EPA United States Environmental Protection Agency

Region 6 Compliance Assurance and Enforcement Division

INSPECTION REPORT

Inspection Date(s):	July 25, 2018 and August 9, 2018		
Media:	Water (CWA)		
Regulatory Program(s)	NPDES – Brine		
Company Name:	**4D Oil and Gas, LLC**		
Facility Name:	***South Cedar Creek***		
Facility Physical Location:	36.796696N, -96.276732W (Sect. 19, T 27N, R 10E)		
(city, state, zip code)	Pawhuska, Oklahoma 74056		
Mailing address:	532 Kihekah		
(city, state, zip code)	Pawhuska, Oklahoma 74056		
County/Parish:	Osage		
Facility Contact:	John Long	Operator: 918-625-7282	
	Dustin Hirrlinger, Production Foreman: 620-330-0213		
FRS Number:	N/A		
Identification/Permit Number:	OKU000871		
Media Number:	N/A		
NAICS:	211111		
SIC:	1311		

Personnel participating in inspection:			
Kent W. Sanborn	EPA Region 6, 6EN-WR	Environmental Engineer	918-557-1615

EPA Lead Inspector Signature/Date	Sanborn, Kent — Digitally signed by Sanborn, Kent DN: cn=Sanborn, Kent, email=Sanborn.Kent@epa.gov Date: 2018.09.04 10:24:04 -05'00'	
	Kent W. Sanborn	Date
Supervisor Signature/Date	GUY TIDMORE — Digitally signed by GUY TIDMORE DN: c=US, o=U.S. Government, ou=USEPA, ou=Staff, cn=GUY TIDMORE, dnQualifier=0000012807 Date: 2018.09.04 12:55:33 -05'00'	9/04/2018
	Guy Tidmore	Date

Section I – INTRODUCTION

PURPOSE OF THE INSPECTION

EPA Region 6 inspector Kent W. Sanborn arrived at the 4D Energy South Cedar Creek lease on a property near Pawhuska, Oklahoma at about 9:00 am on July 25, 2018 for an inspection. The inspection was initiated by a reported discharge of fluids into a nearby creek by Joe Nave of the Bureau of Indian Affairs. There were several company representatives at the site during the inspection. The discharge had reached Elm Creek. I observed that cleanup activities were active at the site during the inspection. The inspection was conducted under the authority of Section 308 of the CWA. The scope of the inspection was to determine if the facility was in compliance with Clean Water Act, including Section 301, and to identify and document discharges of produced wastewater (brine) to waters of the United States.

FACILITY DESCRIPTION

The origination point of discharge was a single fiberglass brine tank and associated secondary containment area. A power interruption caused the tank to flow over into the secondary containment area before flowing to Elm Creek. The tank alarm did not function according to the operator.

Section II – OBSERVATIONS

July 25, 2018

I initially arrived at the 4D Oil and Gas, LLC / South Cedar Creek lease at about 9:00 am on July 25, 2018. Photos 1 and 2 show the source of the brine discharge. The inadequate containment did not hold much of the brine, and it flowed south into the lease road, saturating the entire area (Photo 3). The brine entered a large erosional trench (Photos 4 and 5) and flowed south toward Elm Creek. The brine entered Elm Creek at the location shown in Photo 6. I took a Total Dissolved Solids (TDS) reading of 105,492 milligrams per liter (mg/L) at the location in Photo 7, using a calibrated YSI 30 Pro Conductivity Meter. Elm Creek was observed in Photo 8 south of the entry point, but prior to the first constructed dam. In the creek, I observed white salt staining was present. The first dam south of the discharge entry point was shown in Photo 9. The TDS reading at dam one was 100,470 mg/L (Photo 10). Dam number two, south of the facility where the discharge occurred was shown in Photo 11. The TDS reading at dam two was 61,974 mg/L (Photo 12). I observed numerous dead crayfish and a few dead minnows near the dam two site (Photos 13,14, and 15). Photo 16 showed the third dam constructed south of the discharge entry point of Elm Creek. The TDS reading at dam three was 81,939 mg/L (Photo 17). The creek between dam three and dam four was shown in Photo 18. The TDS reading in the pool shown was 40,056 mg/L (Photo 19). The fourth dam was shown in Photo 20. The TDS reading at that location was 13,294 mg/L (Photo 21). The brine was not flowing southeast past this point because trucks were pumping out and hauling brine from the creek. I observed some seepage under the dam that was constructed at this location, but there was no flow (Photo 22). Elm Creek had been dammed upstream,

or north of the discharge site (Photo 23). The TDS of the drainage and spring water into the pond was 182 mg/L (Photo 24).

