October 11, 2017

Hearing on Proposed Orders

SDWA 06-2017-1110, SDWA 06-2017-1111 and SDWA-06-2017-1112

Tulsa County Courthouse

Room 119

500 South Denver, Avenue

Tulsa, Oklahoma 74103-3844

9:15 – 10:45:	Jireh Resources, LLC
10:45 – 12:15:	Warren American Oil Company, LLC
12:15 – 1:15:	Lunch
1:15 – 2:45:	Novy Oil and Gas, Inc.
2:45 – 3:45:	Public comments

Proposed Hearing: SDWA 06-2017-1110, SDWA-06-2017-1111, and SDWA-06-2017-1112
October 11, 2017

Name	Phone number	Email address	Mailing Address
DAVID HOUSE	918-760-7030	DAVID@DWHOUSE.NET	P.O. BOX 701230 TULSA, OK 74170-1230
Lanny Woods	918-857-0468	Lannywoods@Jirehresourcesllc.com	P.O. BOX 701230 TULSA, OK 74170
Tom Turmelle	918 697-031	tturmelle@warrenamerican.com	6585 S. Yale Ste 800 Tulsa, OK 74136
Robert Winter	918-581 5500	RWinter@prayWalker.com	100 W 5th St, Ste 900 TULSA OK 74103
Brody Wallis Osage Land & Cattle	918 338 2332	bwallis@elcoyote.com	2431 Nowata Place Bartlesville, OK 74006
Bill Biehl	817 390 8823	wbiehl@bassnet.com	201 Main St. Ste 3100 Fort Worth, TX 76102

Proposed Hearing: SDWA 06-2017-1110, SDWA-06-2017-1111, and SDWA-06-2017-1112
October 11, 2017

Name	Phone number	Email address	Mailing Address
JOHN TUCKER	9185821173	JTUCKER@RHODESOKLA.COM	Box 21100 Tulsa OK 74121-1100
BRIAN INBODY	918 605 6543	binbody@mcandlaw.com	1439 S. Boulder Ave. Tulsa 74119
DOUG NORTON	918 269 5625	DNORTON@WARRENAMERICAN.COM	6585 S. YALE AVE TULSA, OK 74136 SUITE 800
Michael Navy	316-794-7200	Mouyo11@aol.com	P.O. Box 119 Goddard, KS 67052
JOHN RANDOLPH			
Valery Giebel	918-581-8500	vgiebel@praywalker.com	100 W 5th St., Suite 900 Tulsa, OK 74103
Kelly Bostian	918-231-1385	kelly.bostian@tulsaworld.com	315 S Boulder - Tulsa.

Proposed Hearing: SDWA 06-2017-1110, SDWA-06-2017-1111, and SDWA-06-2017-1112
October 11, 2017

Name	Phone number	Email address	Mailing Address
Charles A. Ellis	918-382-9201		20 E 5th Suite 320 Tulsa
Gary Johnson	918-382-920[illegible]	gjohnson@gtaylorsa.net	20 E 5th Ste 320 Tulsa, OK
Bert Fisher	918-527-2332	openaccess2@gmail.com	6[illegible] S. Boulder Ste 820 Tulsa, OK 74119
Steve McNamara	918-599-0300	SMcNamara@McNamLaw.com	1431 S. Boulder Ave. Tulsa, OK 74119

OPENING STATEMENT OF WARREN AMERICAN OIL COMPANY, LLC

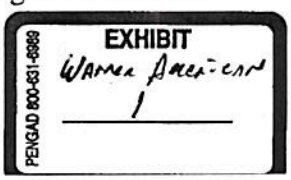
EPA hearing, Wednesday, October 11, 2017

Gentlemen:

My name is Doug Norton, speaking today on behalf of Warren American Oil Company, LLC in Docket No. SDWA-06-2017-1111 concerning the Bird Creek salinity issues being investigated by the Environmental Protection Agency ("EPA"). Warren American is grateful to the EPA for this opportunity to place into the record written expert reports and evidence which we believe conclusively exonerates Warren American from the allegations that it has "failed to confine injected fluids to the authorized injection zone" resulting in the contamination observed in Bird Creek.

Warren American has been in business for over seventy-five (75) years and enjoys an excellent reputation both inside and outside of the oil and gas community. This is the first time in Warren American's history where it has been involved in an EPA Hearing. Warren American is deeply committed to protecting the environment of Osage County while producing oil and gas for our own benefit and for the benefit of the Osage Nation.

Warren American has owned the Chapman lease since December, 2013, when it was acquired from Link Oil Company. Warren American has fully cooperated with the EPA in every aspect of this investigation from August, 2016 until the present date. We have turned over to the EPA all of our files and records pertaining to our injection wells and our production wells. We have devoted hundreds of man hours, internally investigating our own operations, in an attempt to arrive at an answer to this dilemma. We have periodically shut down our operations, conducted numerous diagnostic tests on



injection wells and producers, and monitored salinity and temperatures at various spots along Bird Creek over time. We have spent numerous hours discussing both the facts and theories with representatives of the EPA and representatives of the surface owners. We deeply value the input and efforts that the general public and the EPA have made with respect to this problem and pledge to continue to work with the agency and surface owners in the future.

With respect to the proposed Order that was sent to Warren American by the EPA on July 29, 2017, it is Warren American's opinion that the conclusions reached in the proposed Order as to Warren American's operations are factually and scientifically incorrect, and the data does not support the EPA's theory that the Mississippi Chat formation is over-pressured.

Warren American's opinion is based on the following observations:

1. The Mississippi Chat formation is not over-pressured. As a preliminary matter, we would note that of the three (3) injection wells operated by Warren American on the Chapman Lease, two of the wells (B-8 and B-9) are taking water on a vacuum and the third is operating at a very low injection pressure. It is difficult to understand how the EPA could arrive at the conclusion that injection wells that take water on a vacuum could lead to, or contribute to, the over-pressuring of the Mississippi Chat formation. In the aggregate, Warren American's producing operations bring both water and oil to the surface, separates the oil from the water, and then reinjects the water back into the same producing formation without adding any "make-up" water to replace the oil volume produced. This concept (or recycling operation) has been going on with respect to the Mississippi Chat reservoir at this location for more than 50 years. The result is that the

reservoir pressure in this Mississippi Chat formation is now less than the bottom-hole pressure was 50 years ago. Since the pressure within the Mississippi Chat has continuously declined over time, there is no scientific or factual basis for the conclusion that the Mississippi Chat has been or is "over-pressured". As a professionally registered petroleum engineer with forty years of experience, I can attest that it would be classified as a normally pressured reservoir.

To study this finding of the EPA, Warren American has engaged the services of Cobb and Associates Petroleum Engineers. Under Cobb's guidance, Warren American recently obtained measured bottom-hole injection pressures for all three of its injectors on the Chapman lease. A copy of the Cobb and Associates report is submitted along with this statement which concludes (A) the Mississippi Chat is not over-pressured; (B) that the Warren American injection wells are not injecting water in volumes, or at pressures, anywhere close to the fracture gradient of the Mississippi Chat formation; and, (C) that there is approximately 2400 feet of vertical elevation between the top of the Mississippi Chat formation and the bottom of Bird Creek at Monitoring Station No. 6; and (D) that 90 percent of the pressure drop (from the injection wells to the producers) occurs within 10 feet of the injectors and therefore there is insufficient reservoir pressure (even while water injection is occurring) to lift a column of fluid from the Mississippi Chat into the bottom of Bird Creek (as long as the water entering our injection wells at the surface actually enters the Mississippi Chat formation and does not channel up the backside of the casing).

2. Warren American's injected water is confined solely to the Mississippi Chat formation. Also submitted along with this statement is the Affidavit of our Vice-

President of Operations, Mr. John Burroughs. As Mr. Burroughs affidavit describes, Warren American has taken additional steps to conclusively prove that the water it is injecting into its injection wells is not escaping somewhere between the surface and the Mississippi Chat formation. This is evidenced primarily by three radioactive injection profile tests which Warren American recently caused to be run by Associated Wireline Service, Inc. of Healdton, Oklahoma. These tests, results of which are attached to Mr. Burroughs affidavit, conclusively show that all waters injected into the Warren American wells enter the Mississippi Chat formation and do not escape between the surface and the Mississippi Chat or channel up the outside of the wellbores. The Cobb Report, referenced previously, also concludes, based on these injection profiles, that the injected water is confined solely to the Mississippi Chat formation.

3. Warren American injection wells have not "recently" failed MIT tests. There has been insinuation that Warren American's injection wells have "recently" failed MIT tests. This was alluded to in the public comments. Mr. Burroughs affidavit corrects the record with respect to these facts. A summary of Mr. Burroughs affidavit regarding these issues is as follows:

A) The Warren American C-W4 well (sometimes referred to as the C-1 well) did fail an MIT test on November 18, 2014 at which time all injection of fluids was discontinued. The well was subsequently plugged in 2016 as witnessed by the EPA.

B) The Warren American B-9 well failed an MIT on August 11, 2015. All injection was discontinued at that time. As Mr. Burroughs affidavit shows, efforts were made to repair the B-9 well which were ultimately

successful. Injection was re-commenced after the well successfully passed an MIT test on December 30, 2016. The B-9 well is currently taking water on a vacuum and injecting approximately 900 BWPD.

In summary, neither of these wells could have contributed to the pollution of Bird Creek which occurred in August, 2016 as neither had been in operation for a full year prior to the discovery at Monitoring Station No. 2. Also, neither had the type of failure that would permit injection into a shallow horizon.

Concurrent with our conclusion that Warren American is not responsible for the Bird Creek contamination, a separate likelihood has also been determined: that the contamination was a one-time event and there is no ongoing pollution into the creek. This topic is addressed in a second report, authored by Dr. Kerry Sublette, distinguished Professor of Environmental Engineering at the University of Tulsa. In addition to studying data provided by the EPA, Dr. Sublette walked the creek and supervised the measuring of salinity and temperature at several spots (beyond the EPA sondes) over time. Dr. Sublette's report is also being offered into the record today to support Warren American's observation that the salinity levels present in Bird Creek have declined over time, and are continuing to decline. This finding strongly supports the position that there is no ongoing pollution into the creek. In particular, the salinity levels at Monitoring Station No. 2, where initial reports found 80,000 parts per million of chlorides, have now fallen to below 1,000 parts per million-and continue to decline. Salinity also continues to fall at Monitoring Station No. 6, although the salinity measurements remain high in the deepest part of that pool. However, salinity readings 6" from the surface at Station No. 6

decrease rapidly to the 1500 ppm range. Dr. Sublette concludes that all observations of increased salinity can be explained by stratified flow and pool to pool transport of salts.

Another significant finding by Dr. Sublette is that the temperature anomalies observed at various depths of Bird Creek could readily be explained by solar heating of the dense saline layers. Therefore, communication with the creek and a deeper stratum would not be necessary to explain elevated temperatures at deeper, high salinity locations.

So that the record is clear, Warren American was requested to voluntarily shut-in all three of its injection wells on at least two occasions. The first time was from June 9 – June 16, in conjunction with the shut-in of all three of the operators' wells, at the EPA's request. The second shut-in began on August 9, to cooperate with the EPA's Proposed Administrative Order. From that date, for approximately thirty (30) days, Warren American's production facilities were completely shut down. As should be noted for the record, Warren American has no alternative source to take produced water off of the Chapman lease. Also, Warren American has been told by EPA personnel that no new permits, to drill a disposal well further to the north or to dispose of our produced water into different formations, will be approved. Without disposal wells, Warren American cannot produce the Chapman lease.

As a consequence of the foregoing, and in an effort to continue to gather scientific data, Warren American decided to reactivate its operations following the thirty (30) day shut-in. The reactivation occurred on September 8, 2017. From that date, Warren American has obtained readings from both Monitoring Station No. 2 and Monitoring Station No. 6 with the consent of the surface owner and with the knowledge of the EPA.

Dr. Sublette addresses those readings in his report. The bottom line is that the salinity levels continue to decline or remain steady, even after the Warren American's wells have been re-activated. This certainly suggests that the Warren American wells have not, and do not, contribute to the salt water that entered Bird Creek in August, 2016, nor does it appear that there is any current inflow of saltwater from any source.

In conclusion, it is Warren American's position that it, at all times, operated its wells in compliance with the terms of its underlying permits. We believe that the initial photographic evidence of oil and oil sheens in the creek in August, 2016, and the absence of any reported oil sheens subsequent to August, 2016, strongly substantiate that this was a one (1) time event. The gradual decline of the salinity of the water remaining in the creek also supports our conclusion that the pollution is not currently reoccurring. This is particularly true with respect to Warren American's wells which were voluntarily shut-in for an extended period of time. The evidence shows that prior to the Warren American shut-in, during the shut-in, and after injection activities were resumed, salinity levels within Bird Creek all continued a gradual and steady decline.

Warren American concurs with the recommendation in Dr. Sublette's Report, that the high salinity water in Monitoring Station No. 6 be drained; two or three times, if necessary. The salinity at that Station should continue to be monitored during this process.

Further, Warren American believes that the EPA's proposed order to permanently discontinue disposing of produced water into the Mississippi Chat is arbitrary and capricious, and is not supported by the data. As noted above, such an order would likely lead to an inability to produce the Chapman lease. Other alternatives are available, at

least on an interim basis, to monitor the situation. These would include: (1) lowering the allowed maximum injection pressure on the Warren American injection wells; (2) requiring an annual or biannual MIT test on Warren American injection wells; (3) conducting weekly monitoring and reporting of casing pressure, in addition to the current tubing pressure; and (4) requiring weekly monitoring of the salinity levels within Bird Creek for an extended period of time.

Warren American has not yet received all of the documents that it has requested from the EPA through various Freedom of Information Act requests. We respectfully request that we be provided adequate time to review and respond to this information once it is received.

