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 MOTION TO RECONSIDER AND WITHDRAW FINAL ORDER**
RESPONDENT	§	

RESPONDENT'S MOTION TO RECONSIDER AND WITHDRAW FINAL ORDER

COMES NOW, Warren American Oil Company, LLC ("Respondent"), through its undersigned counsel, and files its Motion to Reconsider and Withdraw Final Order in the above-captioned matter. In support of this Motion, Respondent states as follows:

BACKGROUND

1. Respondent was served with Proposed Administrative Order ("Proposed Order") in the above-captioned matter dated August 4, 2017, by Complainant, U.S. Environmental Protection Agency ("EPA") Region 6 ("Complainant"). EPA alleged that Respondent is in violation of the Safe Drinking Water Act (SWDA), for allegedly violating 40 CFR § 2912(c), failure to confine injected fluids to the authorized injection zone for Well No. 7B and 8B, and violation of 40 CFR § 2920(d) for Well Number 9B.

2. Respondent filed its Answer to the Proposed Order and Request for Hearing ("Answer") on August 31, 2017, and contested material facts alleged and the appropriateness of the Proposed Order.

3. Respondent requested time to conduct independent discovery and investigation regarding the EPA's allegations.

4. Respondent requested that it be furnished with all data and information the EPA utilized or reviewed in making its determination leading to the issuance of the Proposed Order.

5. Respondent, and the other two operators, expressed concern over the timing of the public hearing and their inability to properly gather and analyze evidence and prepare witnesses in advance of the hearing.

6. In response to Respondent's concerns about the need for additional discovery, on September 14, 2017, the EPA's Regional Judicial Officer stated:

> "This public hearing is not adjudicatory in nature, nor is it a trial. I will not rule on motions, allow for cross examination, provide for prehearing exchanges, or conduct this public hearing in any manner like a traditional trial/hearing. Rather, the statute allows for an opportunity for public comments via a public hearing. **This is that early step in the process and whatever transpires at this public hearing does not foreclose the ability to bring up any current/prior/new facts/arguments/evidence in future discussions with EPA counsel or further adjudicatory/administrative proceedings.**
>
> **If any parties/commenters are still gathering information or waiting on witnesses or experts and that information or those persons are not available for the public hearing, it will not impact your ability to discuss these issues or call witnesses at a later adjudicatory hearing or with EPA counsel in negotiations/discussions."** *See* Exhibit "A" attached (emphasis added).

7. On October 11, 2017, EPA Region 6 administered a public hearing on this matter in Tulsa, Oklahoma.

8. Subsequent to the public hearing, Respondent has continued to gather information and consult with its experts regarding the EPA's allegations. Respondent's experts continue to formulate and refine their opinions regarding the EPA's allegations.

9. After several weeks of negotiations with the landowner on December 5 and 6, 2017, Respondent was allowed access to Monitoring Station #6 in order to vacuum saltwater and

conduct salinity measurements. The data was forwarded to Respondent's expert for further evaluation. *See* Exhibit "B", attached.

10. On December 13, 2017, Respondent measured vertical salinity Monitoring Station #6. *See* Exhibit "C", attached.

11. Respondent, on the advice of its experts, has requested a second (and possibly third) opportunity to vacuum Monitoring Station #6 at Bird Creek in order to further prove that the release of brine water was a one-time event. Respondent's request was denied.

12. On December 19, 2017, Dr. Kerry Sublette issued a letter confirming that all recent observations from the vacuuming operations are consistent with a one-time event resulting in a large input of produced water into the tributary at or near Monitoring Station #2. Dr. Sublette also reiterated his belief that a second (and maybe third), pumping event was recommended. *See* Exhibit "D", attached.

13. On December 21, 2017, the EPA served Respondent with its overview and response to comments.

14. On December 21, 2017, the EPA proceeded with the issuance of the Order as it was proposed, with some non-material revisions.

15. The Final Order was issued without any notice to Respondent that it would not be allowed to submit further evidence. Respondent, therefore, has been denied a reasonable opportunity to defend itself, to further identify flaws in the proposed order, and to attack the sufficiency of the data used to support its conclusions.

16. Contrary to the representations of the EPA's Regional Judicial Officer, Respondent has not been allowed an adjudicatory hearing and has not been allowed to present new facts, studies, reports, and evidence, which would further demonstrate that it has not

violated the Safe Drinking Water Act or violated regulations at 40 C.F.R. §§ 2912(c) and 2920(d). Accordingly, Respondent requests that the EPA reconsider and withdraw its Final Order.