August 9, 2018

Photo 25 on the second inspection day, shows the continued discharge of brine fluids from the facility. I observed that some dirt and gravel work had been done to the containment walls, but the contaminated contents inside the berms were not removed (Photo 26). Additionally, some dirt was removed near the trench that received the discharge, but still shows salt staining (Photos 27 and 28). A large portion of the trench was still contaminated and stained with salt (Photo 29). The brine fluids flowed from the seeping berms to the trench and then on to Elm Creek. Elm Creek was shown south of the trench in Photo 30. The TDS reading in the creek was 12,799 mg/L at the location of Photo 30 (Photo 31), as measured with a calibrated YSI 30 Pro Conductivity Meter. Salt staining was still evident farther south in and along the creek (Photos 32 and 33). The TDS reading in the creek near those locations was 5,696 mg/L (Photo 34). Farther south in the creek (Photo 35) the creek had an observed TDS reading of 20,211 mg/L (Photo 36). The remaining dam location (Photo 37) farther south had a TDS reading of 3,217 mg/L (Photo 38). The last observed location south of the discharge entry point was shown in Photo 39. The TDS reading was 6,731 mg/l (Photo 40) at this location. I observed that there was no activity to remove brine from the creek during the inspection.

Section III – AREAS OF CONCERN

Elevated levels of TDS were observed in Elm Creek during the spill, which came from discharged brine fluids from the site. Remedial activities had occurred, but there was evidence of damage to the creek and aquatic life during the inspection, including vegetation along the creek, a few minnows, and many crayfish. The secondary containment area showed seepage and was continuing to discharge brine fluids from the facility to Elm Creek. A large amount of salt staining was evident in the containment area, along the flow path to the trench, in the trench, and in Elm Creek as well.

Section IV – FOLLOW UP

A follow up inspection will be conducted as needed.

Section V – LIST OF APPENDICES

Appendix 1 – Photo Log – 24 photos taken July 25, 2018 and 16 photos taken August 9, 2018.

Appendix 1

Photographic Log (24 photos)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Photograph Log

Photo No. 1

36.796696N, -96.276732W (Sect. 19, T 27N, R 10E)		
City: Pawhuska	County: Osage	State: Oklahoma

Photo File Name: Photo 1 (IMG_0282.jpg)
Orientation: Northeast
Date of Photo: 07/25/2018
Time of Photo: 10:41 am
Latitude: 36.36.796696N
Longitude: -96.276732W
Photographer: K.W. Sanborn
Description: The discharge originated from this brine tank and pit.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Photograph Log

Photo No. 2

36.796696N, -96.276732W (Sect. 19, T 27N, R 10E)		
City: Pawhuska	County: Osage	State: Oklahoma

Photo File Name: Photo 2 (IMG_0283.jpg)
Orientation: Northeast
Date of Photo: 07/25/2018
Time of Photo: 10:41 am
Latitude: 36.796696N
Longitude: -96.276732W
Photographer: K.W. Sanborn
Description: The brine flowed from the inadequate containment area here. The alarm on the tank did not work according to the operator. There was not a sign at the facility.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Photograph Log

Photo No. 3

36.796696N, -96.276732W (Sect. 19, T 27N, R 10E)		
City: Pawhuska	County: Osage	State: Oklahoma

Photo File Name: Photo 3 (IMG_0284.jpg)
Orientation: South
Date of Photo: 07/25/2018
Time of Photo: 10:41 am
Latitude: 36.796696N
Longitude: -96.276732W
Photographer: K.W. Sanborn
Description: The discharge path flowed south shown in this photo toward an eroded trench, which flowed towards Elm Creek.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Photograph Log

Photo No. 4

36.796696N, -96.276732W (Sect. 19, T 27N, R 10E)		
City: Pawhuska	County: Osage	State: Oklahoma