Warren American is of the firm belief that its activities were not the cause of the observed pollution. Our expert reports show that the proposed order, as directed to Warren American, is not supported by scientific evidence and represents a finding of "guilt by association" that is not warranted. We honor our reputation for honesty and integrity in all matters pertaining to our operations and the proposed order deprives us of the ability to prove our innocence. We would strongly urge the EPA not to go forward with the proposed Administrative Order while data is indicating that no further contamination is occurring.

Attachments:

1) Report of Cobb & Associates

2) Report of Dr. Kerry Sublette

3) Affidavit of John D. Burroughs, P.E.

RESERVOIR ENGINEERING STUDY

OF THE

MISS CHAT RESERVOIR

OSAGE COUNTY OKLAHOMA

PREPARED FOR

WARREN AMERICAN OIL COMPANY

OCTOBER 2017

WILLIAM M. COBB & ASSOCIATES, INC.
Worldwide Petroleum Consultants

WILLIAM M. COBB & ASSOCIATES, INC.

Worldwide Petroleum Consultants

12770 Coit Road, Suite 907
Dallas, Texas 75251

(972) 385-0354
Fax: (972) 788-5165
E-Mail: office@wmcobb.com

October 6, 2017

Mr. Doug Norton
Warren American Oil Company
6585 South Yale, Suite 800
Tulsa, Oklahoma 74136

Re: Miss Chat Reservoir
Osage County, Oklahoma

Dear Mr. Norton:

At your request, I have reviewed two technical reports and various data items associated with waterflood operations in the Miss Chat reservoir in Osage County Oklahoma. My study addresses allegations that operators of water injection wells in the Miss Chat reservoir have failed to contain the water to the injection interval resulting in brine contamination at the surface, specifically in Bird Creek. The two technical reports which I have reviewed are:

1. "Bird Creek Investigation and Injection Well Response Action Plan", August 4, 2017, prepared by the US EPA Dallas office
2. "Comment Letter on Administrative Orders: SDWA-06-217-1110 (Jireh Resources, LLC); SDWA-06-2017-1112 (Novy Oil and Gas, Inc. (Grayhorse Operating, LLC)), and SDWA-06-2017-1111 (Warren American Company, LLC), September 1, 2017, prepared by Bill Biehl, PG, EH&S Manager, BEPCO, L.P. (on behalf of Osage Land & Cattle Co.)

Field History

The Miss Chat reservoir, also known as the "Blackland Pool" was discovered in 1922, according to a memo and technical data compiled by Mr. David Roberts[1], a petroleum engineering consultant. Very few wells were drilled until field wide development commenced in 1953. From 1953 to 1966, all produced water was disposed of into the Layton sand. A field-wide cooperative waterflood was implemented in 1966 by Texaco, Sun, and K-M Oil Co. This cooperative unit covered nine quarter sections, and produced water was re-injected into the Miss Chat reservoir. There is no evidence that makeup water was ever used on the Chapman lease.

[1] Memo dated October 3, 2017, by David Roberts.

This appears to be corroborated in a 1976 report by Keplinger and Associates, Inc.[2] which states that reservoir withdrawals have exceeded water injection.

Oil production for the specific Warren American Oil Company (WAOC) Chapman lease is unknown. However, the combined Jireh McComb and WAOC Chapman leases have produced about 4.1 million barrels of oil. Produced and injected water volumes are unknown. What is known, however, is that total water injection is less than total water production.

WAOC purchased the Chapman lease properties in December, 2013, from Link Oil & Gas. As shown on Exhibit 1, the Chapman lease borders the Jireh McComb lease on the east and south. Grayhorse operates another Miss Chat property about a mile southeast of the Chapman lease.

Current Reservoir Pressure

We know that only a portion of the produced volumes have been returned to the Miss Chat reservoir, which should have resulted in gradual pressure depletion over time. Current measurements of bottom-hole pressure (BHP) confirm this fact.

There are no early BHP readings available for the Miss Chat reservoir. However, original BHP (BHP_i) can be estimated using the following equation:

BHP_i = Avg. Depth * 0.433 psi/ft. (normal pressure gradient)

BHP_i = 2500 ft. * 0.433 psi/ft.

BHP_i = 1082 psi

WAOC has conducted recent BHP surveys in producing and injection wells, as shown in Exhibit 2. This test program indicates that the current pressure in the Miss Chat reservoir is between 900 and 950 psi, which is lower than original BHP. Significantly, this pressure ***is not*** sufficient to bring a column of brine water to the surface. In fact, the standing fluid levels measured in these tests ranged from 500 feet to 737 feet below the surface. Neither the EPA report nor the Osage Land and Cattle report dispute this finding. However, the EPA claims that injection operations could force water to the surface (page 2, bullet 4).

In Mr. Biehl's report, he spends considerable time and text showing what allowable injection surface pressures are and what the calculated downhole pressure would be, ***IF*** the maximum allowed surface pressures were used (see Reservoir Engineering – Allowable Injection Pressure section, page 10). This is irrelevant to the WAOC wells, which are operated with surface pressures as shown from recent tests:

1. Well B7 > Injecting 1146 BWPD with **135 psi surface pressure**. Measured BHP while injecting was 1285 psig at 2517 feet (0.511 psi/ft.). When shut-in, the surface ***went on a vacuum*** in 20 seconds. BHP dropped from 1285 psig to 1086 psig in 15 minutes and was still dropping when the gauges were pulled.

[2] An Evaluation of Interests Owned by K-M Oil Company, Blackland Pool, Osage County, Oklahoma as of July 1, 1976.

2. Well B8 > injecting 858 BWPD with 27" ***vacuum*** at the surface. Measured BHP while injecting was 1149 psig at 2546 feet (0.451 psi/ft.).
3. Well B9 > injecting 1168 BWPD with 27" **vacuum** at the surface. Measured BHP while injecting was 1160 psig at 2557 feet (0.454 psi/ft.).

The tests shown above clearly show that bottom hole injection pressures are not excessive. In fact, this is one of the most "gentle" waterfloods, in terms of bottom-hole injection pressure gradient, that I have seen in my 35+ year career.

The average injection pressure gradient in the WAOC wells is 0.472 psi/ft. This is sufficient to bring brine water close to the surface ***IF*** there is a high conductivity breach, right at the wellbore. However, WAOC has run mechanical integrity tests (MIT's) and injection profile surveys which do not indicate any such breach. Therefore, in order for injected brine to reach the surface, it must first travel through the reservoir to a nearby well with compromised integrity to find a path to the surface. In doing so, the injected water loses most of its energy (pressure) within a few feet of the injection well, leaving it incapable of lifting a column of water to the surface. Exhibit 3 is cartoon diagram of the theoretical pressure distribution in an oil reservoir from an injection well to a producing well. I have placed actual pressure values on this diagram; however, the shape of the pressure trend near the wells is implied from theory.

To further illustrate this point, I have made a calculation of the pressure drop from an injector to a point 660 feet away (10 acre well spacing) for a reservoir with a permeability value of 50 md. Results of this calculation are shown graphically in Exhibit 4. Note on Exhibit 4, that more than 90 percent of the pressure drop from the injector to the producer occurs within 10 feet of the injection well. Again, this indicates that any pathway more than a few feet from the injection well cannot deliver water with sufficient pressure to bring it close to the surface.

Miss Chat Frac Gradient

In the Osage Land and & Cattle Co. report, Mr. Biehl speculates that the frac gradient for the Miss Chat reservoir will likely be low, perhaps around 0.5 psi/foot due to the rock being a "soft , weathered chert". In my experience this 0.5 psi/foot frac gradient is too low. In fact, a 1967 frac treatment report for the K-M Chapman F-1 well shows a frac gradient of about 0.70 psi/foot, which I find to be quite normal. Using that value, the surface pressure required to frac the Miss Chat reservoir would be calculated as follows:

Frac Pressure (FP) = BHP= SURFP + HP – FP (Biehl equation, page 10)

Rearranging this equation to solve for the surface pressure (Max SURFP) at which the Miss Chat will frac:

Max SURFP = BHP (frac pressure) – HP + FP

Max SURFP = (0.70*2500) – (2500*0.433*1.07) + 49

Max SURFP = 641 psi

As shown in the previous section, WAOC well B7 is injecting with 135 psi surface pressure, while the B8 and B9 wells take water on a vacuum. Clearly, none of the WAOC injection wells are injecting at or above the frac gradient. Conversely, all three wells are injecting ***well under*** the frac gradient.

Fluctuations in TDS Measurements

On page 6 of the EPA report, in bullet 4, the EPA contends that fluctuations in the TDS readings are due to injection pump cycling. This contention is technically flawed in at least two ways:

1. Injection pumps cycling would send pressure pulses through the reservoir. Note that these pressure pulses diffuse with distance from the injector and are almost imperceptible a short distance from the injector.
2. Injection pump cycling would have no impact on the chemical composition of the water being produced at a distant location.

It is very likely that the fluctuating TDS values cited by the EPA are due to temperature fluctuations when the samples were taken. Exhibit 5 is a graph of TDS and temperature measurements from MP6. Note the cyclic behavior of both temperature and TDS. The dark blue border on Exhibit 5 shows the time period when field injection operations were shut down. Exhibit 6 shows this same data with the time scale focused on the period when injection operations were shut-in. Note that the temperature and TDS values cycle on a 24-hour period. This is simply the effect of daytime heating and nighttime cooling on the constant composition water in the pool at MP6. This data provides no evidence of any link between injection well operations and surface water quality in Bird Creek.

Exhibit 7 presents TDS data for stations 2 and 6 obtained by the EPA, Bureau of Indian Affairs (BIA), and WAOC. Cumulative rainfall is also displayed on this graph. This graph shows that with passing time and periodic rainfall, the TDS readings at both stations 2 and 6 are declining. Upstream station 2 has returned to normal conditions. Downstream station 6, which is deeper than station 2, shows a declining TDS trend. This graph clearly shows that there is no ongoing release of Miss Chat water into Bird Creek.

Conclusions

1. Analysis of available data indicates that the release of brine water into Bird Creek in August of 2016 was a one-time event.
2. The Miss Chat reservoir has been gradually voided over time, causing a gradual reduction in pressure, from an original value of about 1082 psi to a current value of about 925 psi.
3. The current average Miss Chat reservoir pressure is not sufficient to bring reservoir fluids to the surface.
4. Current reservoir pressure can bring a column of brine water no higher than about 500 feet from the surface. This is corroborated by recent BHP and fluid level measurements.
5. The three WAOC injection wells have passed MIT tests and all have had injection profile surveys run, indicating that injected fluids are not escaping the reservoir at these wells.

6. Current bottom-hole injection pressures at the WAOC wells are well below the Miss Chat frac gradient of about 0.70 psi/foot.
7. If fluids are escaping the reservoir any distance from the injection wells, there will be insufficient pressure to bring fluids higher than about 500 feet from surface.
8. Fluctuations (noise) in the TDS and temperature readings cited by the EPA are simply cyclic events associated with temperature variations over each 24 hour period. These are normal and to be expected, and are not an indication of communication from injection wells to the surface.

I appreciate the opportunity to assist Warren American Oil Company in this matter. Should you have any questions regarding the subject report or conclusions, please do not hesitate to contact me.

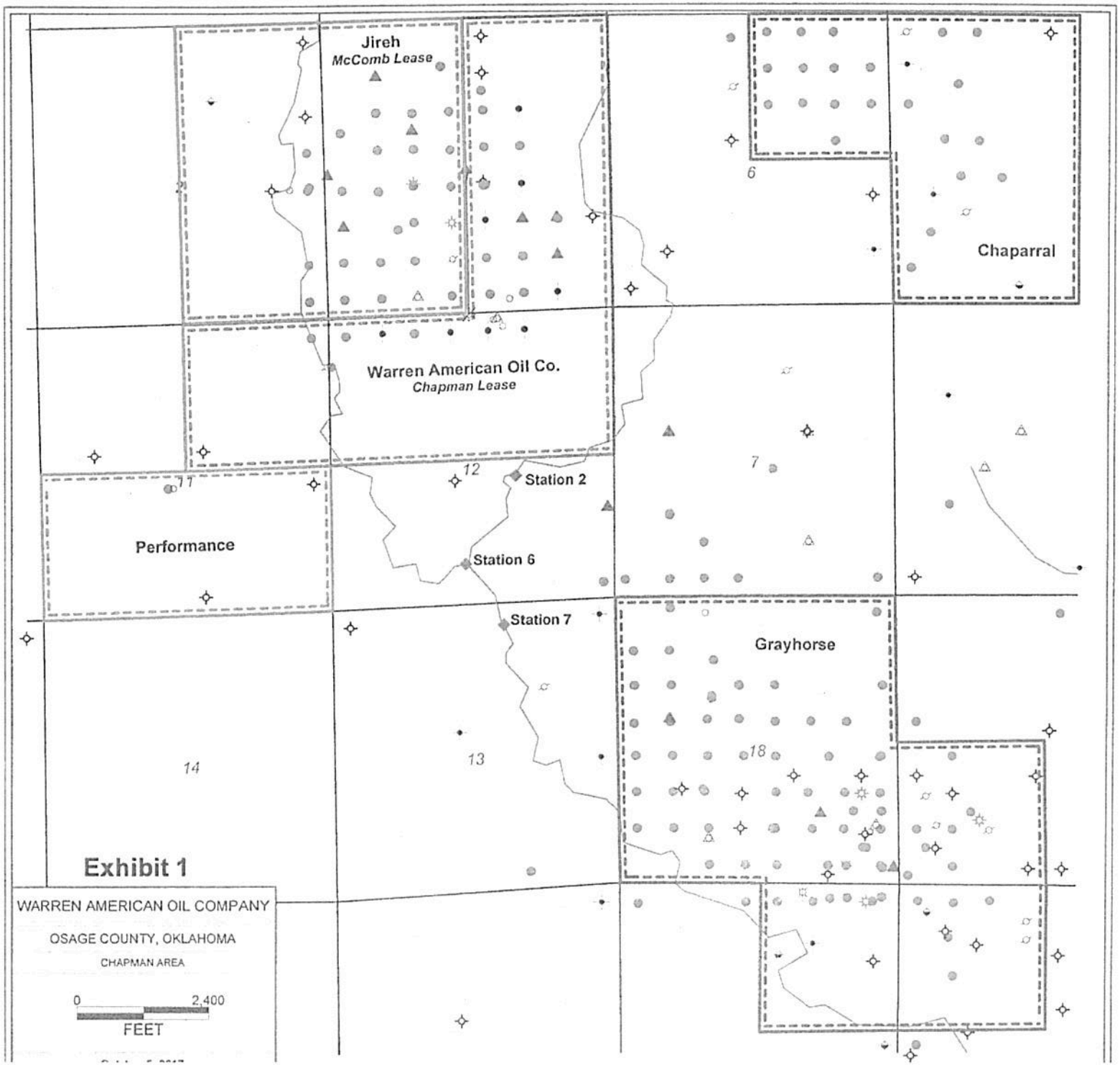
Sincerely,

WILLIAM M. COBB & ASSOCIATES, INC.
Texas Registered Engineering Firm F-84

Frank J. Marek, P.E.
President

FJM: ar
Attachments
M/Warren America/Miss chat Reservoir 100617

EXHIBITS


Jireh
McComb Lease
Chaparral
Warren American Oil Co.
Chapman Lease
Station 2
Station 6
Station 7
Performance
Grayhorse
6
7
11
12
13
14
18
Exhibit 1
WARREN AMERICAN OIL COMPANY
OSAGE COUNTY, OKLAHOMA
CHAPMAN AREA
0
2,400
FEET