STATEMENT OF REASONS FOR RECONSIDERATION OF THE FINAL ORDER

I. Respondent has been denied its ability to complete its investigation of the EPA's allegations.

The Final Order has been issued prematurely because Respondent was not given proper notice that the Record on this matter was closing. Respondent has been deprived of the opportunity to present evidence and be heard as was represented by the EPA's Regional Judicial Officer, and as required under Section 1423(c)(3)(A) of the Safe Drinking Water Act, 42 U.S.C. § 300h-2(c)(3)(A).

Respondent had expressed its concern to the EPA over the timing of the public hearing and its ability to properly discover and analyze evidence, and to prepare expert witnesses to exonerate itself of the EPA's allegations. In response to those concerns, the EPA's Regional Judicial Officer assured Respondent that it would have the ability to gather information and prepare expert witnesses for a subsequent adjudicatory hearing:

> "This public hearing is not adjudicatory in nature, nor is it a trial. I will not rule on motions, allow for cross examination, provide for prehearing exchanges, or conduct this public hearing in any manner like a traditional trial/hearing. Rather, the statute allows for an opportunity for public comments via a public hearing. **This is that early step in the process and whatever transpires at this public hearing does not foreclose the ability to bring up any current/prior/new facts/arguments/evidence in future discussions with EPA counsel or further adjudicatory/administrative proceedings.**
>
> **If any parties/commenters are still gathering information or waiting on witnesses or experts and that information or those persons are not available for the public hearing, it will not impact your ability to discuss these issues or call witnesses at a later adjudicatory hearing or**

with EPA counsel in negotiations/discussions." *See* Exhibit "A" attached (emphasis added).

In spite of this assurance from the EPA, Respondent was never given notice that the EPA intended to issue its Final Order before an adjudicatory hearing, and before Respondent had the ability to complete its investigation and submit its findings. Respondent has obtained, and continues to obtain, further evidence that the release of brine water was a one-time event and that the EPA's allegations against Respondent are demonstratably incorrect. Respondent's experts continue to refine their opinions regarding the EPA's allegations. The failure of the EPA to allow Respondent to complete its investigation and to present its experts for an adjudicatory hearing is unfair and contrary to the expressed representation of the EPA's Regional Judicial Officer.

As a matter of due process, Respondent should have been provided advance notice that the record on this matter would be closing. Such notice would be expected given the representation of the EPA's Regional Judicial Officer. That is the only way that Respondent's right to a fair opportunity to be heard could have been fulfilled. The public hearing was represented to be an "early step in the process", that would not impact Respondent's "ability to call witnesses at a later adjudicated hearing". *See* Exhibit "A", attached. The representations made by the EPA created a reasonable expectation that Respondent would have an opportunity in the future to present its case, whether informally in discussions with the EPA, or in an adjudicatory hearing, before any final order would be issued. This fundamental lack of a fair opportunity to be heard violates Respondent's due process rights.

II. Recent and continuing evidence confirms that the salinity level at Station #6 is decreasing and that this was a one-time event.

Subsequent to the public hearing, Respondent has continued to gather information and consult with experts regarding the EPA's allegations. After several weeks of negotiations with the landowner on December 5 and 6, 2017, Respondent was allowed access to Monitoring Station #6 in order to vacuum saltwater and conduct salinity measurements. Respondent, on the advice of its experts, has requested a second (and possibly third) opportunity to vacuum Monitoring Station #6 at Bird Creek in order to further prove that the release of brine water was a one-time event. Respondent's request was denied.

Respondent continues to measure salinity at Monitoring Station #6. The readings confirm a gradual decrease of salinity. *See* Exhibit "C", attached. Respondent's experts expect those levels to continue to decrease, further supporting their conclusions in this case.