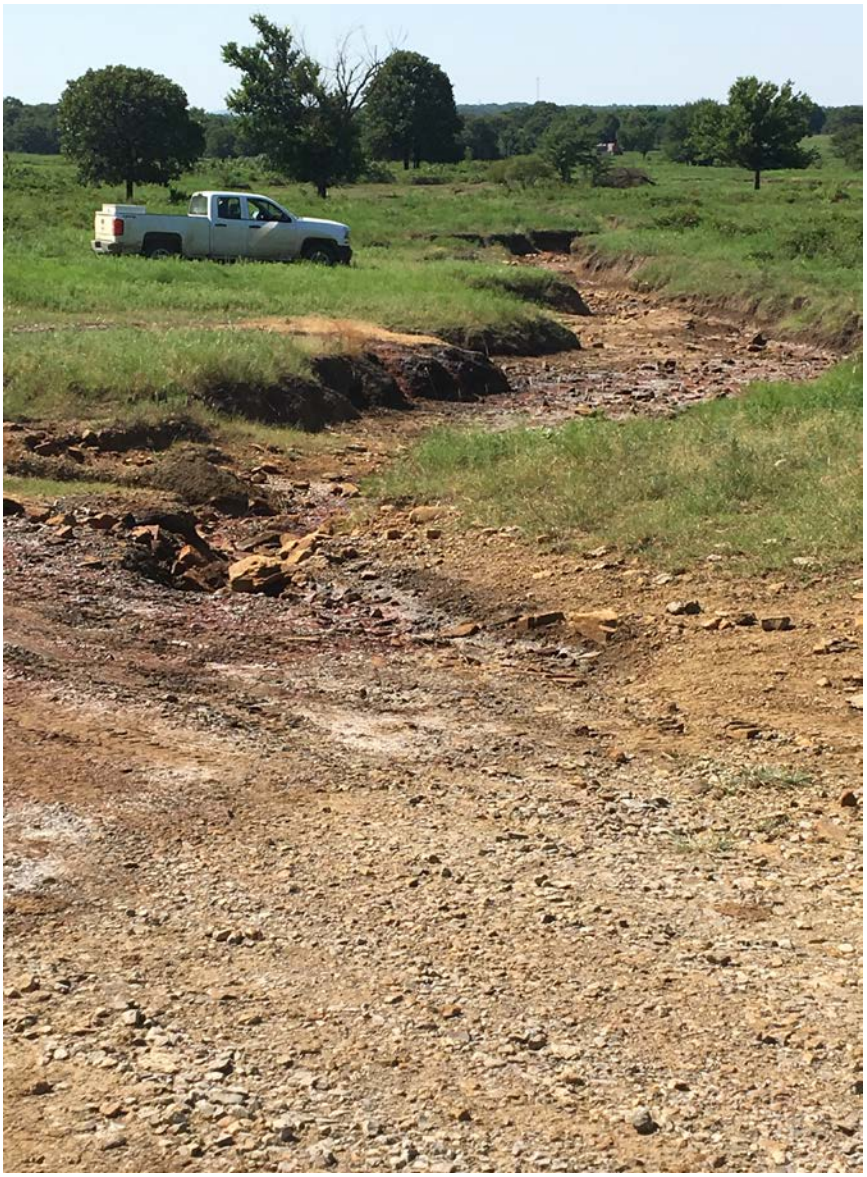

Photo File Name: Photo 4 (IMG_0285.jpg)
Orientation: South
Date of Photo: 07/25/2018
Time of Photo: 10:42 am
Latitude: 36.796696N
Longitude: -96.276732W
Photographer: K.W. Sanborn
Description: The brine entered the trench here and continued to flow south from this location to the point of entry of brine fluids into Elm Creek.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Photograph Log

Photo No. 5

36.796696N, -96.276732W (Sect. 19, T 27N, R 10E)		
City: Pawhuska	County: Osage	State: Oklahoma

Photo File Name: Photo 5 (IMG_0286.jpg)
Orientation: South
Date of Photo: 07/25/2018
Time of Photo: 10:51 am
Latitude: 36.796696N
Longitude: -96.276732W
Photographer: K.W. Sanborn
Description: The brine fluids in the trench flowed to Elm Creek to the south. The trench was flowing at the time of the inspection and had defined bed and bank.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Photograph Log

Photo No. 6

36.796696N, -96.276732W (Sect. 19, T 27N, R 10E)		
City: Pawhuska	County: Osage	State: Oklahoma

Photo File Name: Photo 6 (IMG_0287.jpg)
Orientation: Southeast
Date of Photo: 07/25/2018
Time of Photo: 10:53 am
Latitude: 36.795348N
Longitude: -96.276437W
Photographer: K.W. Sanborn
Description: The trench flowed into Elm Creek here. The creek had a large pond built along the flow path upstream of this point. Then Elm Creek flowed south from here.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Photograph Log

Photo No. 7

36.796696N, -96.276732W (Sect. 19, T 27N, R 10E)		
City: Pawhuska	County: Osage	State: Oklahoma

