.00 ft
Drill Pipe Above KB:	23.00 ft			String Weight: Initial 32000.00 lb
Depth to Top Packer:	3327.00 ft			Final 32000.00 lb
Depth to Bottom Packer:	ft			
Interval between Packers:	38.00 ft			
Tool Length:	59.00 ft			
Number of Packers:	2	Diameter: 6.75 inches		

Tool Comments:

Tool Description	Length (ft)	Serial No.	Position	Depth (ft)	Accum. Lengths
Change Over Sub	1.00			3307.00	
Shut In Tool	5.00			3312.00	
Hydraulic tool	5.00			3317.00	
Packer	5.00			3322.00	21.00      Bottom Of Top Packer
Packer	5.00			3327.00	
Stubb	1.00			3328.00	
Perforations	6.00			3334.00	
Recorder	0.00	8360	Inside	3334.00	
Recorder	0.00	8673	Outside	3334.00	
Perforations	28.00			3362.00	
Bullnose	3.00			3365.00	38.00      Bottom Packers & Anchor

**Total Tool Length: 59.00**



**TRILOBITE  
TESTING, INC.**

**DRILL STEM TEST REPORT**

**FLUID SUMMARY**

Mai Oil Operations Inc  
8411 Preston Rd STE 800  
Dallas TX 75225-5520  
ATTN: Jim Musgrove

**Morgenstern-Herres Unit #1**  
**34-17s-13w Barton, KS**  
Job Ticket: 63083      **DST#: 4**  
Test Start: 2017.09.23 @ 15:41:03

**Mud and Cushion Information**

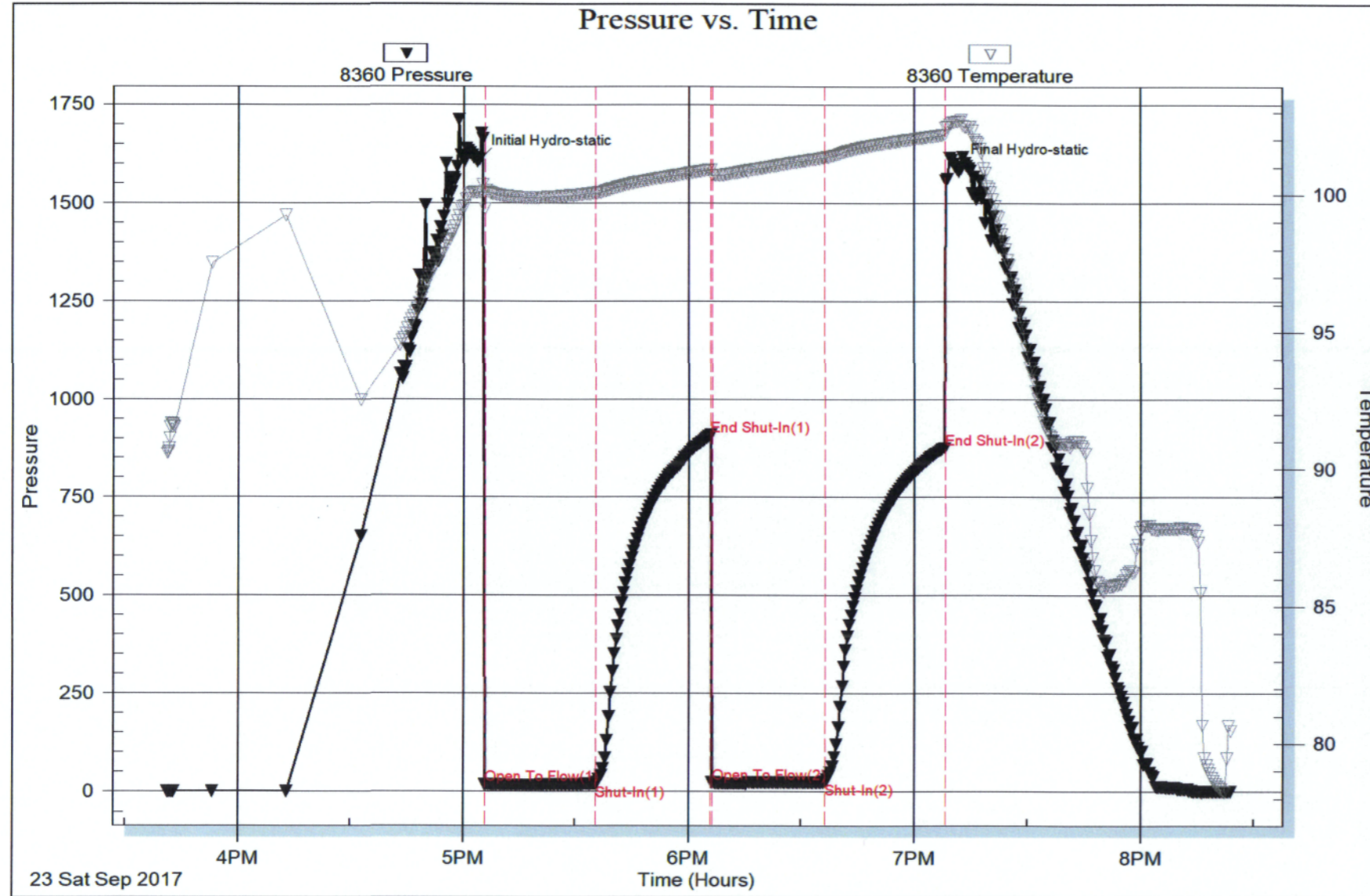
Mud Type: Gel Chem	Cushion Type:	Oil API:	deg API
Mud Weight: 9.00 lb/gal	Cushion Length: ft	Water Salinity:	ppm
Viscosity: 56.00 sec/qt	Cushion Volume: bbl		
Water Loss: 11.14 in <sup>3</sup>	Gas Cushion Type:		
Resistivity: ohm.m	Gas Cushion Pressure: psig		
Salinity: 6500.00 ppm			
Filter Cake: 1.00 inches			