Warren Americal Oil Company

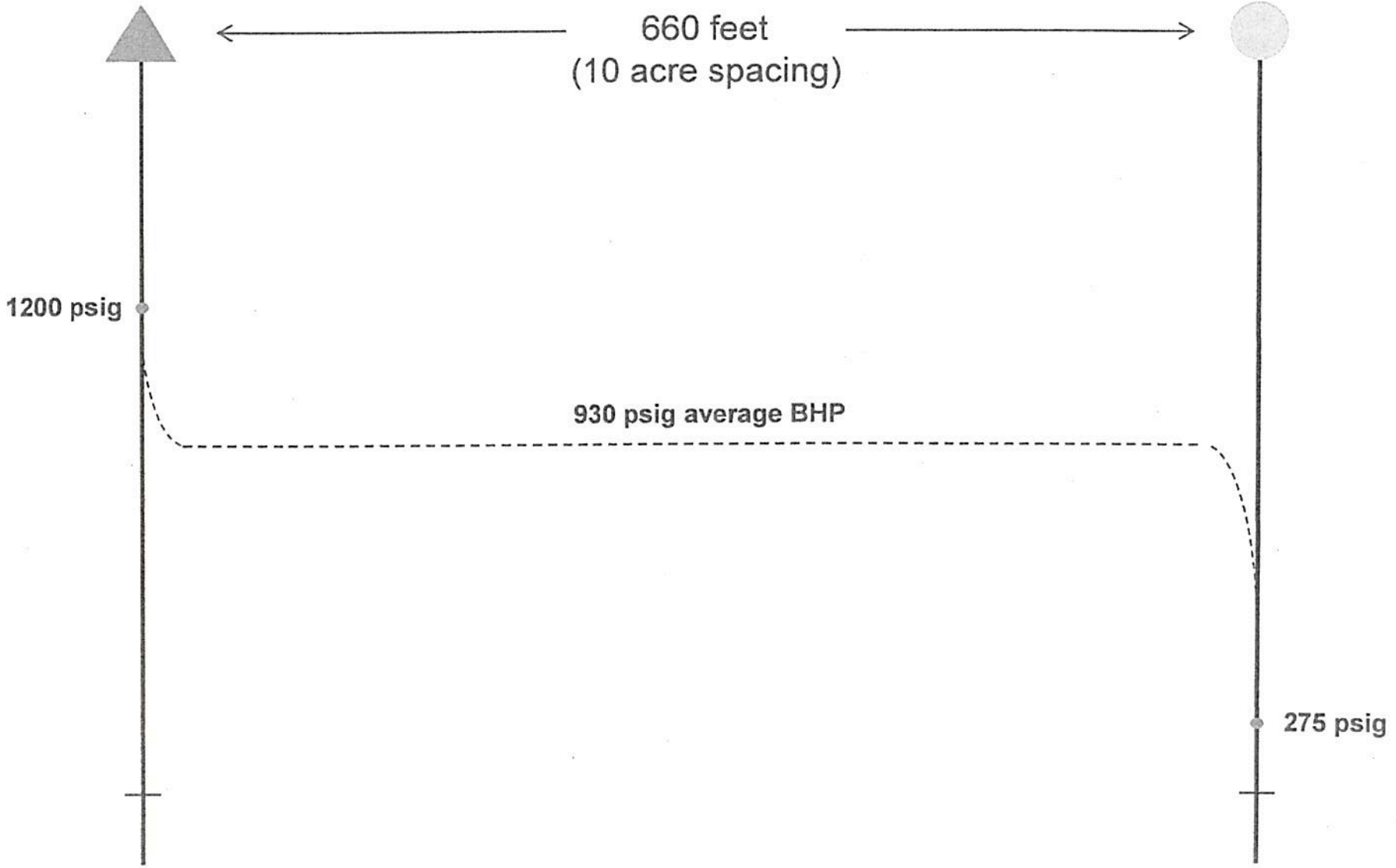
Recent Chapman Lease BHP Data

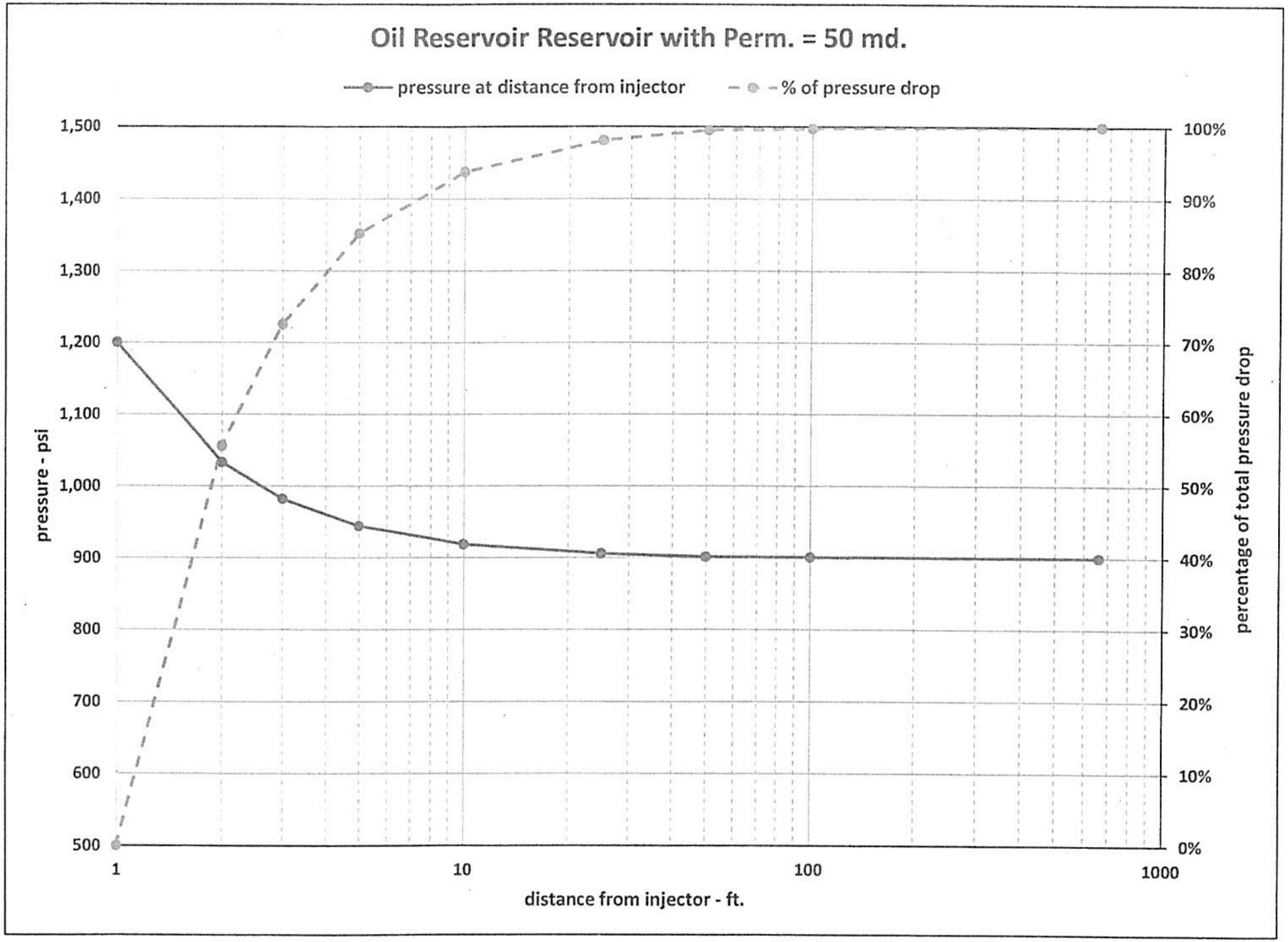
Well	Well Type	Date	MPOP	BHP, psig	BHT	fluid level ft. from Surf.	type of test
B7	injector	08/31/17	2517	898	N/A	631	acoustic F.L.
B8	injector	08/31/17	2546	932	N/A	590	acoustic F.L.
B8	injector	09/07/17	2546	953	107	592	wireline gauge
B9	injector	08/31/17	2556	871	N/A	737	acoustic F.L.
B9	injector	09/07/17	2556	904	113	728	wireline gauge
E3	producer	09/07/17	2497	973	122	506	wireline gauge
E3	producer	09/07/17	2497	885	N/A	500	acoustic F.L.
					Avg. =	612	