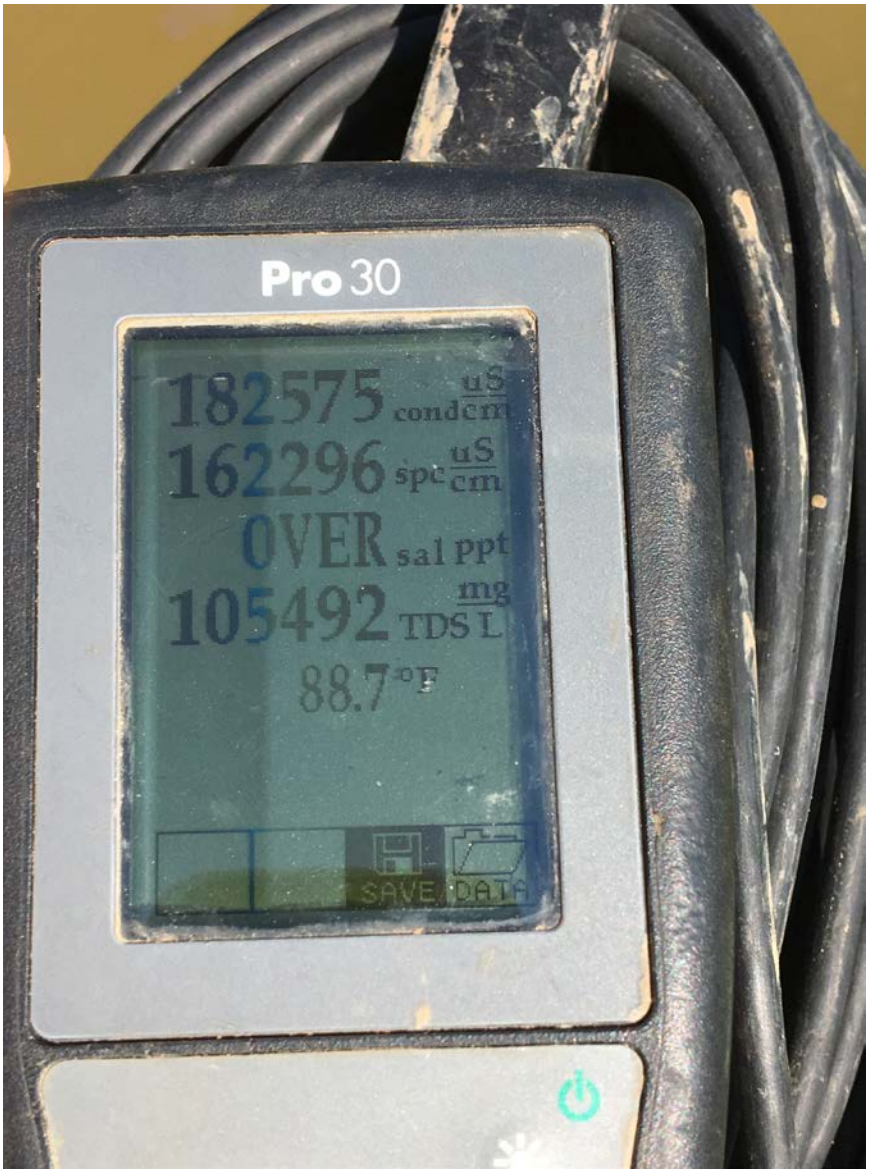

Photo File Name: Photo 7 (IMG_0275.jpg)
Orientation: South
Date of Photo: 07/25/2018
Time of Photo: 10:11 am
Latitude: 36.795348N
Longitude: -96.276437W
Photographer: K.W. Sanborn
Description: With a calibrated YSI 30 Pro Conductivity Meter, a Total Dissolved Solids (TDS) reading of the creek at the point of entry was 105,492 mg/L.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Photograph Log

Photo No. 8

36.796696N, -96.276732W (Sect. 19, T 27N, R 10E)		
City: Pawhuska	County: Osage	State: Oklahoma

Photo File Name: Photo 8 (IMG_0278.jpg)
Orientation: North
Date of Photo: 07/25/2018
Time of Photo: 10:26 am
Latitude: 36.791376N
Longitude: -96.275167W
Photographer: K.W. Sanborn
Description: This was Elm Creek upstream from the first constructed dam and downstream from the point of entry of brine fluids into Elm Creek. I observed salt staining on the rocks in the creek.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Photograph Log

Photo No. 9

36.796696N, -96.276732W (Sect. 19, T 27N, R 10E)		
City: Pawhuska	County: Osage	State: Oklahoma

Photo File Name: Photo 9 (IMG_0276.jpg))
Orientation: Northwest
Date of Photo: 07/25/2018
Time of Photo: 10:24 am
Latitude: 36.791376N
Longitude: -96.275167W
Photographer: K.W. Sanborn
Description: This was the first dam built on the creek, south of the point of entry and facility.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Photograph Log

Photo No. 10

36.796696N, -96.276732W (Sect. 19, T 27N, R 10E)		
City: Pawhuska	County: Osage	State: Oklahoma

Photo File Name: Photo 10 (IMG_0277.jpg)
Orientation: North
Date of Photo: 07/25/2018
Time of Photo: 10:25 am
Latitude: 36.791376N
Longitude: -96.275167W
Photographer: K.W. Sanborn
Description: The TDS of the water at dam number one was 100,470 mg/L.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Photograph Log

Photo No. 11

36.796696N, -96.276732W (Sect. 19, T 27N, R 10E)		
City: Pawhuska	County: Osage	State: Oklahoma