**Recovery Information**

Recovery Table

Length ft	Description	Volume bbl
10.00	CO	0.140
10.00	SOCM 6%O94%M	0.140

Total Length: 20.00 ft      Total Volume: 0.280 bbl  
 Num Fluid Samples: 0      Num Gas Bombs: 0      Serial #:  
 Laboratory Name:      Laboratory Location:  
 Recovery Comments:





**TRILOBITE TESTING, INC.**

**DRILL STEM TEST REPORT**

Mai Oil Operations Inc  
 8411 Preston Rd STE 800  
 Dallas TX 75225-5520  
 ATTN: Jim Musgrove

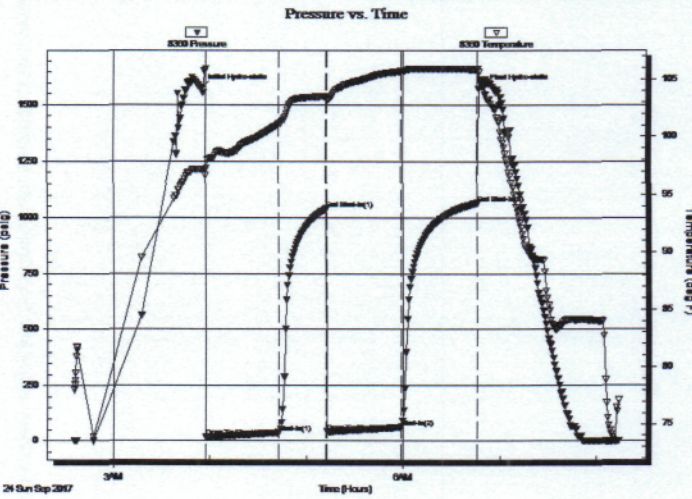
**Morgenstern-Herres Unit #1**  
**34-17s-13w Barton,KS**  
 Job Ticket: 63084      **DST#: 5**  
 Test Start: 2017.09.24 @ 02:35:42