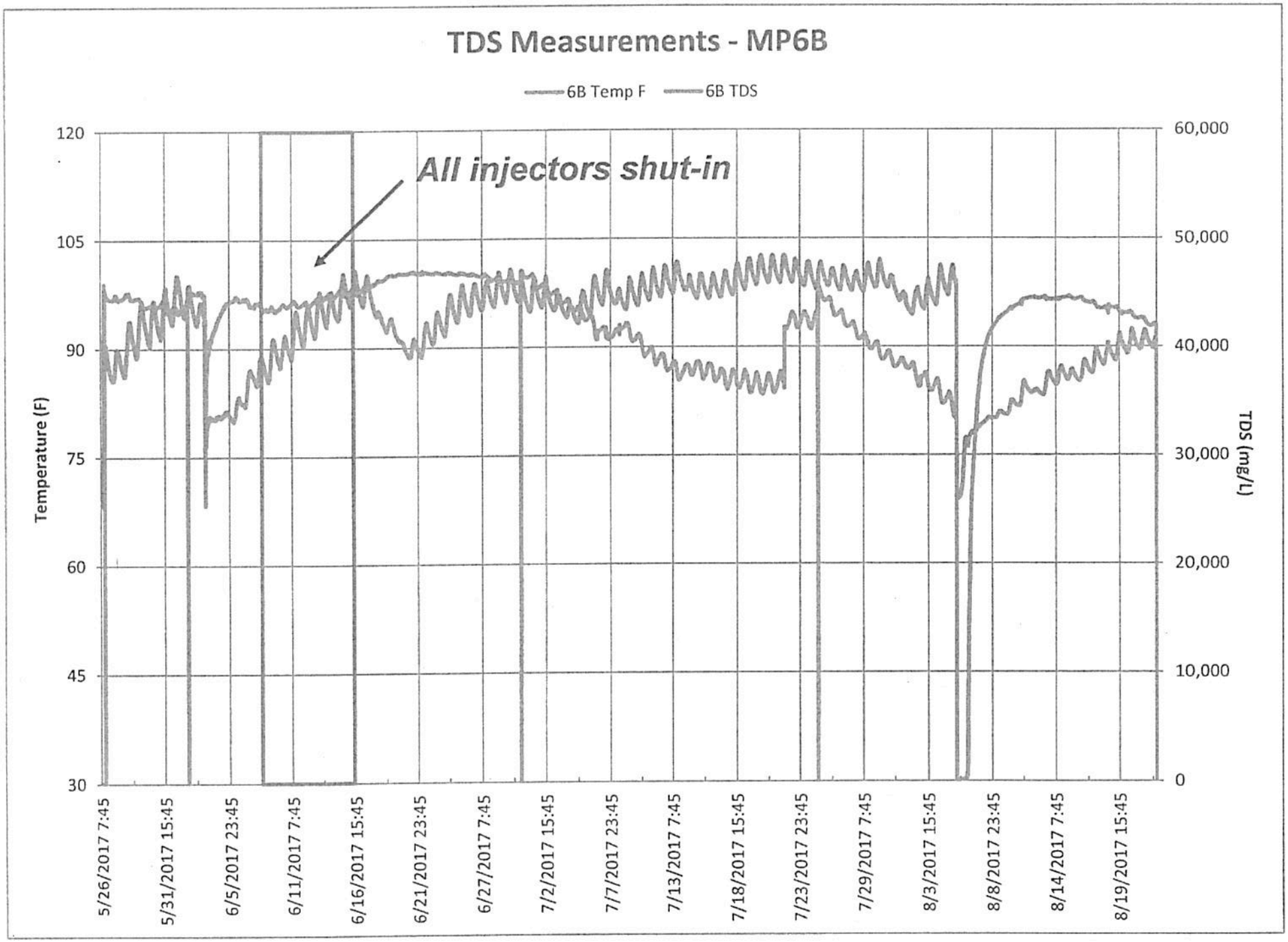
overall average = 917

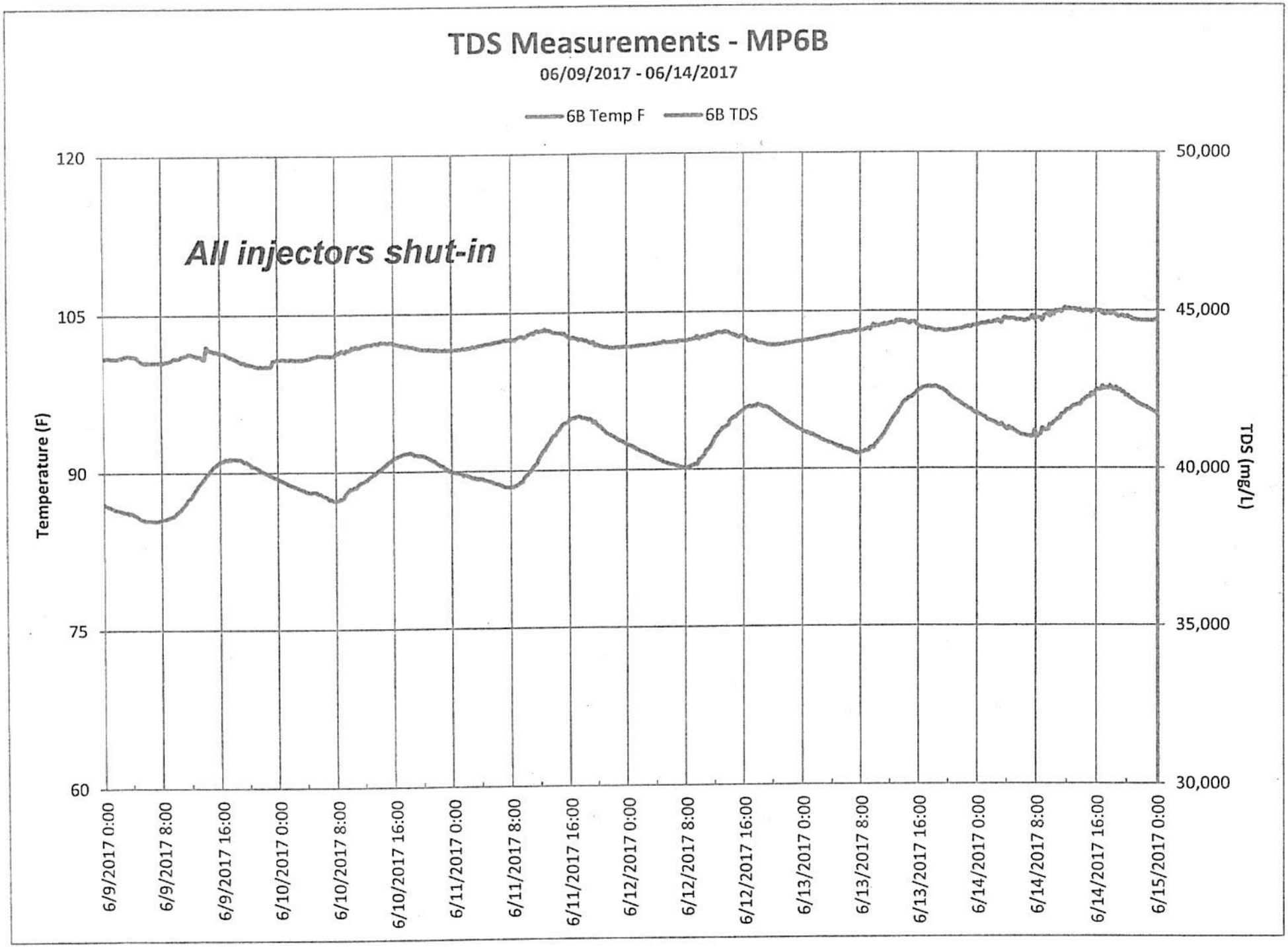
wireline BHP Avg. = 943

Theoretical Pressure Distribution – Injector to Producer

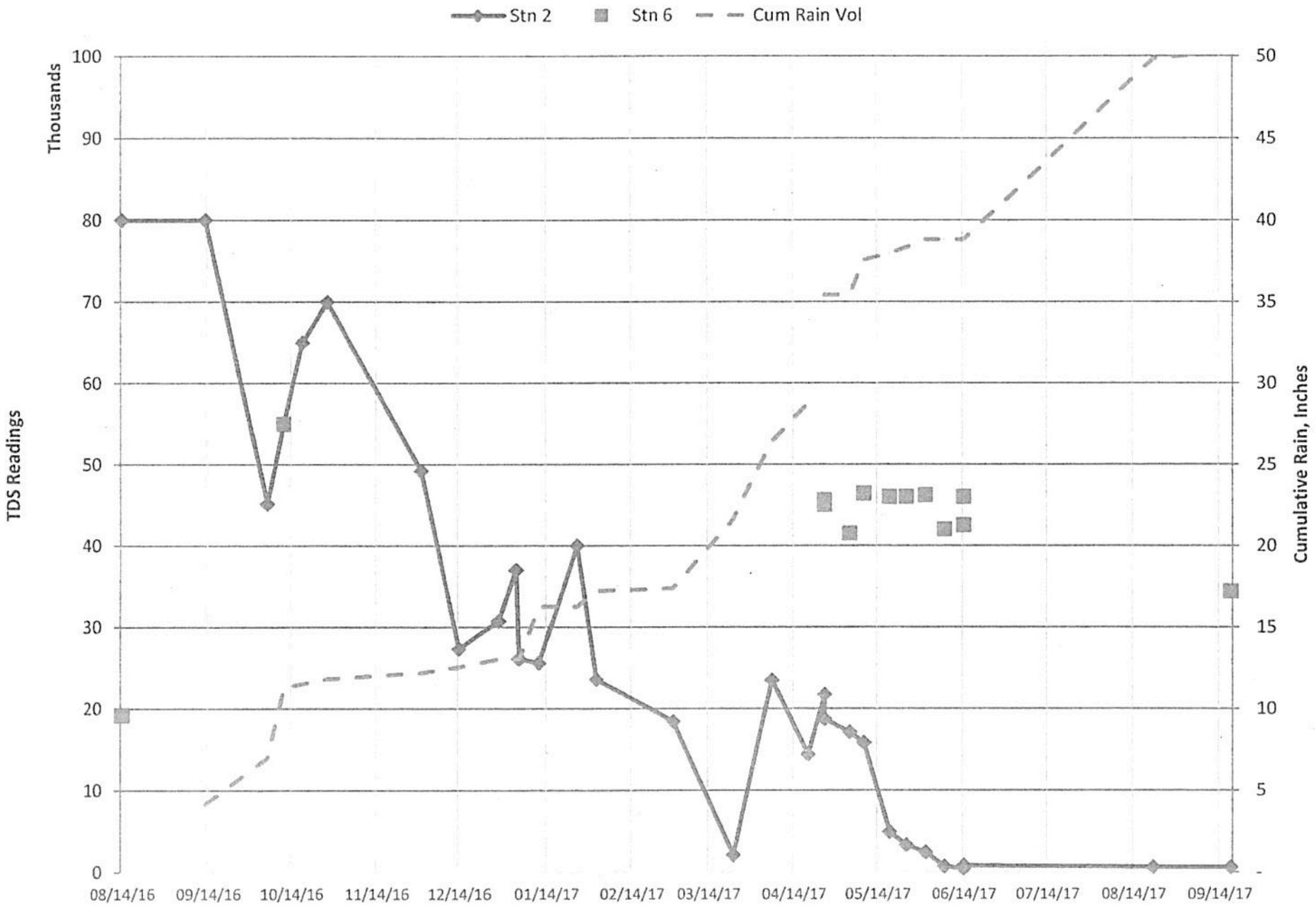



Oil Reservoir Reservoir with Perm. = 50 md.
pressure at distance from injector
% of pressure drop
1,500
1,400
1,300
1,200
1,100
1,000
900
800
700
600
500
pressure - psi
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
percentage of total pressure drop
1
10
100
1000
distance from injector - ft.


TDS Measurements - MP6B
6B Temp F
6B TDS
All injectors shut-in
Temperature (F)
TDS (mg/L)
120
105
90
75
60
45
30
60,000
50,000
40,000
30,000
20,000
10,000
0
5/26/2017 7:45
5/31/2017 15:45
6/5/2017 23:45
6/11/2017 7:45
6/16/2017 15:45
6/21/2017 23:45
6/27/2017 7:45
7/2/2017 15:45
7/7/2017 23:45
7/13/2017 7:45
7/18/2017 15:45
7/23/2017 23:45
7/29/2017 7:45
8/3/2017 15:45
8/8/2017 23:45
8/14/2017 7:45
8/19/2017 15:45


TDS Measurements - MP6B
06/09/2017 - 06/14/2017
6B Temp F
6B TDS
All injectors shut-in
Temperature (F)
TDS (mg/L)
120
105
90
75
60
50,000
45,000
40,000
35,000
30,000
6/9/2017 0:00
6/9/2017 8:00
6/9/2017 16:00
6/10/2017 0:00
6/10/2017 8:00
6/10/2017 16:00
6/11/2017 0:00
6/11/2017 8:00
6/11/2017 16:00
6/12/2017 0:00
6/12/2017 8:00
6/12/2017 16:00
6/13/2017 0:00
6/13/2017 8:00
6/13/2017 16:00
6/14/2017 0:00
6/14/2017 8:00
6/14/2017 16:00
6/15/2017 0:00

Bird Creek - TDS Readings



William M. Cobb & Associates, Inc.

Exhibit 7

UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY, REGION 6
DALLAS, TEXAS

In the matter of:	§	**Docket No. SDWA-06-2017-1111**
Warren American Oil Company, LLC	§	**RESPONDENT'S ANSWER TO PROPOSED ADMINISTRATIVE ORDER AND REQUEST FOR HEARING**
RESPONDENT	§	

AFFIDAVIT OF JOHN D. BURROUGHS

STATE OF OKLAHOMA)
) ss.
COUNTY OF TULSA)

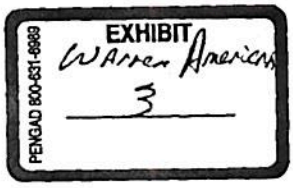
COMES NOW John D. Burroughs, upon his oath and being duly sworn alleges and states as follows:

1. That I am a resident of Tulsa County, Oklahoma, am over the age of 21 years and I have personal knowledge of the facts set forth in this Affidavit.

2. That I am a practicing petroleum engineer with over 37 years of experience in the operation and production of oil and gas properties in Oklahoma.

3. That I currently serve as the Vice-President, Operations, of Warren American Oil Co. ("WAOC").

4. That I, or employees of WAOC working under my supervision and control, have caused salinity readings to be made on "Bird Creek" on September 18, 2017 and on October 4, 2017. The results of these readings are contained on Exhibit "A" attached hereto and made a part hereof. These readings were taken by WAOC after reactivating its disposal wells on the Chapman lease on or about September 8, 2017.



5. That in my capacity as Vice-President of Operations, I retained Associated Wireline Service, Inc. to run injection profiles on Warren American's B-7, B-8 and B-9 disposal wells located on the Chapman lease on September 12, 2017 and October 2, 2017. The results of these injection profiles (attached hereto as Exhibit B-1, B-2 and B-3) show that the fluid going into the subject well is going into the perforations of said wells and into the Mississippi Chat formation. None of the injection profiles indicate that any fluid is channeling upwards behind pike.

6. That in my capacity as Vice-President of Operations, employees of WAOC under my supervision and control, witnessed the failure of a Mechanical Integrity Test (MIT) on the Chapman C-W4 and the Chapman B9 wells. The C-W4 failed its test on November 18, 2014 at which time the well was injecting approximately 600 BWPD with pressure ranging from 20" vacuum to 50 PSIG. Injection was immediately stopped. Subsequent wellwork on the well found a hole in a joint of tubing. After pressure testing the tubing and replacing several joints the packer and tubing was re-run into the well but again the well failed its MIT. The well was temporarily abandoned and fluid level monitoring occurred as per EPA regulations. A decision to plug the well was made in November 2016 and the well was plugged per EPA instructions and witnessed by EPA personnel. The B9 well failed its MIT on August 11, 2015 and injection was discontinued. The tubing was pulled and several leaks in the threads were discovered which were then replaced. The casing was tested from 900' to the surface and held pressure but the well again failed to pass its MIT as the casing pressure slowly bled off more than the allowable amount when the entire casing was pressure tested. The well was temporarily abandoned and fluid level monitoring occurred. The well was then re-worked and passed its MIT in December

2016 and injection began on December 30, 2016. The well is presently taking water at approximately 900 BWPD on a vacuum.

FURTHER AFFIANT SAYETH NOT.

John D. Burroughs

Subscribed and sworn to before me this 10th day of October, 2017.