On December 19, 2017, Dr. Kerry Sublette issued a letter confirming that all observations from the vacuuming operations are consistent with a one-time event resulting in a large input of produced water into the tributary at or near Monitoring Station #2. Dr. Sublette also reiterated his belief that a second (and maybe third), pumping event was highly recommended. Dr. Sublette concluded:

> "In summary, I highly recommend a second pumping event with further pumping of the deepest part of the pool and probing for and pumping isolated depressions or hot spots as described above. Significant further salt removal from the pool will result. I would even go so far as to say that a third event may also be helpful after we have had some periods of heavy rain. As you know I believe that all observations to date are consistent with a one-time event result in a large input of produced water into the tributary at or near monitoring station of #2. Although a lot of that salt has already ended up in the deep pool at monitoring station #6 through normal transport of stratified brine some accumulation of salt in gravel beds and sediments between monitoring station #2 and monitoring station #6 has no doubt occurred. Additional significant rain events will be required to move most of that salt further downstream. Eventually

much of that salt may again accumulate in the pool at monitoring station #6. Although projected accumulation would only be a small fraction of that produced by the original event it could represent an excellent opportunity to remove salt which will be difficult to scour out of the pool naturally." *See* Exhibit "D", attached.

III. Closing the record without allowing Respondent to conclude its investigation prevents Respondent from Demonstrating there is no ongoing pollution.

As one of Respondent's experts intended to point out, the EPA's actions in closing the record in this matter, and thus halting further pumping operations, will result in multiple bad consequences. First, the creek bottom will likely retain high TDS water from the original event. Second, if later detected, some persons with less understanding of the behavior of brine in these types of creeks could erroneously conclude that there is continued input of produced water into the creek. Finally, multiple pumping events will be required to demonstrate once and for all that there is no ongoing contamination and that indeed the TDS concentrations and distributions are consistent with a one-time event. If Respondent is not given permission to conduct these remedial efforts it will have been deprived of the opportunity to prove its innocence and salts remaining in the creek will ultimately move downstream rather than having been removed. *See* Exhibit "E", January 4, 2018 letter form Dr. Kerry Sublette.

IV. Evidence confirms that it is a scientific impossibility that Respondent was/is contributing to overpressuring the Mississippian Chat Reservoir.

The Final Order ignores the evidence submitted by Respondent, including bottom hole injection pressure evidence, that Respondent could not be contributing to overpressuring the Mississippian Chat Formation. Mr. Frank J. Marek's report, submitted at the October 11, 2017 public hearing, provided detailed scientific proof for his conclusion that:

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 above 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 the 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. *See* Exibit "2" to the 10/11/17 Public Hearing Transcript.

The Final Order makes no attempt to interpret the evidence of Respondent independently from the EPA's global allegations and conclusions against the three (3) named operators.

PRAYER FOR RELIEF

WHEREFORE, Respondent prays that the Final Order be withdrawn and that Respondent be given the ability to continue and complete its discovery and investigation regarding the EPA's allegations. Further, Respondent prays that it be allowed an adjudicatory hearing on the proposed order.

Respectfully Submitted,

MCNAMARA, INBODY & PARRISH, PLLC

By: _____

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Attorneys for Respondent

CERTIFICATE OF MAILING

I hereby certify that on this 4th day of January, 2018, RESPONDENT'S MOTION TO RECONSIDER AND WITHDRAW FINAL ORDER was sent to the following persons, in the manners specified.

Original and one copy *via* Federal Express:

Regional Hearing Clerk (6RC-D)
U.S. EPA, Region 6
1445 Ross Avenue, Suite 1200
Dallas Texas 75202-2733

One copy *via* CMRRR and e-mail:

Ms. Ellen Chang-Vaughan (6RC-EW)
U.S. EPA, Region 6
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202-2733
e-mail: Chang-Vaughan.Ellen@epa.gov

_____
Stephen R. McNamara

L::\1063.38.Motion to Reconsider

Brian Inbody

From: Rucki, Thomas <Rucki.Thomas@epa.gov>
Sent: Thursday, September 14, 2017 2:53 PM
To: John Randolph; jhtucker@rhodesokla.com; Stephen McNamara
Cc: Chang-Vaughan, Ellen; Vaughn, Lorena; David House (david@dwhouse.net); 'Lanny Woods' (lannywoods@jirehresourcesllc.com); Stephen McNamara; Brian Inbody; Robert Winter
Subject: SDWA 06-2017-1110, SDWA 06-2017-1111, SDWA 06-2017-1112 - hearing schedule

Good afternoon. It appears there is some confusion regarding the nature and scope of the coming public hearing, so please let me clarify what I intended to convey via my proposed telephone conference. In this matter, I am simply acting as the neutral presiding officer for a public hearing. I am present at the public hearing to allow for the orderly flow of comments/evidence presentation. Each party involved in the case, as well as any public commenters, is afforded an opportunity to present during the hearing - I am otherwise not involved in the matter after the hearing.