Photo File Name: Photo 11 (IMG_0274.jpg)
Orientation: Southwest
Date of Photo: 07/25/2018
Time of Photo: 10:11 am
Latitude: 36.790586N
Longitude: -96.275028W
Photographer: K.W. Sanborn
Description: This was dam number two constructed south of the brine tank on Elm Creek.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Photograph Log

Photo No. 12

36.796696N, -96.276732W (Sect. 19, T 27N, R 10E)		
City: Pawhuska	County: Osage	State: Oklahoma

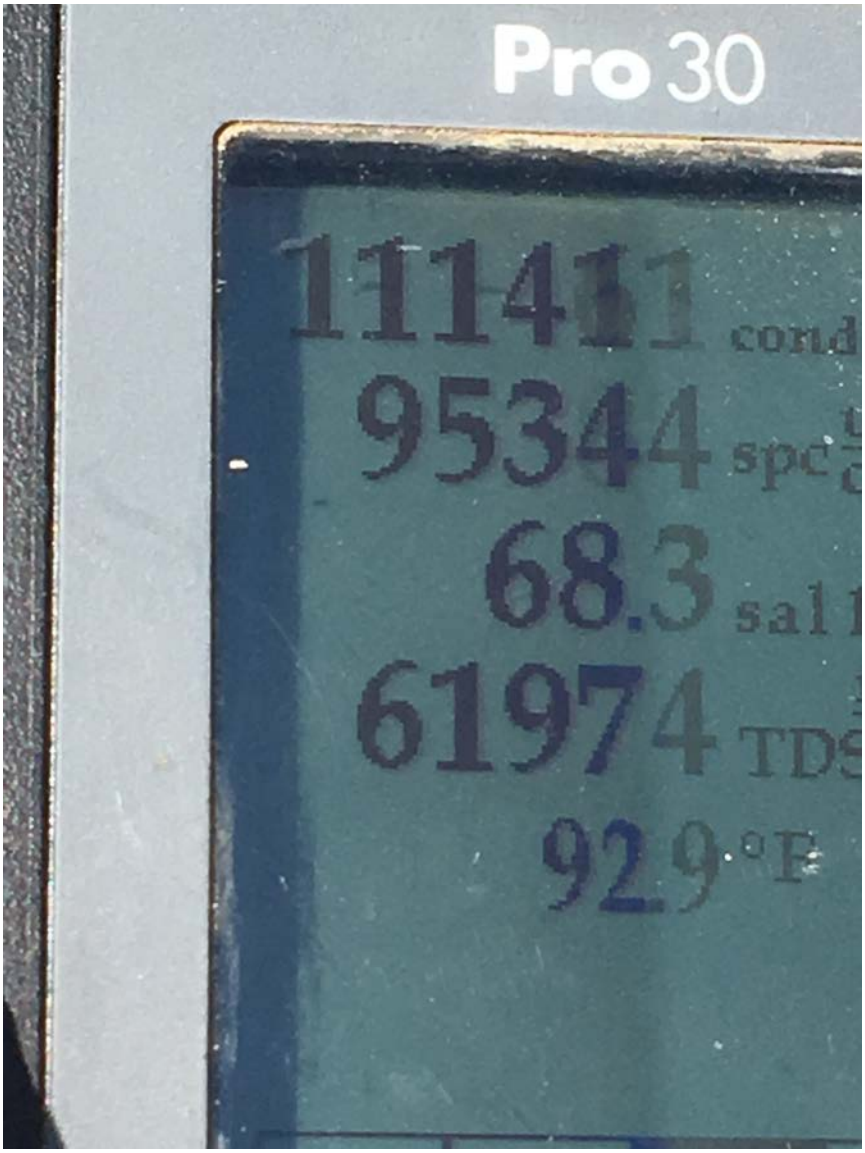

Photo File Name: Photo 12 (IMG_0268.jpg)
Orientation: South
Date of Photo: 07/25/2018
Time of Photo: 10:02 am
Latitude: 36.790586N
Longitude: -96.275028W
Photographer: K.W. Sanborn
Description: The TDS at dam two location was 61,974 mg/L.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Photograph Log

Photo No. 13

36.796696N, -96.276732W (Sect. 19, T 27N, R 10E)		
City: Pawhuska	County: Osage	State: Oklahoma

Photo File Name: Photo 13 (IMG_0273.jpg)
Orientation: West
Date of Photo: 07/25/2018
Time of Photo: 10:11 am
Latitude: 36.790586N
Longitude: -96.275028W
Photographer: K.W. Sanborn
Description: I observed dead crayfish in a pool of Elm Creek at the dam two site.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Photograph Log

Photo No. 14

36.796696N, -96.276732W (Sect. 19, T 27N, R 10E)		
City: Pawhuska	County: Osage	State: Oklahoma