**GENERAL INFORMATION:**

Formation: **Arbuckle**  
 Deviated: No Whipstock: ft (KB)  
 Time Tool Opened: 03:57:37  
 Time Test Ended: 08:13:51  
 Interval: **3358.00 ft (KB) To 3376.00 ft (KB) (TVD)**  
 Total Depth: 3376.00 ft (KB) (TVD)  
 Hole Diameter: 7.88 inches Hole Condition: Fair  
 Test Type: Conventional Bottom Hole (Reset)  
 Tester: Ray Schwager  
 Unit No: 77  
 Reference Elevations: 1875.00 ft (KB)  
 1867.00 ft (CF)  
 KB to GR/CF: 8.00 ft

**Serial #: 8360**      **Inside**  
 Press@RunDepth: 62.14 psig @ 3359.00 ft (KB)      Capacity: 8000.00 psig  
 Start Date: 2017.09.24      End Date: 2017.09.24      Last Calib.: 2017.09.24  
 Start Time: 02:35:42      End Time: 08:13:51      Time On Btm: 2017.09.24 @ 03:54:52  
 Time Off Btm: 2017.09.24 @ 06:50:07

**TEST COMMENT:** 45-IFP-w k to a fr bl 1/4" to 5 1/2" bl  
 30-ISIP-no bl bk  
 45-FFP-surface to 2 1/2" bl  
 45-FSIP-no bl bk



**PRESSURE SUMMARY**

Time (Min.)	Pressure (psig)	Temp (deg F)	Annotation
0	1575.22	97.16	Initial Hydro-static
3	16.53	96.62	Open To Flow (1)
48	37.76	101.08	Shut-In(1)
78	1039.25	103.50	End Shut-In(1)
78	41.68	103.16	Open To Flow (2)
124	62.14	105.72	Shut-In(2)
172	1065.43	105.89	End Shut-In(2)
176	1575.33	104.64	Final Hydro-static

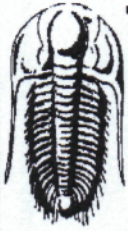
**Recovery**

Length (ft)	Description	Volume (bbl)
90.00	CO	1.26
62.00	HOCM 40%O60%M	0.87

\* Recovery from multiple tests

**Gas Rates**

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



**TRILOBITE  
TESTING, INC.**

**DRILL STEM TEST REPORT**

**TOOL DIAGRAM**

Mai Oil Operations Inc  
8411 Preston Rd STE 800  
Dallas TX 75225-5520  
ATTN: Jim Musgrove

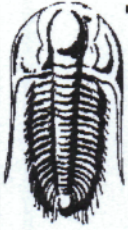
**Morgenstern-Herres Unit #1**  
**34-17s-13w Barton,KS**  
Job Ticket: 63084      **DST#: 5**  
Test Start: 2017.09.24 @ 02:35:42

**Tool Information**

Drill Pipe:	Length: 3359.00 ft	Diameter: 3.80 inches	Volume: 47.12 bbl	Tool Weight: 2200.00 lb
Heavy Wt. Pipe:	Length: 0.00 ft	Diameter: 0.00 inches	Volume: 0.00 bbl	Weight set on Packer: 25000.00 lb
Drill Collar:	Length: 0.00 ft	Diameter: 0.00 inches	Volume: 0.00 bbl	Weight to Pull Loose: 45000.00 lb
			<u>Total Volume: 47.12 bbl</u>	Tool Chased 0.00 ft
Drill Pipe Above KB:	22.00 ft			String Weight: Initial 32000.00 lb
Depth to Top Packer:	3358.00 ft			Final 34000.00 lb
Depth to Bottom Packer:	ft			
Interval between Packers:	18.00 ft			
Tool Length:	39.00 ft			
Number of Packers:	2	Diameter: 6.75 inches		