This public hearing is not adjudicatory in nature, nor is it a trial. I will not rule on motions, allow for cross examination, provide for prehearing exchanges, or conduct this public hearing in any manner like a traditional trial/hearing. Rather, the statute allows for an opportunity for public comments via a public hearing. This is that early step in the process and whatever transpires at this public hearing does not foreclose the ability to bring up any current/prior/new facts/arguments/evidence in future discussions with EPA counsel or further adjudicatory/administrative proceedings.

If any parties/commenters are still gathering information or waiting on witnesses or experts and that information or those persons are not available for the public hearing, it will not impact your ability to discuss these issues or call witnesses at a later adjudicatory hearing or with EPA counsel in negotiations/discussions. Furthermore, I will not make a decision when the hearing is over – I do not have that authority in this matter. Instead, I will forward the hearing transcript to the decision maker.

Again, this is a public hearing, where I will gather information and nothing more – this hearing was requested and is allowed per the statute and that opportunity will now occur. With that said, below is the schedule for the public hearing, which will occur on October 11, 2017, in Tulsa, Oklahoma. Please note that you need not attend this public hearing and that decision to not attend will not have any impact on your position/standing in this case - positive or negative. If you do choose to attend, however, each party will be allowed 1.5 hours to present, as set forth below. If you do not need the allocated 1.5 hours, please provide as such and I can adjust the schedule accordingly. If you are unable to attend, you can always submit any documents or evidence to EPA counsel.

Please let me know whether or not you plan to attend and participate in the public hearing.

All further communications in this manner should be directed to EPA counsel in this matter, unless there are questions or responses related only to the public hearing procedures, location, or similar public hearing matters (such as informing whether or not you will attend).

Tulsa County Courthouse
500 S. Denver Avenue
Room 119
Tulsa, Oklahoma 74103-3844

10:15-11:45: Jireh Resources, LLC
11:45-12:45: lunch
12:45-2:15: Warren American Oil Company, LLC

2:15-3:45: Novy Oil and Gas, Inc.
3:45-4:45: public comments

Regards,

Tom Rucki
Regional Judicial Officer
Senior Assistant Regional Counsel
Office of Regional Counsel (6RC-EC)
U.S. EPA - Region VI
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202
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EPA Site 6

12/05/2017

Initial measurements

3ft. S of EPA monitor 34.31 g/L TDS

10ft. S of EPA monitor 34.90 g/L TDS

20ft. S of EPA monitor 3750 **mg/L** TDS

3ft. N of EPA monitor 34.52 g/L TDS

10ft. N of EPA monitor 32.05 g/L TDS

20ft. N of EPA monitor 34.30 g/L TDS

30ft. N of EPA monitor 23.5 g/L TDS

40ft. N of EPA monitor 5.87 g/L TDS

50ft. N of EPA monitor 4200 **mg/L** TDS

Suction hose located 8 ft. South of EPA monitor, start pumping at 9:05 a.m.

Discharge readings:

9:05 35.00 g/L TDS

9:15 36.00 g/L TDS

9:25 36.50 g/L TDS

9:35 36.50 g/L TDS

9:50 37.00 g/L TDS

10:20 24.00 g/L TDS

10:50 16.00 g/L TDS

Moved suction hose 4ft. north, suction now located 4ft. south of EPA monitor. TDS meter reading at 34.00 g/L on bottom at suction intake.

Discharge readings:

11:00 16.00 g/L TDS

11:30 12.00 g/L TDS -TDS meter reading at 31.00 g/L TDS on bottom at suction intake.

11:45 11.00 g/L TDS

12:15 9.7 g/L TDS

2:00 6.0 g/L TDS

3:30 4.1 g/L TDS

4:00 Move to south end of pool, 2300 mg/L TDS (best we could find) begin flush to frac tank.

4:15 Shutdown pump, disconnect and drain line into creek.

12/06/2017

EPA Kent Sanborn takes initial TDS readings. Readings taken in an area that extends approximately 10ft. south of EPA monitoring station to approximately 20ft. north of EPA monitoring station. Area of high TDS concentration measures approximately 8ft east to west. Area of high TDS concentration measures approximately 30ft by 8ft by 18" deep. Kent performs initial profile for depth of high TDS concentration. TDS ranges from 30.00 g/L TDS to 35.00 g/L TDS. With little rainfall in the area over the last 30 days water was very clear, you can stand on the high west bank of the creek and see the bottom of the pool, you can see the deep section where the higher TDS water is accumulating.