Notary Public

My Commission Expires:

8/22/20
#11152

CHERYL DIXON
Notary Public
State of Oklahoma
Commission #00011152
Expires: August 22, 2020

L:\1063.38.Affidavit

Bird Creek - TDS Readings - Taken by Warren American Oil

All readings taken with a YSI Salinity Meter

	Sept 18, 2017			October 4, 2017				
	TDS, ppm	Depth	TDS, ppm	Temp, *C	SC, uS	Salinity, PPT	Estimated Depth to Btm
EPA Monitoring Stn 2	501							
EPA Monitor Stn 6	34,360	Bottom	34,800	28.7	53600	33.0	9'
EPA Monitor Stn 6		6" below Surf	1,670	23.3	2570	1.4	
10' Upstream Stn 6		Bottom	34,790	29.6	53500		9'
10' Upstream Stn 6		6" below Surf	1,674	23.2	2578		
20' Upstream Stn 6	32,970	Bottom	33,930	28.8	52400		8'
20' Upstream Stn 6		6" below Surf	1,609	23	2484		
50' Upstream Stn 6	4,444	Bottom	18,890	26.8	30320		7'
50' Upstream Stn 6		6" below Surf	1,640	23	2521		
10' Downstream Stn 6	33,780	Bottom	35,220	29.1	53800		8'
10' Downstream Stn 6	1,519	6" below Surf	1,644	23.2	2534		
20' Downstream Stn 6		Bottom	32,750	24.4	50100		5'
20' Downstream Stn 6		6" below Surf	1,676	22.9	2548		
50' Downstream Stn 6	2,695	Bottom	1,726	22.9	2643		1'
50' Downstream Stn 6		6" below Surf	1,696	22.8	2610		
By low water crossing EPA Monitor Stn	3,263	Bottom	3,742	22.3	5760		
By low water crossing EPA Monitor Stn		6" below surf	3,181	22.4	4900		
By low water crossing - 25' upstream		Bottom	3,690	22.4	5680		
By low water crossing - 25' upstream		6" below surf	3,399	22.2	5290		
By low water crossing - 50' upstream		Bottom	3,412	22.2	5050		
By low water crossing - 50' upstream		6" below surf	3,215	22.2	4930		
By low water crossing - 25' downstream		Bottom	3,820	22.3	5880		
By low water crossing - 25' downstream		6" below Surf	3,170	22.3	4867uS		
By low water crossing - 50' downstream		Bottom	3,516	22.4	5380		
By low water crossing - 50' downstream		6" below Surf	3,152	22.4	4523		

Exhibit "A"

Exhibit "B-1"

ASSOCIATED WIRELINE SERVICE. Inc

580-229-0731 · Box 906 · Healdton, Oklahoma 7343

FILING NO.

COMPANY WARREN AMERICAN OIL CO., LLC

WELL CHAPMAN #B-9

FIELD N/A

COUNTY OSAGE STATE OK.

LOCATION

SEC 1 TWP 27N RGE 7E

TYPE SERVICES:
INJECTION PROFILE

PERMANENT DATUM ELEV.

LOG MEASURED FROM FT ABOVE PERM DATUM

DRILLING MEASURED FROM

ELEV K.B

D.F.

G.L.

DATE	9/12/2017
RUN NO.	ONE
TYPE LOG	INJECTION PROFILE
DEPTH-DRILLER	2586 PBTD
DEPTH-LOGGED	2588
BOTTOM LOGGED INTERVAL	2588
TOP LOGGED INTERVAL	2400
TYPE FLUID IN HOLE	WATER
LEVEL	~~~~
RECORDING SPEED	25'/MIN
TOOL SIZE	1"
RECORDED BY	COX
WITNESSED BY	

INJECTION
PRESSURE
RATE 877 BP
FLUID WATE
ISOTOPE I-13
8 DAY HALF LIFE

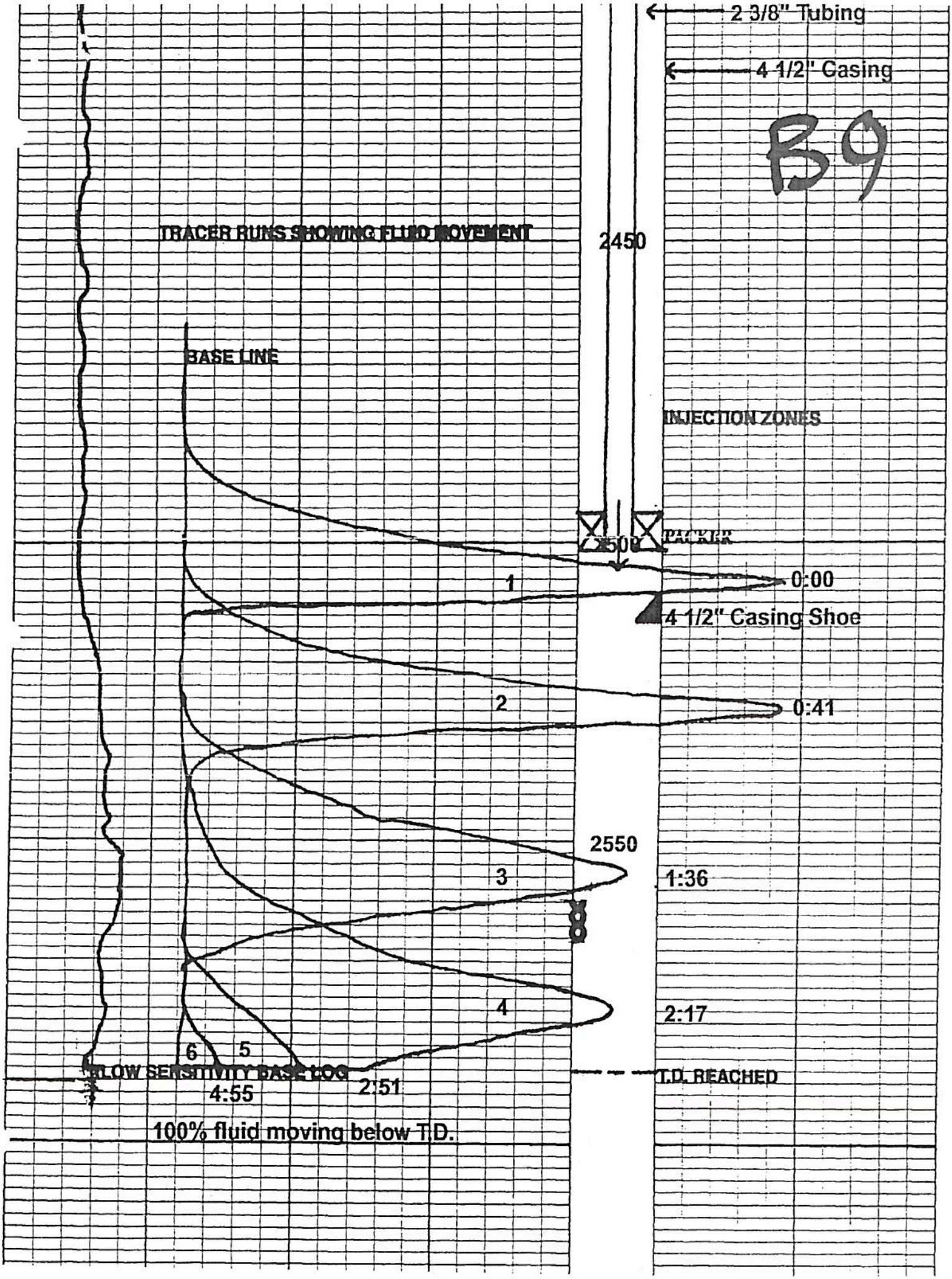
CASING AND TUBING RECORD

SIZE	WGT	TYPE	FROM	T
5 1/2"			0	260
4 1/2"	11.6#		0	251
2 3/8"		S.T.	0	250

PERFORATIONS 2560-67

REMARKS SEE NOTE BELOW.

Exhibit "B-1"


2 3/8" Tubing
4 1/2" Casing
B9
TRACER RUNS SHOWING FLUID MOVEMENT
2450
BASE LINE
INJECTION ZONES
2500
PACKER
1
0:00
4 1/2" Casing Shoe
2
0:41
2550
3
1:36
4
2:17
6
5
FLOW SENSITIVITY BASE LOG
4:55
2:51
T.D. REACHED
100% fluid moving below T.D.

PERCENT OF INPUT

PERCENT PER FOOT

GAMMA LOG

R/A FOLLOW UP TRACER

RADIO ACTIVITY INCREASES

PERFORATIONS FROM CUSTOMERS RECORDS

SLOTS

CHANNEL

WARREN AMERICAN OIL CO., LLC
CHAPMAN #B-9
N/A FIELD
OSAGE CO., OK.
9/12/2017

Sta. Num.	Rate Bbls. Day	Depth. Interval	Percent of Fluid Going Below Base of Interval	Percent of Fluid Lost in Interval	Press P.S.I.
	877	100% FLUID MOVING BELOW T D.			0
	NOTE:	NO LEAKS OR CHANNELS INDICATED UNDER EXISTING			
		INJECTION CONDITIONS.			

Exhibit "B-2"

ASSOCIATED WIRELINE SERVICE. Inc.

580-229-0731 • Box 906 • Healdton. Oklahoma 73438

FILING NO.

COMPANY WARREN AMERICAN OIL CO., LLC

WELL CHAPMAN #B-8

FIELD N/A

COUNTY OSAGE STATE OK.

LOCATION

SEC 1 TWP 27N RGE 7E

TYPE SERVICES: INJECTION PROFILE

PERMANENT DATUM ELEV.

LOG MEASURED FROM FT ABOVE PERM DATUM

DRILLING MEASURED FROM

ELEV K.B

D.F

G.L

DATE	9/12/2017
RUN NO.	ONE
TYPE LOG	INJECTION PROFILE
DEPTH-DRILLER	2575 PBTD
DEPTH-LOGGED	2540
BOTTOM LOGGED INTERVAL	2540
TOP LOGGED INTERVAL	2350
TYPE FLUID IN HOLE	WATER
LEVEL	~~~~
RECORDING SPEED	25'/MIN
TOOL SIZE	1"
RECORDED BY	COX
WITNESSED BY	

INJECTION

PRESSURE 0

RATE 885 BD.