Photo File Name: Photo 14 (IMG_0271.jpg)
Orientation: West
Date of Photo: 07/25/2018
Time of Photo: 10:10 am
Latitude: 36.790586N
Longitude: -96.275028W
Photographer: K.W. Sanborn
Description: I observed more dead crayfish in the pool at dam two.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Photograph Log

Photo No. 15

36.796696N, -96.276732W (Sect. 19, T 27N, R 10E)		
City: Pawhuska	County: Osage	State: Oklahoma

Photo File Name: Photo 15 (IMG_0270.jpg)
Orientation: West
Date of Photo: 07/25/2018
Time of Photo: 10:09 am
Latitude: 36.790586N
Longitude: -96.275028W
Photographer: K.W. Sanborn
Description: I observed salt staining on the rocks in Elm Creek and dead crayfish near dam two.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Photograph Log

Photo No. 16

36.796696N, -96.276732W (Sect. 19, T 27N, R 10E)		
City: Pawhuska	County: Osage	State: Oklahoma

Photo File Name: Photo 16 (IMG_0264.jpg)
Orientation: Southwest
Date of Photo: 07/25/2018
Time of Photo: 9:58 am
Latitude: 36.789723N
Longitude: -96.275006W
Photographer: K.W. Sanborn
Description: This was dam number three constructed south of the discharge point on Elm Creek.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Photograph Log

Photo No. 17

36.796696N, -96.276732W (Sect. 19, T 27N, R 10E)		
City: Pawhuska	County: Osage	State: Oklahoma

Photo File Name: Photo 17 (IMG_0266.jpg)
Orientation: West
Date of Photo: 07/25/2018
Time of Photo: 9:59 am
Latitude: 36.789723N
Longitude: -96.275006W
Photographer: K.W. Sanborn
Description: The TDS of the pool in Elm Creek at dam three site was 81,939 mg/L.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Photograph Log

Photo No. 18

36.796696N, -96.276732W (Sect. 19, T 27N, R 10E)		
City: Pawhuska	County: Osage	State: Oklahoma

Photo File Name: Photo 18 (IMG_0261.jpg)
Orientation: West
Date of Photo: 07/25/2018
Time of Photo: 9:51 am
Latitude: 36.789532N
Longitude: -96.274850W
Photographer: K.W. Sanborn
Description: This was Elm Creek between dam three and dam four. I observed bed and bank at this location.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Photograph Log

Photo No. 19

36.796696N, -96.276732W (Sect. 19, T 27N, R 10E)		
City: Pawhuska	County: Osage	State: Oklahoma

Photo file Name: Photo 19 (IMG_0262.jpg)
Orientation: South
Date of Photo: 07/25/2018
Time of Photo: 9:51 am
Latitude: 36.789532N
Longitude: -96.274850W
Photographer: K.W. Sanborn
Description: The TDS was 40,056 mg/L in the creek shown at the location in Photo 18.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Photograph Log

Photo No. 20

36.796696N, -96.276732W (Sect. 19, T 27N, R 10E)		
City: Pawhuska	County: Osage	State: Oklahoma

Photo File Name: Photo 20 (IMG_0254.jpg)
Orientation: Southeast
Date of Photo: 07/25/2018
Time of Photo: 9:48 am
Latitude: 36.788841N
Longitude: -96.274468W
Photographer: K.W. Sanborn
Description: This was dam number 4 south of the brine tank and discharge in Elm Creek.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Photograph Log

Photo No. 21

36.796696N, -96.276732W (Sect. 19, T 27N, R 10E)		
City: Pawhuska	County: Osage	State: Oklahoma

Photo File Name: Photo 21 (IMG_0259.jpg)
Orientation: South
Date of Photo: 07/25/2018
Time of Photo: 9:50 am
Latitude: 36.788841N
Longitude: -96.274468W
Photographer: K. W. Sanborn
Description: The TDS at the dam four location was 13,294 mg/L. There was no flow past this point due to trucks pumping and hauling out fluids from Elem Creek.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Photograph Log

Photo No. 22

36.796696N, -96.276732W (Sect. 19, T 27N, R 10E)		
City: Pawhuska	County: Osage	State: Oklahoma