Suction hose located where EPA monitor had been previously, new suction intake in use. (Ensuring we are pulling water from bottom ½" of water column)

Start pump at 8:45

Discharge readings:

8:45 33.0 g/L TDS

9:00 36.5 g/L TDS

9:20 16.00 g/L TDS

9:25 5.0 g/L TDS

9:30 Suction moving to target areas of higher TDS. Using boat and EPA meter to identify higher concentration areas, we are able to see the suction being set down within inches of the TDS meter. Identifying TDS that ranges from 17.0 g/L to 30.00 g/L, drop suction into those areas, TDS falls to less than 10.0 g/L in first 10 seconds of pumping, below 5.0 TDS within 30 seconds total pumping time. The last 10 stations we pumped using this method, TDS would range from 17.0 g/L to 22.0 g/L, suction would be set into the area and TDS would drop to 4.0 g/L in 5 to 10 seconds.

Minutes before 10:00 a.m. EPA Kent recommends we shut down for an hour and see if the column of high TDS water re-develops. Shutdown pump approximately 10:10.

Doug Norton visits the location approximately 10:30. Discussion between EPA and Bass Bros on progress that has/hasn't been made.

12:15 Measured depth at approximately 5.5ft at deepest point in pool. Measured for TDS profile, probe laying on bottom @ 34.00 g/L TDS, pull up less than ½" end of probe still touching bottom but actual measurement being taken approximately ½' off bottom TDS drops to 7.0 g/L TDS, move probe up ½" again TDS reads 3.3 g/L.

C

Bird Creek – Station 6 – Volume

Pool is 30' Long x 8' Wide x 5.5' Deep = 1320 Ft3 = 235 Bbls

Estimation of High Salinity volume
Pumping at 70 Bbl/Hour

Day 1 Dec 5th	TDS Reading, mg/L	Estimated Vol of 35K Wtr
Start Pumping @ 9:05	35K	
@10:15	35K	82 Bbl
From 10:20 – 10:50	20K	20 Bbl
From 11:00 - 12:15	13K	32 Bbl
From 2:00 – 4:00	4K	16 Bbl
	Total	150 Bbl

Estimate 150 Bbls of 35K wtr is approximately 3-1/2' deep in the pool

Day 2 – Dec 6th		
8:45 – 9:00	35K	17.5 Bbl
9:00 – 9:20	26K	17.2 Bbl
		35 Bbl

Estimate 35 Bbls is approximately 10" deep
Actual measurement showed 35K salinity at 18" from bottom (based on EPA's Kent Sanborn measurement prior to starting pumping on 2nd Day)
Pumped total of 550 Bbls of water over the 2 day period.

One Week Later – Dec 13th

Measurements taken showed high salinity water (approximately 35K TDS) was a depth from the bottom of the creek to anywhere from 4" to 8" off bottom. Then the salinity was decreasing rapidly as you went to the surface where it was generally around 1,000 mg/L TDS. The total amount of high salinity water decreased.

CONCLUSION: The pumping operation was successful in reducing the total volume of salt water at Station 6. Although it did not completely remove all of the high salinity salt water it did reduce the amount of salt water at this location. It is not unusual in a brine spill for it to take numerous pumping operations to remove the salt water as salt that has saturated gravel and aggregate leaches back into fresher water.