FLUID WATER

ISOTOPE I-131

8 DAY HALF LIFE

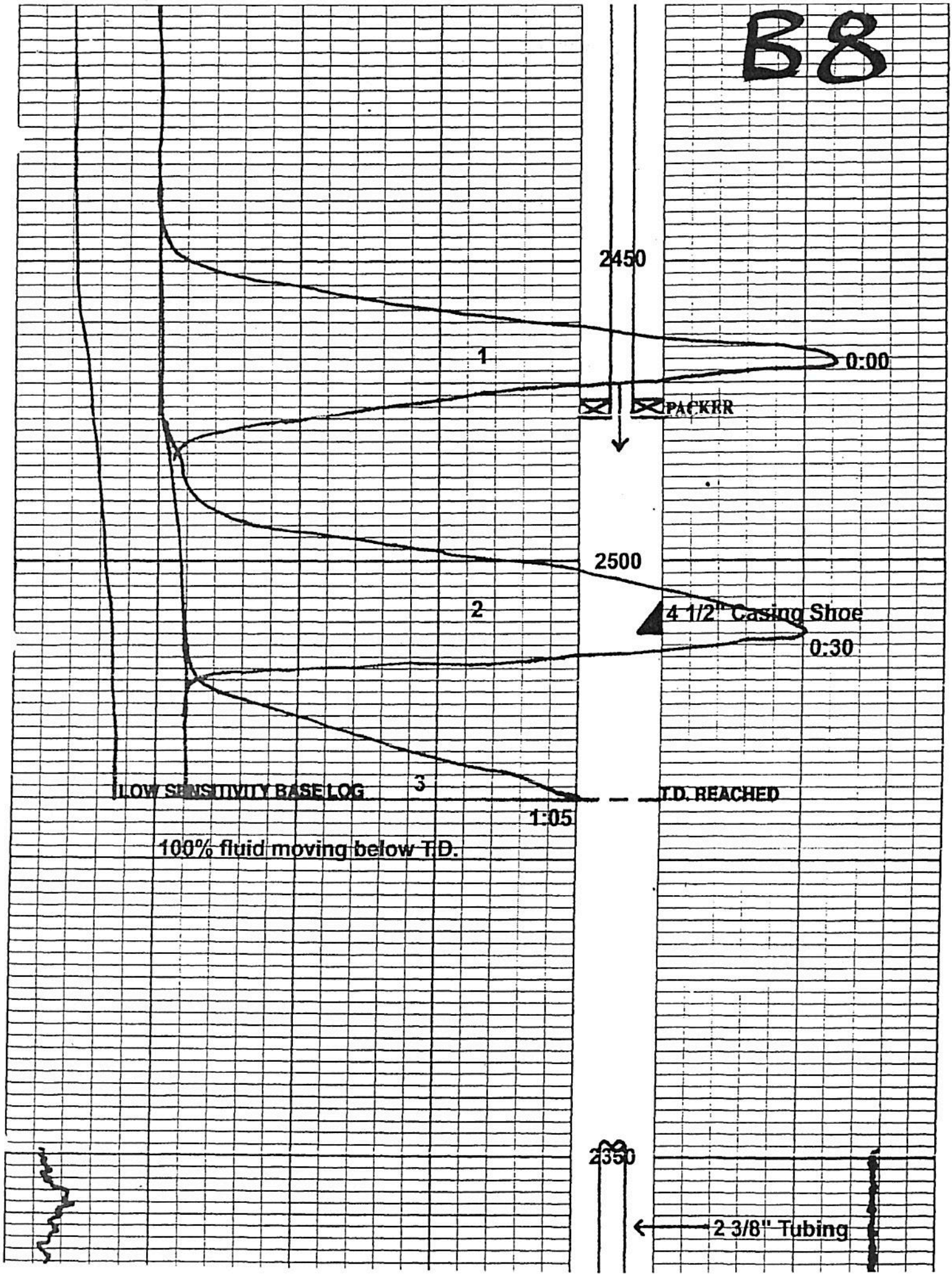
CASING AND TUBING RECORD

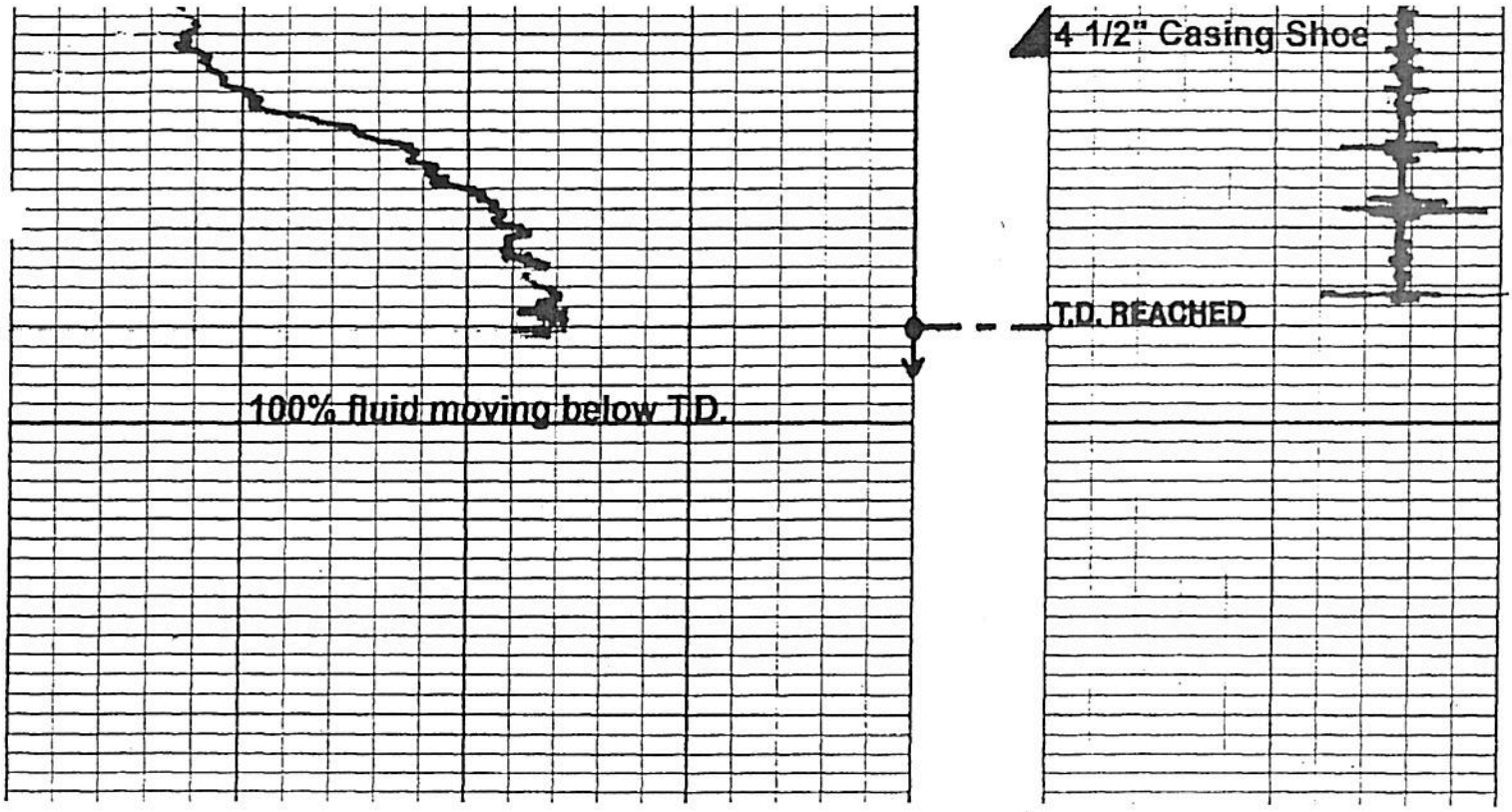
SIZE	WGT	TYPE	FROM	TO
5 1/2"			0	2591
4 1/2"	10.5#		0	2512
2 3/8"		S.T.	0	2476

PERFORATIONS 2540-52

REMARKS SEE NOTE BELOW.

Exhibit "B-2"


B8
2450
1
0:00
PACKER
2500
2
4 1/2" Casing Shoe
0:30
LOW SENSITIVITY BASE LOG
3
T.D. REACHED
1:05
100% fluid moving below T.D.
2350
2 3/8" Tubing



2|5 5|0 7|5 10|0

PERCENT OF INPUT

1|0 2|0 3|0 4|0 5|0

PERCENT PER FOOT

GAMMA LOG

R/A FOLLOW UP TRACER

RADIO ACTIVITY INCREASES

PERFORATIONS FROM CUSTOMERS RECORDS

SLOTS

CHANNEL

WARREN AMERICAN OIL CO., LLC
CHAPMAN #B-8
N/A FIELD
OSAGE CO., OK.
9/12/2017

Sta. Num.	Rate Bbls. Day	Depth. Interval	Percent of Fluid Going Below Base of Interval	Percent of Fluid Lost in Interval	Press P.S.I.
	885	100% FLUID MOVING BELOW T.D.			0
	NOTE:	NO LEAKS OR CHANNELS INDICATED UNDER EXISTING			
		INJECTION CONDITIONS.			

ASSOCIATED WIRELINE SERVICE. Inc

580-229-0731 · Box 906 · Healdton. Oklahoma 7343

Exhibit "B-3"

FILING NO.

COMPANY WARREN AMERICAN OIL CO., LLC

WELL CHAPMAN #B-7

FIELD N/A

COUNTY OSAGE STATE OK.

LOCATION

API #35-113-34148

SEC 1 TWP 27N RGE 7E

TYPE SERVICES:
INJECTION PROFILE

PERMANENT DATUM ELEV.

LOG MEASURED FROM 8 FT ABOVE PERM DATUM

DRILLING MEASURED FROM

ELEV. K.B

D.F

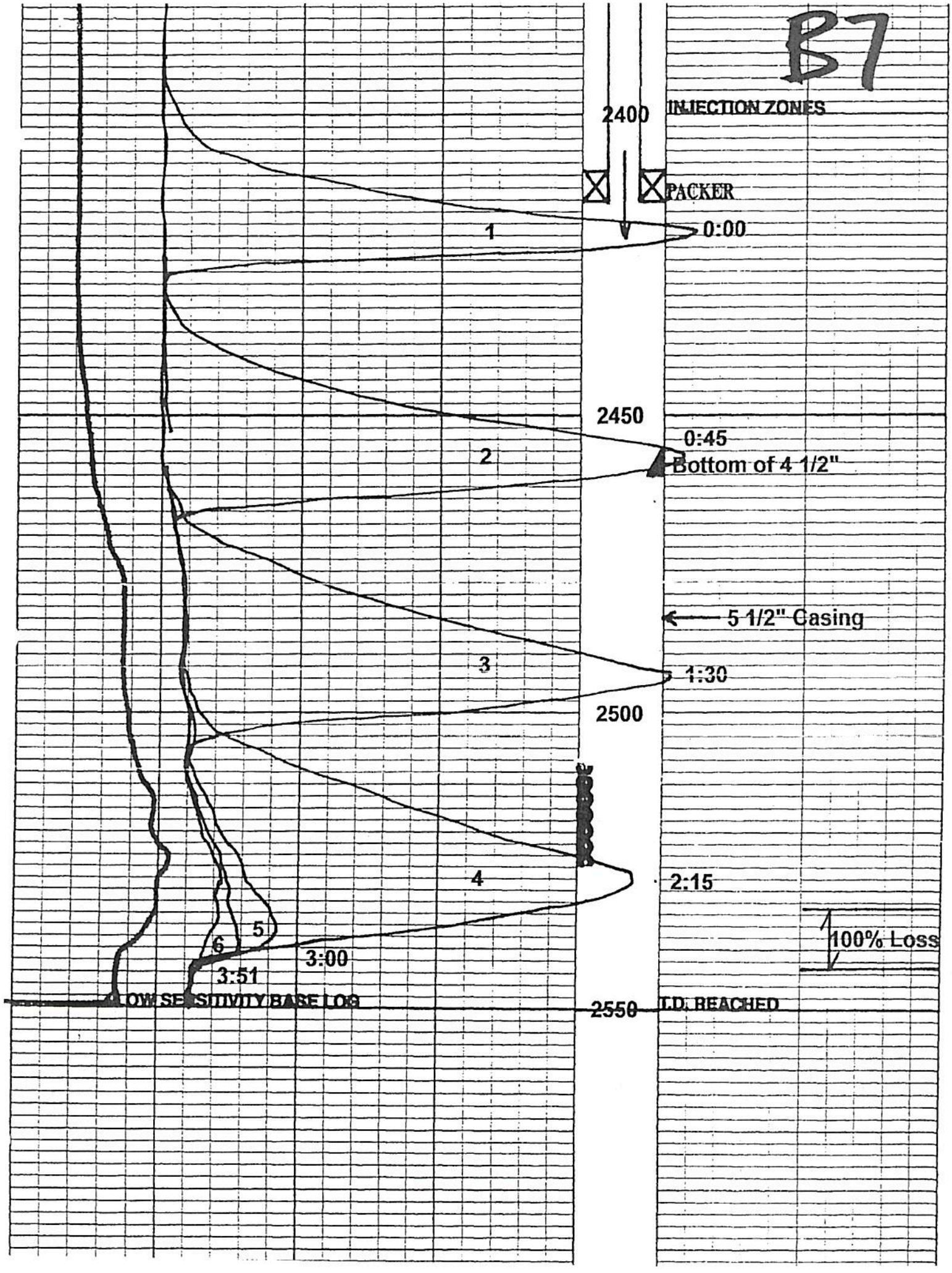
G.L.

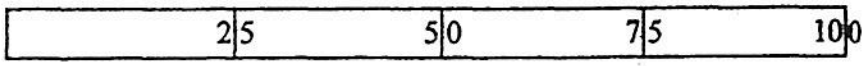
DATE	10/2/2017					INJECTION	
RUN NO.	ONE					PRESSURE	120#
TYPE LOG	INJECTION PROFILE					RATE	1138 BD.
DEPTH-DRILLER	2551					FLUID	WATER
DEPTH-LOGGED	2550					ISOTOPE	I-131
BOTTOM LOGGED INTERVAL	2550					8 DAY HALF LIFE	
TOP LOGGED INTERVAL	2300						
TYPE FLUID IN HOLE	WATER	CASING AND TUBING RECORD					
LEVEL	FULL	SIZE	WGT	TYPE	FROM	TO	
RECORDING SPEED	25'/MIN	5 1/2"	14#		0	2551	
TOOL SIZE	1"	2 3/8"		S.T.	0	2414	
RECORDED BY	COX	4 1/2"			0	2460	
WITNESSED BY							

PERFORATIONS 2509-26

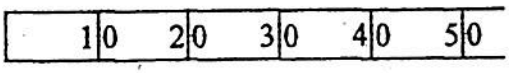
REMARKS: SEE NOTE BELOW.

Exhibit "B-3"


B7
2400
INJECTION ZONES
PACKER
1
0:00
2450
0:45
2
Bottom of 4 1/2"
5 1/2" Casing
3
1:30
2500
4
2:15
100% Loss
5
6
3:00
3:51
LOW SENSITIVITY BASE LOG
2550
T.D. REACHED



PERCENT OF INPUT



PERCENT PER FOOT

_____ GAMMA LOG

- - - - - - - - - R/A FOLLOW UP TRACER

→ RADIO ACTIVITY INCREASES

PERFORATIONS FROM CUSTOMERS RECORDS

SLOTS

CHANNEL

WARREN AMERICAN OIL CO., LLC
CHAPMAN #B-7
N/A FIELD
OSAGE CO., OK.
10/2/2017

Sta. Num.	Rate Bbls. Day	Depth. Interval	Percent of Fluid Going Below Base of Interval	Percent of Fluid Lost in Interval	Press P.S.I.
1	1138	2414-2533	100	0	120
2	"	2533-2543	0	100	"
	NOTE:	SURVEY INDICATES FLUID LOSS BELOW REPORTED			
		PERFORATIONS @ 2533-2543. NO OTHER LEAKS OR			
		CHANNELS INDICATED.			

Comments submitted by
Kerry L. Sublette
Sarkeys Professor of Environmental Engineering
University of Tulsa
October 9, 2017

I have been asked to comment on certain assertions and findings referenced in the EPA Interim Final report titled "Bird Creek Investigation and Injection Well Response Action Plan" dated August 4, 2017. Each of these assertions or findings are given below followed by my comments.

Cation/anion analysis of injected fluids and high TDS waters show a match with the Mississippi Chat Formation (which is used for both oil production and an injection dispersal zone).

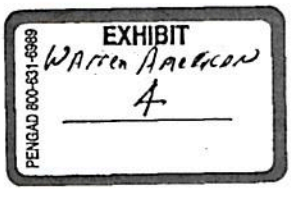
Stiff diagrams as visual representations of water composition are ambiguous when strongly dominated by one cation/anion pair such as Na^+ and Cl^-. Stiff diagrams can readily demonstrate that fresh water has been impacted with a produced water. It is much more difficult to demonstrate that fresh water has been impacted by a particular produced water. Definitive identification of a particular produced water requires analysis of minor components (As, Se, Cr, radioisotopes, etc) and/or isotopic analysis of $\delta^{18}O$, $\delta^{2}H$, and $^{87/86}Sr$. Isotopic analysis is the current state of the art for forensic analysis of produced water impacts. Thus with the available data it can concluded that the Bird Creek tributary was impacted by produced water but the source of that water remains unknown.