Tool Comments:

Tool Description	Length (ft)	Serial No.	Position	Depth (ft)	Accum. Lengths
Change Over Sub	1.00			3338.00	
Shut In Tool	5.00			3343.00	
Hydraulic tool	5.00			3348.00	
Packer	5.00			3353.00	21.00      Bottom Of Top Packer
Packer	5.00			3358.00	
Stubb	1.00			3359.00	
Recorder	0.00	8360	Inside	3359.00	
Recorder	0.00	8673	Outside	3359.00	
Perforations	14.00			3373.00	
Bullnose	3.00			3376.00	18.00      Bottom Packers & Anchor
<b>Total Tool Length:</b>	<b>39.00</b>				



**TRILOBITE  
TESTING, INC.**

**DRILL STEM TEST REPORT**

**FLUID SUMMARY**

Mai Oil Operations Inc  
8411 Preston Rd STE 800  
Dallas TX 75225-5520  
ATTN: Jim Musgrove

**Morgenstern-Herres Unit #1**  
**34-17s-13w Barton,KS**  
Job Ticket: 63084      DST#: 5  
Test Start: 2017.09.24 @ 02:35:42

**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: 56.00 sec/qt	Cushion Volume: bbl		
Water Loss: 11.16 in <sup>3</sup>	Gas Cushion Type:		
Resistivity: ohm.m	Gas Cushion Pressure: psig		
Salinity: 6500.00 ppm			
Filter Cake: 1.00 inches			