EPA	Depth	From Btm		8'S 6'W SW of EPA	Depth	6' N of EPA	Depth
38.7	5'10"	0		7.89	4'9"	38.35	5'10"
35	up 2"	2		6.43	up 2"	37.97	up 2"
31.5	up 2"	4		6.28	up 2"	34.1	up 2"
17	up 2"	6		3850	up 2"	19.75	up 2"
10.5	up 2"	8		3333	up 12"	10.75	up 2"
5.65	up 2"	10		2906	up 12"	7.75	up 2"
4.4	up 2"	12		2571	up 12"	6.53	up 2"
3285	up 12"	24		1006	surf	5.32	up 2"
2785	up 12"	36				3367	up 12"
1005	surf	70				1037	surf
5' W of EPA				8'S 3'E SE of EPA		6'N 8' W of EPA	
38	5'10"	0		37.3	5'1"	37.2	5' 4"
38.4	up 2"			38.4	up 2"	29.36	up 2"
35.5	up 2"			36.77	up 2"	12.36	up 2"
17.5	up 2"			27.94	up 2"	9.75	up 2"
11.04	up 2"			17.22	up 2"	8.86	up 2"
8.75	up 2"			10.92	up 2"	5.4	up 2"
5.35	up 2"			9.25	up 2"	4010	up 2"
4155	up 2"			7.1	up 2"	4006	up 2"
3208	up 12"			3410	up 12"	3285	up 12"
954	surf			1010	surf	1014	surf
3' E of EPA				18' S of EPA		6'N 5'E of EPA	
36.71	5'7"			3615	3'11"	38.67	5'5"
37.61	up 2"			3372	up 2"	31.44	up 2"
35.85	up 2"			3350	up 2"	13.81	up 2"
19.35	up 2"			3316	up 2"	11.73	up 2"
14.49	up 2"			3245	up 2"	7.64	up 2"
10.65	up 2"			3083	up 2"	6.91	up 2"
8.45	up 2"			3020	up 2"	5.56	up 2"
4278	up 2"			2974	up 2"	3458	up 2"
3275	up 12"			2693	up 12"	3078	up 12"
1050	surf			1003	surf	1125	surf
8' S of EPA				18'S 5'W SW of EPA		16' N of EPA	
37.75	5'11"			3304	3'11"	34.79	5'5"
38.6	up 2"			3298	up 2"	22.89	up 2"
38.88	up 2"			3298	up 2"	10.35	up 2"
37.05	up 2"			3205	up 2"	7.69	up 2"
35.44	up 2"			3061	up 2"	5.21	up 2"
16.7	up 2"			3039	up 2"	4176	up 2"
12.25	up 2"			2994	up 2"	3704	up 2"
10.26	up 2"			2944	up 2"	3333	up 2"
8.67	up 2"			2777	up 2"	3216	up 12"
3579	up 12"			1602	up 12"	1045	surf
1020	surf			985	surf		

16'N 6'W of EPA	Depth			30'N 7'E of EPA	Depth	55'N of EPA	Depth
10.25	4'10"			3517	3'	13.62	4'5"
5.6	up 2"			3480	up 2"	3609	up 2"

3584		up 2"			3352		up 2"	3467	up 2"
3384		up 2"			3240		up 2"	3322	up 2"
3378		up 2"			2995		up 2"	3301	up 2"
3335		up 2"			2977		up 2"	3126	up 2"
3310		up 2"			2943		up 2"	3073	up 2"
3237		up 2"			2891		up 2"	3060	up 2"
2949		up 12"			1864		up 12"	2807	up 12"
1074		surf			1145		surf	1267	surf
16'N 5'E of EPA					40'N of EPA			55'N 6'W of EPA	
11.09		4'11"			5.75		4'8"	12.75	4'4"
9.1		up 2"			5.47		up 2"	4252	up 2"
4476		up 2"			4015		up 2"	3711	up 2"
3731		up 2"			3562		up 2"	3382	up 2"
3369		up 2"			3426		up 2"	3334	up 2"
3365		up 2"			3366		up 2"	3284	up 2"
3352		up 2"			3354		up 2"	3227	up 2"
3330		up 2"			3317		up 2"	3174	up 2"
3034		up 12"			2877		up 12"	2830	up 12"
1114		surf			1058		surf	1115	surf
30' N of EPA					40'N 6'W of EPA			60'N of EPA	
16.72		4'8"			3284		4'2"	32.75	5"1"
10.1		up 2"			3314		up 2"	24.76	up 2"
8.13		up 2"			3314		up 2"	19.55	up 2"
4.82		up 2"			3320		up 2"	16.51	up 2"
3809		up 2"			3291		up 2"	6.19	up 2"
3416		up 2"			3245		up 2"	3732	up 2"
3552		up 2"			3160		up 2"	3303	up 2"
3310		up 2"			3085		up 2"	3289	up 2"
2933		up 12"			2794		up 12"	3046	up 12"
1099		surf			1080		surf	1166	surf
30'N 7'W of EPA					40'N 7'E of EPA			N Bird inflow 335.4mg/L TDS	
3340		4'1"			3289		3'10"	noname trib Inflow 3607 mg/L	
3330		up 2"			3316		up 2"	outflow 1077 mg/L	
3285		up 2"			3294		up 2"	nxt pool S, 2137 mg/L	
3145		up 2"			3016		up 2"		
3107		up 2"			3021		up 2"		
2991		up 2"			2789		up 2"		
2954		up 2"			2771		up 2"		
2854		up 2"			2751		up 2"		
2662		up 12"			1845		up 12"		
1186		surf			1214		surf		

N of EPA		Depth			Loc.		Depth	Loc.	Depth

NW of EPA				Loc.			Loc.		
NE of EPA				Loc.			Loc.		
Loc.				Loc.			Loc.		