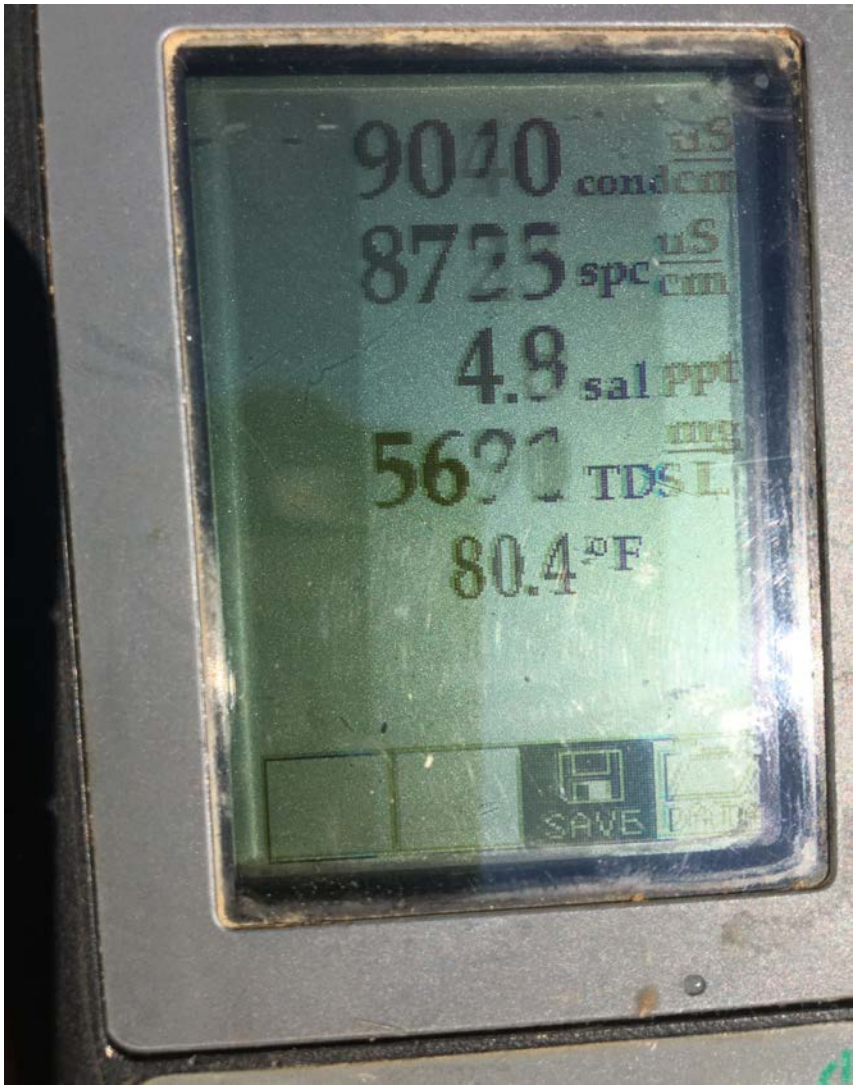

Photo File Name: Photo 22 (IMG_0258.jpg)
Orientation: South
Date of Photo: 07/25/2018
Time of Photo: 9:49 am
Latitude: 36.788841N
Longitude: -96.274468W
Photographer: K.W. Sanborn
Description: The TDS on the downstream side of the dam was 5,692 mg/L due to some seepage at the dam in Elm Creek.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Photograph Log

Photo No. 23

36.796696N, -96.276732W (Sect. 19, T 27N, R 10E)		
City: Pawhuska	County: Osage	State: Oklahoma

Photo File Name: Photo 23 (IMG_0288.jpg)
Orientation: Northwest
Date of Photo: 07/25/2018
Time of Photo: 11:16 am
Latitude: 36.797285N
Longitude: -96.277384W
Photographer: K.W. Sanborn
Description: This pond was located above the discharge entry point and was built on Elm Creek. It was nearly full at the time of the inspection and I observed fish in the pond.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Photograph Log

Photo No. 24

36.796696N, -96.276732W (Sect. 19, T 27N, R 10E)		
City: Pawhuska	County: Osage	State: Oklahoma

Photo File Name: Photo 24 (IMG_0289.jpg)
Orientation: Northwest
Date of Photo: 07/25/2018
Time of Photo: 11:16 am
Latitude: 36.797285N
Longitude: -96.277384W
Photographer: K.W. Sanborn
Description: The TDS of the pond was 182 mg/L. There was some seepage from the pond south to Elm Creek.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Photograph Log

Photo No. 25

36.796696N, -96.276732W (Sect. 19, T 27N, R 10E)		
City: Pawhuska	County: Osage	State: Oklahoma

Photo File Name: Photo 25 (DSC_0002)
Orientation: Northeast
Date of Photo: 08/09/2018
Time of Photo: 3:47 pm
Latitude: 36.796664N
Longitude: -96.276637W
Photographer: K.W. Sanborn
Description: I observed that some remedial activity had been done at the salt water facility. I observed brine staining and some leaks from the containment area near the corners of the berm.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Photograph Log

Photo No. 26

36.796696N, -96.276732W (Sect. 19, T 27N, R 10E)		
City: Pawhuska	County: Osage	State: Oklahoma

Photo File Name: Photo 26 (DSC_0003)
Orientation: North
Date of Photo: 08/09/2018
Time of Photo: 3:47 pm
Latitude: 36.796664N
Longitude: -96.276637W
Photographer: K.W. Sanborn
Description: The discharge that occurred on 07/25/2018 originated here. I observed that the recent work on the berm of the secondary containment area still had soil inside the containment that was not removed. There were fluids seeping from the base of the berm.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Photograph Log