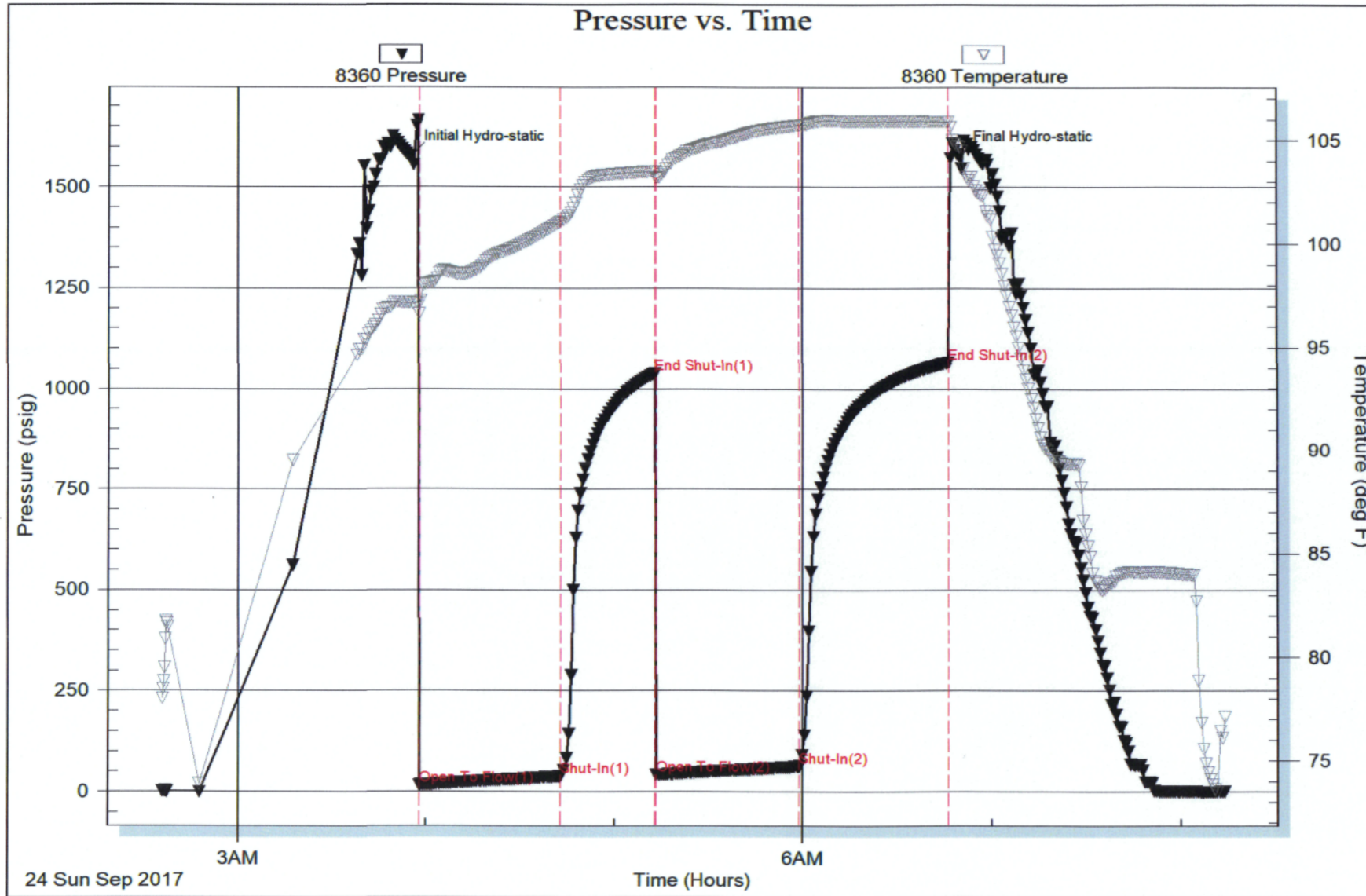
**Recovery Information**

Recovery Table

Length ft	Description	Volume bbl
90.00	CO	1.262
62.00	HOCM 40%O60%M	0.870

Total Length: 152.00 ft      Total Volume: 2.132 bbl  
 Num Fluid Samples: 0      Num Gas Bombs: 0      Serial #:  
 Laboratory Name:      Laboratory Location:  
 Recovery Comments:





# QUALITY OILWELL CEMENTING, INC.

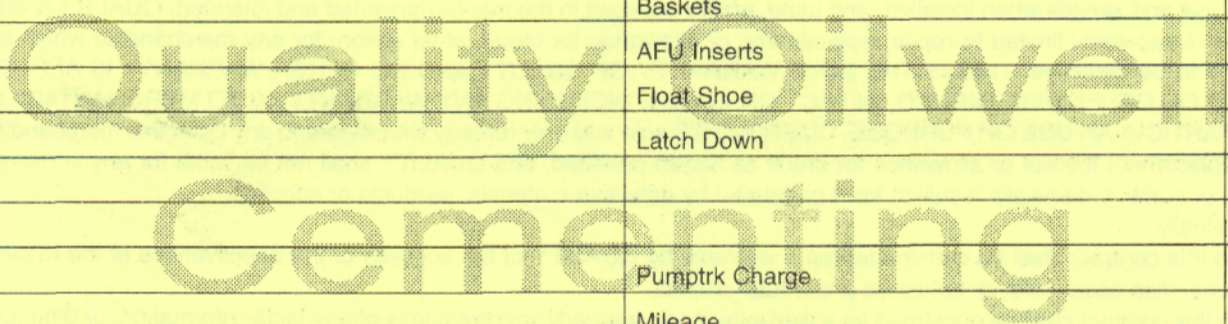
Federal Tax I.D.# 20-2886107

Phone 785-483-2025  
Cell 785-324-1041

Home Office P.O. Box 32 Russell, KS 67665

No. 412

Date	9-19-17	Sec.	34	Twp.	17	Range	13	County	Barton	State	Ks	On Location		Finish	3:00 AM
Lease	Morgenstern - Herres unit							Location	Housington - IE, 100 yds N, E into						
Contractor	Southwind #3		Well No.	#1		Owner									
Type Job	Surface		To Quality Oilwell Cementing, Inc. You are hereby requested to rent cementing equipment and furnish cementer and helper to assist owner or contractor to do work as listed.												
Hole Size	12 1/4"		T.D.	453'		Charge To									
Csg.	8 5/8"		Depth	453'		Mai oil operations									
Tbg. Size			Depth			Street									
Tool			Depth			City									
Cement Left in Csg.	20'		Shoe Joint	20'		State									
Meas Line			Displace	27 1/2 BLS		The above was done to satisfaction and supervision of owner agent or contractor.									
<b>EQUIPMENT</b>												Cement Amount Ordered			
												225 60/40 40/6 CC 20/60			
Pumptrk	16	No.	Cementer			Common									
			Helper	Tavis		Poz. Mix									
Bulktrk	14	No.	Driver	Tony		Gel.									
			Driver	Rick		Calcium									
Bulktrk	pu.	No.	Driver			Hulls									
<b>JOB SERVICES &amp; REMARKS</b>															
Remarks:	Cement did Circulate											Salt			
Rat Hole												Flowseal			
Mouse Hole												Kol-Seal			
Centralizers												Mud CLR 48			
Baskets												CFL-117 or CD110 CAF 38			
D/V or Port Collar												Sand			
												Handling			
												Mileage			
<b>FLOAT EQUIPMENT</b>															
												Guide Shoe			
												wood plug			
												Centralizer			
												Baskets			
												AFU Inserts			
												Float Shoe			
												Latch Down			
												Pumptrk Charge			
												Mileage			
												Tax			
												Discount			
												Total Charge			
X Signature	Joy Huser														



# QUALITY OILWELL CEMENTING, INC.

Federal Tax I.D.# 20-2886107

Phone 785-483-2025  
Cell 785-324-1041

Home Office P.O. Box 32 Russell, KS 67665

No. 417

Date	9-25-17	Sec.	34	Twp.	17	Range	13	County	Barton	State	Ks	On Location		Finish	3:30AM								
Morgenstern - Herres unit								Location								Herington, Ks - 1E, 100 yds N, E/S							
Lease				Well No.				1				Owner				To Quality Oilwell Cementing, Inc. You are hereby requested to rent cementing equipment and furnish cementer and helper to assist owner or contractor to do work as listed.							
Contractor				Southwind #3																			
Type Job				Longstring																			
Hole Size				7 7/8"				T.D.				3435'											
Csg.				5 1/2" used 14#				Depth				3434'											
Tbg. Size								Depth															
Tool								Depth															
Cement Left in Csg.				33.14'				Shoe Joint				33.14'											
Meas Line				Displace				83 BLS				1000 gal Mud Clear 48											
<b>EQUIPMENT</b>												Common											
Pumptrk		16		No.		Cementer		Helper		Troy's		Poz. Mix											
Bulktrk		9		No.		Driver		Driver		Tony		Gel.											
Bulktrk		PU		No.		Driver		Driver		Rick		Calcium											
<b>JOB SERVICES &amp; REMARKS</b>												Hulls											
Remarks:												Salt											
Rat Hole												Flowseal											
Mouse Hole												Kol-Seal											
Centralizers												1-9, 13											
Baskets												pipe on bottom break Circulation											
D/V or Port Collar												plug 1800 gal mud Clear 48											
plug Rathok												w/ 130# cement shut down wash pump											
+ lines Displaced plug w/ 83 BLS												Released & held											
Lift pressure												650 #											
Land plug to												1500 #											
<b>QUALITY OILWELL CEMENTING</b>												<b>FLOAT EQUIPMENT</b>											
												Guide Shoe											
												Centralizer											
												10											
												Baskets											
												AFU Inserts											
												Float Shoe											
												Latch Down											
												Pumptrk Charge											
												Mileage											
												Tax											
												Discount											
												Total Charge											
X Signature				[Signature]																			