D

December 19, 2017

John Burroughs
Vice-President Drilling/Operations
Warren American Oil Co.
6585 S. Yale, Suite 800
Tulsa, OK 74136

John,

Thank you for sharing your data (volumes and average TDS values) from your 12/5-12/6 pumping event at monitoring station #6. By my calculations you removed almost 800 kg of salt from the pool and removed a significant fraction of the high TDS water from the bottom of the pool. I also received your post-pumping monitoring data from 12/14. The dataset is comprehensive with TDS measured over a wide area at two-inch depth intervals at each point. Although significant progress has been made I highly recommend a second pumping event in the near term.

The plot below is a graph of depth vs. TDS using all data from your 12/14 monitoring. Most of the data are represented by the blue points. The red points are from two sites (60 ft N of EPA and 8 ft S, 3 ft E of EPA) which seem to be outliers with respect to the rest of the data in that they show very high TDS concentrations at depths where the TDS concentrations are < 12 g/L everywhere else. I believe that these represent depressions in shallower areas of the stream where some of the original brine transported downstream has collected. There may be more that have gone undetected so far.

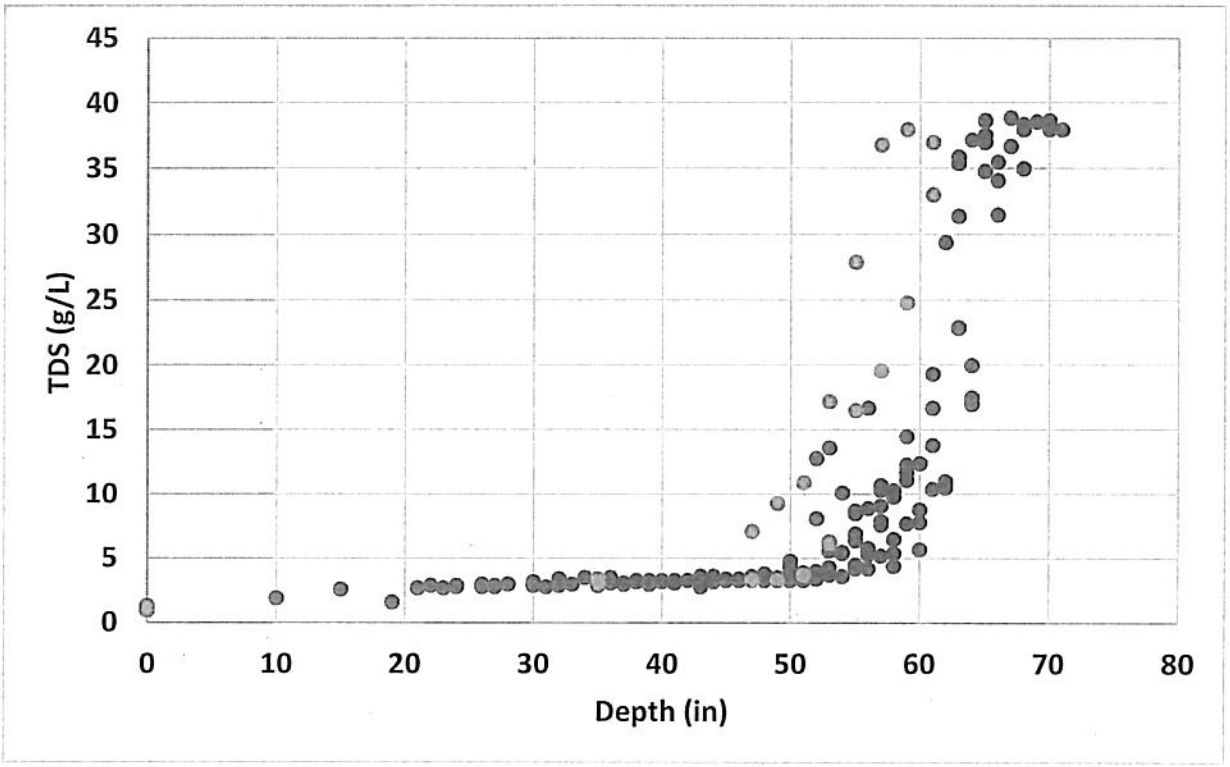
Based on your measurements most of the high TDS water is confined to an area of about 500 ft^2 roughly centered on the EPA monitoring point with the one exception noted above (60 ft N of EPA). As seen in the plot below, ideally removal of about 10 in of water from the bottom of this area would reduce the highest TDS concentrations to about 10-15 g/L. This would require pumping about 75 bbl of water and would remove about 300 kg of salt. Another 10 in (another 75 bbl) would reduce the highest TDS concentrations to about to about 5 g/L removing another 105 kg of salt. Of course, some mixing during pumping will occur so actual pumping requirements will be higher. This calculation does not include the hot spot outside of the main contaminated area (60 ft N of EPA) referenced above or similar hot spots that may exist. Also, pumping from the lowest spot in the most contaminated area may not capture all of the salt in the other outlier spot (8 ft S, 3 ft E of EPA) even though it is in close proximity of the low point. I would suggest that during a second pumping event withdrawal not be limited to the lowest spot but instead coupled to continuous monitoring of TDS concentrations at depth to identify and pump hot spots similar to those described above.