Surface water concentrations at the originally reported location (Monitoring Station 2, MS2) have declined steadily and significantly since the Jireh Resources Well 18 (OS6320) was repaired in September 2016 following an MIT failure.

Further declines at the original location (MS2) also occurred immediately after the shut-in of the Novy/Greyhorse disposal well (S5258) due to MIT failure.

High TDS remains at MS6, ½ mile downstream of the original location.

In the absence of significant turbulence introduction of saline waters into fresh water streams or rivers produces a stratified condition with the denser saline waters near the bottom and the fresh water above. If the depth of the stream is uniform the saline waters and the fresh water will flow more or less together in a stratified flow. If the stratified flow encounters a deep pool the denser saline waters will accumulated in the pools. Under ordinary flow conditions transport of salts out of the deeper layers of these pools occurs through diffusion and convective currents that operate near the boundary of the saline waters and fresh water in what can be considered a mixing or transition zone. Under normal flow conditions these mechanism will only slowly



transport salts downstream. Therefore, it has been observed that these stratified pools are often persistent over a long period of time. It is also well established that significant transport of salts out of a stratified pool requires turbulent mixing of the pools to scour saline waters out of the pool to mix with fresh water to be transported downstream. This type of turbulence results from significant rain events. The efficiency of any rain event to scour salts from the pools depends on the rain intensity, the depth of the pool and the geometry of the pool especially the slope of the downgradient wall of the pool. Following such an event it is not uncommon for salts transported downstream to collect in another pool and reform stratified layers of water based on density. Therefore, following large rain events significant fractions of the salts can be transported pool to pool. Cumulative rainfall is far less significant in determining salt transport from these pools.

Another consequence of the formation and persistence of these stratified pools is the formation of a temperature gradient where higher temperatures are measured in the dense saline layer at the bottom of the pool. Solar infrared radiation is absorbed by the bottom of the pool which heats the saline layer. The fresh water above acts as an insulator slowing the dissipation of the heat vertically. There are many examples of natural lakes of various depths, for example, with saline inputs that have resulted in stratified layers based on salt concentration and density where the dense saline layers are heated by the sun relative to the fresh water above.

Two pools in the tributary to Bird Creek were referenced extensively in the cited referenced interim final report, the pool at MS2 and the much deeper pool at MS6. The salinity and temperature data collected to date are consistent with a single release of produced water at or near MS2 in August 2016. All observations of increased or persistent salinity and elevated deep pool temperatures downstream of MS2 can be explained by stratified flow and pool to pool transport of salts as described above. Specifically the steady decline in bottom TDS in MS2 is consistent with the repeated scouring during significant rain events such as those shown below based on Foraker mesonet daily rainfall totals. Only rain events exceeding 1 inch are shown.

Date	Rainfall (in)
September 9, 2016	1.75
January 15, 2017	1.89
March 29, 2017	1.35
April 16, 2017	2.37
April 17, 2017	1.83
April 21, 2017	1.27
April 25. 2017	1.00
April 29, 2017	3.78
May 3, 2017	1.88
May 11, 2017	1.53
August 5, 2017	3.89
August 6, 2017	1.64
September 26, 2017	1.51

Given the expected behavior of stratified saline/fresh water pools during these types of rain events and the turbulence they would have created it is no surprise that the TDS in the pool at MS2 has decreased over this time period. Further the TDS in the pool at MS6 would be expected to increase and then decrease over the same time interval as has been observed. In the intervening periods between large rain events when rainfalls were low any salt-laden pools like that at MS6 would stratify and solar heating of the dense saline layer would be evident. In summary, with a reasonable degree of scientific certainty this is expected behavior consistent with a single discharge event in August 2016 at or near MS2. The TDS data alone cannot prove a cause-effect relationship between the TDS in the tributary and either the repair of the Jireh well in September 2016 or the shut in of the Novy/Greyhorse well on May 9, 2017 (note the large rain event two days later).

Monitoring at some locations indicates that despite repairs to the Jireh Well 18W (OS6320) and shut-in (termination) of the Novy/Grayhorse well, injection operations appeared to affect in-stream water quality (TDS) before and after the coordinated shut-in event, but amplitude (degree of variability) of short term concentration fluctuations at some stations diminished during the shut-in period. This indicates ongoing impacts from the injection operations unrelated to the mechanical integrity failures of these two wells.

First of all, the expected pool-to-pool transport of salt in the stratified tributary and the depth of the pool at MS6 fully accounts for the appearance of salt contamination in the pool at MS6 and its long-term persistence as a dense, high-TDS layer in this deep pool. The much greater depth of this pool explains why this pool has not been as completely scoured as the more shallow pool at MS2.

The reference to variability in TDS seems to primarily refer to the difference in variability in TDS measurements at depth in the pool at MS6 prior to and after July 1, 2017. From the plot of TDS vs. time in the EPA report titled "In-Stream Monitoring Project at the Tributary of North Bird Creek Area" it appears that the increase in the amplitude of these variations followed removal of the sensor from the water (note TDS goes to zero) for cleaning, maintenance, or calibration. It is only after replacing the probe does the amplitude of these variations show a significant increase. The field technician could not be sure the sensor was replaced in the same spot. Most importantly the field technician could not be sure that the sensor was replaced at the same depth given the likely slope of the bottom of the pool. If the sensor was placed at a location higher in the dense saline layer closer to the transition zone between the dense saline layer and the fresh water above then the variability in the TDS could possibly be explained by the daily solar heating pattern. The TDS in the transition zone would be expected to be more sensitive to convective currents produced by heating during the day. In other words small variations in TDS were produced daily due to heat-induced differences in density and the resulting small-scale circulation of the water. At night, without solar heating some of these convective currents would be expected to relax.

In summary, the change in the amplitude of the TDS variations occurring immediately after the sensor was removed and replaced makes the cause of the change highly suspect. It is plausible that replacement of the sensor at a different vertical depth resulted in the change.

Recommendations

A major question that the above cited interim final report seeks to address is whether there is ongoing salt input to the Bird Creek tributary. The persistence of a high TDS saline layer in the pool at MS6 seems to be of most concern with regard to this question. As outlined above it is my opinion that all observations to date are consistent with a one-time event resulting in a large influx of produced water (and oil) into the tributary at or near MS2 in August 2016. However, there is a simple experiment that can be conducted to provide further evidence to support either position. The dense saline layer in the pool at MS6 could be pumped out for disposal allowing fresh water to return to the deeper regions of the pool. The TDS of the pool could then be monitored over time. If the TDS increases again then there is an ongoing input to the pool. In my opinion, the pumping and disposal process should be carried out in 2-3 stages. The removal process will result in some vertical mixing with some salt escaping removal in the first effort requiring a 2nd or 3rd trial (after re-stratifying) to fully remove the salt. Also given the age of the dense saline layer it is expected that salts will have diffused into the sediments. The time period between repeated withdrawals will allow the sediments to re-equilibrate with the water.