Finally, I have some concern about the gravel you observed during your 12/14 monitoring event outside of the area of the EPA Sonde. My concern is that this gravel may be covering depressions where brine may have collected and as yet has been undetected. The device you had

on the extraction hose during the first pumping event was excellent for pumping close to the bottom. However, during the second pumping event some exploration of the depth of the gravel may be helpful. If depressions are found then a smaller pipe that can be worked into those depressions would be helpful in further removal of salt from the pool.

In summary, I highly recommend a second pumping event with further pumping of the deepest part of the pool and probing for and pumping isolated depressions or hot spots as described above. Significant further salt removal from the pool will result. I would even go so far as to say that a third event may also be helpful after we have had some periods of heavy rain. As you know I believe that all observations to date are consistent with a one-time event resulting in a large input of produced water into the tributary at or near monitoring station of #2. Although a lot of that salt has already ended up in the deep pool at monitoring station #6 through normal transport of stratified brine some accumulation of salt in gravel beds and sediments between monitoring station #2 and monitoring station #6 has no doubt occurred. Additional significant rain events will be required to move most of that salt further downstream. Eventually much of that salt may again accumulate in the pool at monitoring station #6. Although projected accumulation would only be a small fraction of that produced by the original event it could represent an excellent opportunity to remove salt which will be difficult to scour out of the pool naturally.

Kerry Sublette
Sublette Consulting, Inc.
Sarkeys Professor of Environmental Engineering
University of Tulsa


45
40
35
30
25
20
15
10
5
0
TDS (g/L)
0
10
20
30
40
50
60
70
80
Depth (in)

January 4, 2018

John Burroughs
Vice-President Drilling/Operations
Warren American Oil Co.
6585 S. Yale, Suite 800
Tulsa, OK 74136

John,

I would like support my letter of December 19, 2017 with one additional concern. As I noted in that letter I believe that all observations to date in this creek are consistent with a one-time release of produced water into the creek at or near monitoring station #2. However, EPA Region 6 takes the position that there is on-going contamination of produced water to the creek. This is a mystery to me since I know that Kent Sanborn is very familiar with the stratified flow of brine in creeks, knows how it collects in depressions, and has himself overseen numerous cleanup efforts requiring multiple pumping events. Be that as it may, unless and until a pumping protocol similar to what I have suggested in my previous letter is implemented in this creek there will continue to be depressions in the creek bottom which will retain some of the original high TDS water from the original event in the absence of large rain events and sufficient turbulent flow to scour them out. If detected, some persons with less understanding of the behavior of brine in these types of creeks could erroneously conclude that there is continued input of produced water into the creek. I know that you are eager to remove as much salt from the creek as possible to protect waters and ecosystems downstream. Multiple pumping events will be required to accomplish that. Also, multiple pumping events will be required to demonstrate once and for all that there is no ongoing contamination and that indeed the TDS concentrations and distributions are consistent with a one-time event. If you are not given permission to conduct these remedial efforts you will have been deprived of the opportunity to prove this assertion and salts remaining in the creek will ultimately move downstream rather than having been removed.

Kerry Sublette
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