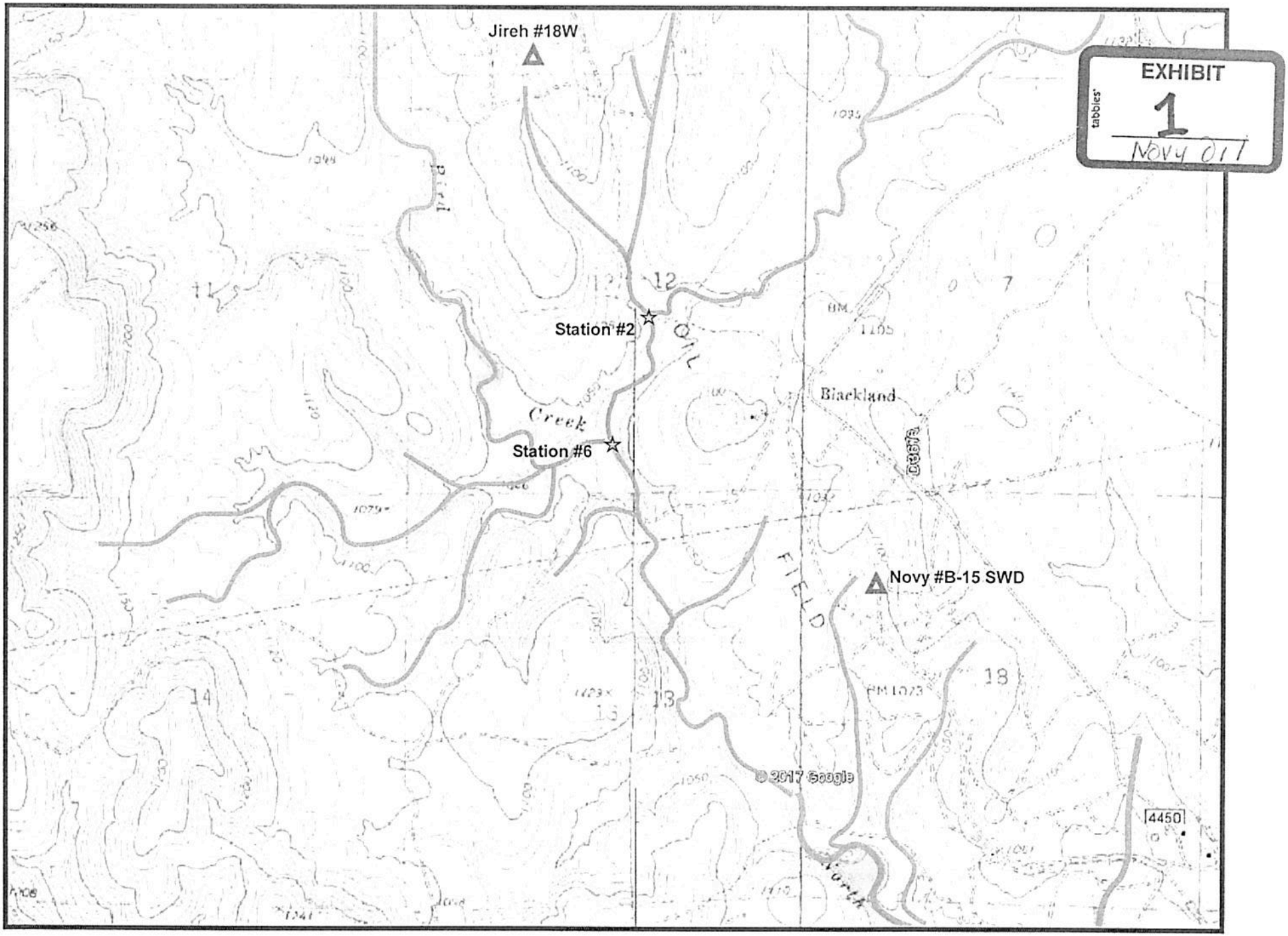


EXHIBIT
1
Novy 017

EXHIBIT
2
tabbies

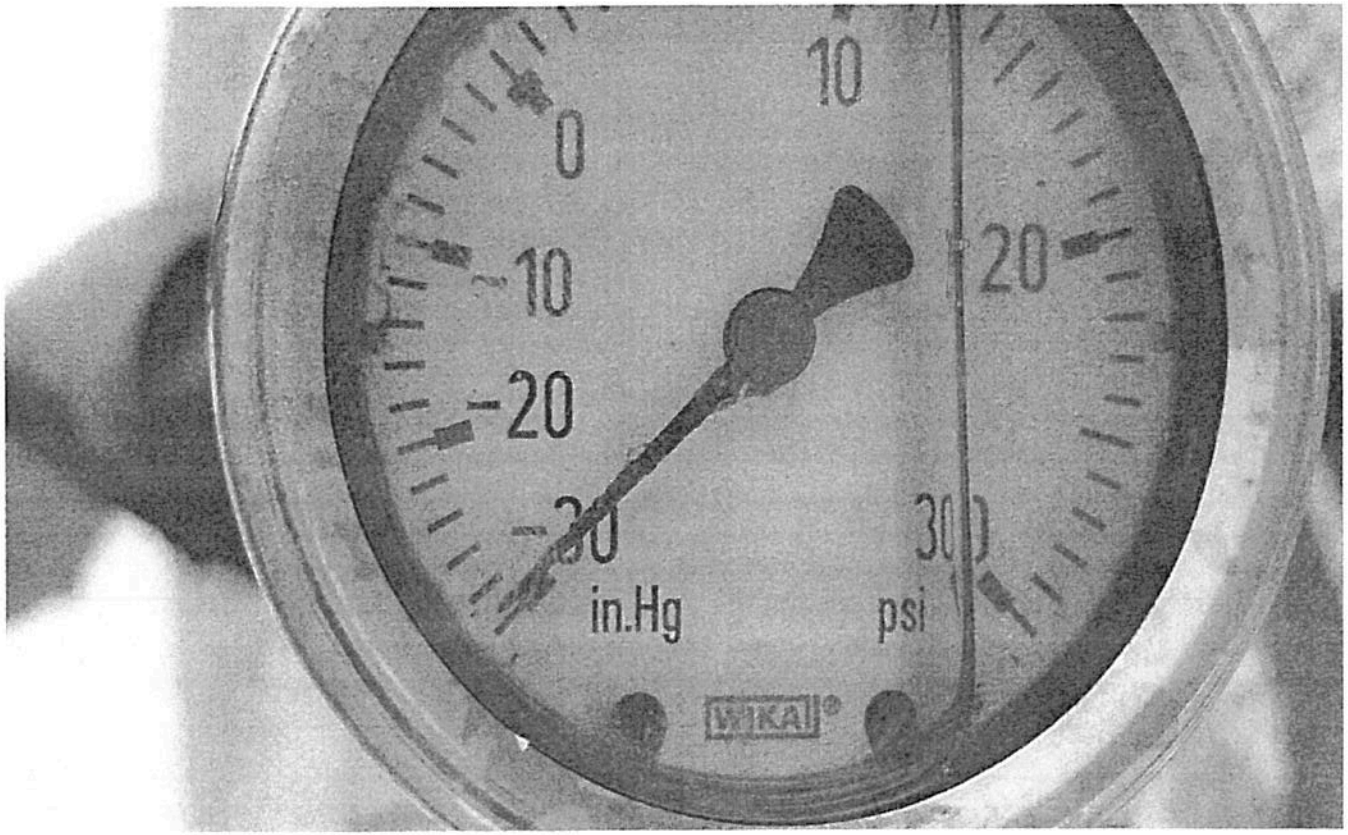
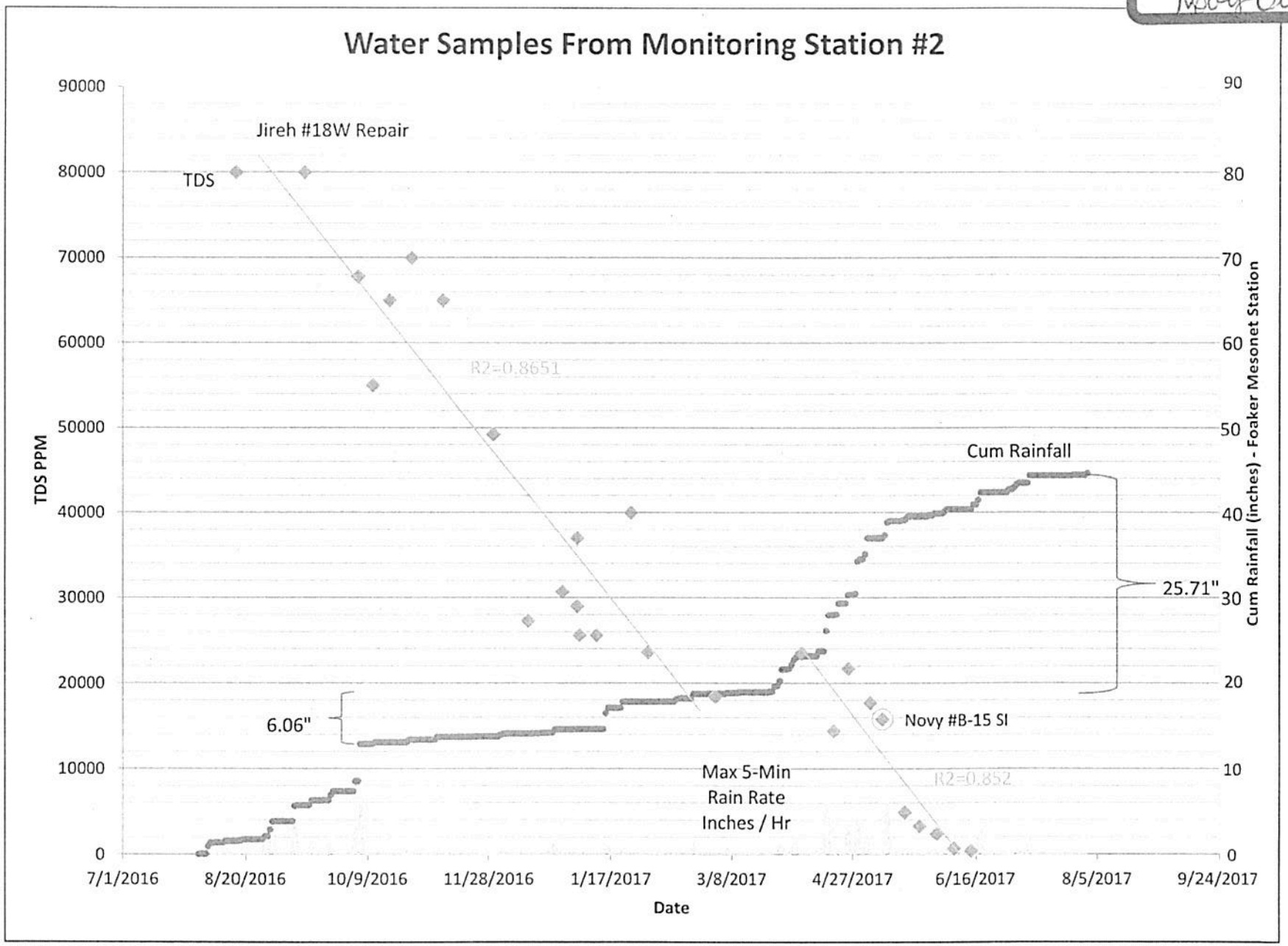


EXHIBIT
tabbies
3
Novy Oil

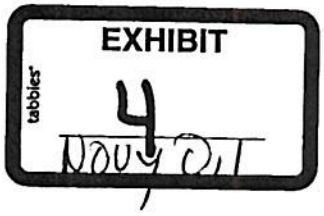


MESONET RAINFALL RECORDS

FORAKER, OKLAHOMA

--

March 23, 2017 to August 1, 2017



2017	3	23	3/23/2017 FORA	0	0	18.89
2017	3	24	3/24/2017 FORA	0.12	0.06	18.95
2017	3	25	3/25/2017 FORA	0.12	0.03	18.98
2017	3	26	3/26/2017 FORA	0.84	0.56	19.54
2017	3	27	3/27/2017 FORA	0.48	0.11	19.65
2017	3	28	3/28/2017 FORA	1.2	0.56	20.21
2017	3	29	3/29/2017 FORA	1.08	1.35	21.56
2017	3	30	3/30/2017 FORA	0.12	0.03	21.59
2017	3	31	3/31/2017 FORA	0	0	21.59
2017	4	1	4/1/2017 FORA	0.12	0.07	21.66
2017	4	2	4/2/2017 FORA	0.48	0.46	22.12
2017	4	3	4/3/2017 FORA	1.32	0.58	22.7
2017	4	4	4/4/2017 FORA	1.2	0.31	23.01
2017	4	5	4/5/2017 FORA	0.36	0.1	23.11
2017	4	6	4/6/2017 FORA	0	0	23.11
2017	4	7	4/7/2017 FORA	0	0	23.11
2017	4	8	4/8/2017 FORA	0	0	23.11
2017	4	9	4/9/2017 FORA	0	0	23.11
2017	4	10	4/10/2017 FORA	0	0	23.11
2017	4	11	4/11/2017 FORA	0	0	23.11
2017	4	12	4/12/2017 FORA	0	0	23.11
2017	4	13	4/13/2017 FORA	1.2	0.58	23.69
2017	4	14	4/14/2017 FORA	0.12	0.02	23.71
2017	4	15	4/15/2017 FORA	0	0	23.71
2017	4	16	4/16/2017 FORA	5.88	2.37	26.08
2017	4	17	4/17/2017 FORA	2.88	1.83	27.91
2017	4	18	4/18/2017 FORA	0.12	0.01	27.92
2017	4	19	4/19/2017 FORA	0	0	27.92
2017	4	20	4/20/2017 FORA	0.24	0.08	28
2017	4	21	4/21/2017 FORA	0.6	1.27	29.27
2017	4	22	4/22/2017 FORA	0.12	0.02	29.29
2017	4	23	4/23/2017 FORA	0	0	29.29
2017	4	24	4/24/2017 FORA	0	0	29.29
2017	4	25	4/25/2017 FORA	2.88	1	30.29
2017	4	26	4/26/2017 FORA	0.12	0.04	30.33
2017	4	27	4/27/2017 FORA	-996	0.02	30.35
2017	4	28	4/28/2017 FORA	0.12	0.07	30.42
2017	4	29	4/29/2017 FORA	3.84	3.78	34.2
2017	4	30	4/30/2017 FORA	0.36	0.29	34.49
2017	5	1	5/1/2017 FORA	0	0	34.49
2017	5	2	5/2/2017 FORA	1.08	0.57	35.06
2017	5	3	5/3/2017 FORA	1.8	1.88	36.94
2017	5	4	5/4/2017 FORA	0	0	36.94
2017	5	5	5/5/2017 FORA	0	0	36.94
2017	5	6	5/6/2017 FORA	0	0	36.94
2017	5	7	5/7/2017 FORA	0	0	36.94
2017	5	8	5/8/2017 FORA	0	0	36.94

2017	5	9	5/9/2017 FORA	0	0	36.94
2017	5	10	5/10/2017 FORA	0.36	0.33	37.27
2017	5	11	5/11/2017 FORA	5.76	1.53	38.8
2017	5	12	5/12/2017 FORA	0.24	0.15	38.95
2017	5	13	5/13/2017 FORA	0	0	38.95
2017	5	14	5/14/2017 FORA	0	0	38.95
2017	5	15	5/15/2017 FORA	0	0	38.95
2017	5	16	5/16/2017 FORA	0	0	38.95
2017	5	17	5/17/2017 FORA	0.36	0.1	39.05
2017	5	18	5/18/2017 FORA	0.12	0.03	39.08
2017	5	19	5/19/2017 FORA	0.72	0.38	39.46
2017	5	20	5/20/2017 FORA	0.12	0.03	39.49
2017	5	21	5/21/2017 FORA	0	0	39.49
2017	5	22	5/22/2017 FORA	0.12	0.01	39.5
2017	5	23	5/23/2017 FORA	0	0	39.5
2017	5	24	5/24/2017 FORA	0	0	39.5
2017	5	25	5/25/2017 FORA	0	0	39.5
2017	5	26	5/26/2017 FORA	0	0	39.5
2017	5	27	5/27/2017 FORA	0	0	39.5
2017	5	28	5/28/2017 FORA	0.72	0.13	39.63
2017	5	29	5/29/2017 FORA	0	0	39.63
2017	5	30	5/30/2017 FORA	0.36	0.22	39.85
2017	5	31	5/31/2017 FORA	0	0	39.85
2017	6	1	6/1/2017 FORA	0	0	39.85
2017	6	2	6/2/2017 FORA	0	0	39.85
2017	6	3	6/3/2017 FORA	0.6	0.23	40.08
2017	6	4	6/4/2017 FORA	0.84	0.26	40.34
2017	6	5	6/5/2017 FORA	0	0	40.34
2017	6	6	6/6/2017 FORA	0	0	40.34
2017	6	7	6/7/2017 FORA	0	0	40.34
2017	6	8	6/8/2017 FORA	0	0	40.34
2017	6	9	6/9/2017 FORA	0	0	40.34
2017	6	10	6/10/2017 FORA	0	0	40.34
2017	6	11	6/11/2017 FORA	0	0	40.34
2017	6	12	6/12/2017 FORA	0	0	40.34
2017	6	13	6/13/2017 FORA	0	0	40.34
2017	6	14	6/14/2017 FORA	0	0	40.34
2017	6	15	6/15/2017 FORA	1.08	0.54	40.88
2017	6	16	6/16/2017 FORA	0	0	40.88
2017	6	17	6/17/2017 FORA	2.16	0.55	41.43
2017	6	18	6/18/2017 FORA	2.88	0.89	42.32
2017	6	19	6/19/2017 FORA	0	0	42.32
2017	6	20	6/20/2017 FORA	0	0	42.32
2017	6	21	6/21/2017 FORA	0	0	42.32
2017	6	22	6/22/2017 FORA	0	0	42.32
2017	6	23	6/23/2017 FORA	0	0	42.32
2017	6	24	6/24/2017 FORA	0	0	42.32

2017	6	25	6/25/2017	FORA	0	0	42.32
2017	6	26	6/26/2017	FORA	0	0	42.32
2017	6	27	6/27/2017	FORA	0	0	42.32
2017	6	28	6/28/2017	FORA	0	0	42.32
2017	6	29	6/29/2017	FORA	0	0	42.32
2017	6	30	6/30/2017	FORA	0.36	0.34	42.66
2017	7	1	7/1/2017	FORA	0	0	42.66
2017	7	2	7/2/2017	FORA	0.72	0.25	42.91
2017	7	3	7/3/2017	FORA	0.24	0.32	43.23
2017	7	4	7/4/2017	FORA	0.12	0.19	43.42
2017	7	5	7/5/2017	FORA	0	0	43.42
2017	7	6	7/6/2017	FORA	0	0	43.42
2017	7	7	7/7/2017	FORA	0	0	43.42
2017	7	8	7/8/2017	FORA	1.68	0.9	44.32
2017	7	9	7/9/2017	FORA	0	0	44.32
2017	7	10	7/10/2017	FORA	0	0	44.32
2017	7	11	7/11/2017	FORA	0	0	44.32
2017	7	12	7/12/2017	FORA	0	0	44.32
2017	7	13	7/13/2017	FORA	0	0	44.32
2017	7	14	7/14/2017	FORA	0.12	0.01	44.33
2017	7	15	7/15/2017	FORA	0	0	44.33
2017	7	16	7/16/2017	FORA	0	0	44.33
2017	7	17	7/17/2017	FORA	0	0	44.33
2017	7	18	7/18/2017	FORA	0	0	44.33
2017	7	19	7/19/2017	FORA	0	0	44.33
2017	7	20	7/20/2017	FORA	0	0	44.33
2017	7	21	7/21/2017	FORA	0	0	44.33
2017	7	22	7/22/2017	FORA	0	0	44.33
2017	7	23	7/23/2017	FORA	0	0	44.33
2017	7	24	7/24/2017	FORA	0	0	44.33
2017	7	25	7/25/2017	FORA	0	0	44.33
2017	7	26	7/26/2017	FORA	0.24	0.05	44.38
2017	7	27	7/27/2017	FORA	0.12	0.02	44.4
2017	7	28	7/28/2017	FORA	0	0	44.4
2017	7	29	7/29/2017	FORA	0	0	44.4
2017	7	30	7/30/2017	FORA	0	0	44.4
2017	7	31	7/31/2017	FORA	0	0	44.4
2017	8	1	8/1/2017	FORA	0.24	0.2	44.6