Photo No. 27

36.796696N, -96.276732W (Sect. 19, T 27N, R 10E)		
City: Pawhuska	County: Osage	State: Oklahoma

Photo File Name: Photo 27 (DSC_0005)
Orientation: South
Date of Photo: 08/09/2018
Time of Photo: 3:48 pm
Latitude: 36.796664N
Longitude: -96.276637W
Photographer: K.W. Sanborn
Description: There was some dirt that was removed along the flow path in the trench that leads to Elem Creek, shown here. This location was near the salt water facility.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Photograph Log

Photo No. 28

36.796696N, -96.276732W (Sect. 19, T 27N, R 10E)		
City: Pawhuska	County: Osage	State: Oklahoma

Photo File Name: Photo 28 (DSC_0006)
Orientation: South
Date of Photo: 08/09/2018
Time of Photo: 3:48 pm
Latitude: 36.796664N
Longitude: -96.276637W
Photographer: K.W. Sanborn
Description: I observed salt staining along the flow path again, after dirt removal, near the trench.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Photograph Log

Photo No. 29

36.796696N, -96.276732W (Sect. 19, T 27N, R 10E)		
City: Pawhuska	County: Osage	State: Oklahoma

Photo File Name: Photo 29 (DSC_0008))
Orientation: South
Date of Photo: 08/09/2018
Time of Photo: 3:49 pm
Latitude: 36.796664N
Longitude: -96.276637W
Photographer: K.W. Sanborn
Description: I observed salt staining in the trench that had not had any remedial activity in the trench. The trench leads to Elm creek.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Photograph Log

Photo No. 30

36.796696N, -96.276732W (Sect. 19, T 27N, R 10E)		
City: Pawhuska	County: Osage	State: Oklahoma

Photo File Name: Photo 30 (DSC_0009)
Orientation: South
Date of Photo: 08/09/2018
Time of Photo: 3:56 pm
Latitude: 36.795221N
Longitude: -96.276318W
Photographer: K.W. Sanborn
Description: This was Elm Creek just south of the trench point of entry. I observed salt staining in Elm Creek.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Photograph Log

Photo No. 31

36.796696N, -96.276732W (Sect. 19, T 27N, R 10E)		
City: Pawhuska	County: Osage	State: Oklahoma

Photo File Name: Photo 31 (DSC_0012)
Orientation: South
Date of Photo: 08/09/2018
Time of Photo: 4:00 pm
Latitude: 36.795221N
Longitude: -96.276318W
Photographer: K.W. Sanborn
Description: With a calibrated YSI 30 Pro Conductivity Meter, the TDS in the creek at Photo 30 was 12,799 mg/L.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Photograph Log

Photo No. 32

36.796696N, -96.276732W (Sect. 19, T 27N, R 10E)		
City: Pawhuska	County: Osage	State: Oklahoma

Photo File Name: Photo 32 (DSC_0019)
Orientation: North
Date of Photo: 08/09/2018
Time of Photo: 4:52 pm
Latitude: 36.794950N
Longitude: -96.276321W
Photographer: K.W. Sanborn
Description: I observed additional salt staining along Elm Creek, south of the point of entry.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Photograph Log

Photo No. 33

36.796696N, -96.276732W (Sect. 19, T 27N, R 10E)		
City: Pawhuska	County: Osage	State: Oklahoma

Photo File Name: Photo 33 (DSC_0020)
Orientation: North
Date of Photo: 08/092018
Time of Photo: 4:53 pm
Latitude: 36.794950N
Longitude: -96.276321W
Photographer: K.W. Sanborn
Description: I continued to observe salts and salt staining in Elm Creek south of the point of entry. This location was near Photo 32 and was stained with brine or salt.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Photograph Log

Photo No. 34

36.796696N, -96.276732W (Sect. 19, T 27N, R 10E)		
City: Pawhuska	County: Osage	State: Oklahoma

Photo File Name: Photo 34 (DSC_0015)
Orientation: North
Date of Photo: 08/09/2018
Time of Photo: 4:48 pm
Latitude: 36.794950N
Longitude: -96.276321W
Photographer: K.W. Sanborn
Description: The TDS of Elm Creek near the locations in Photo 32 and 33 was 5,696 mg/L.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Photograph Log

Photo No. 35

36.796696N, -96.276732W (Sect. 19, T 27N, R 10E)		
City: Pawhuska	County: Osage	State: Oklahoma

Photo File Name: Photo 35 (DSC_0022)
Orientation: South
Date of Photo: 08/09/2018
Time of Photo: 4:59 pm
Latitude: 36.791450N
Longitude: -96.275166W
Photographer: K.W. Sanborn
Description: This was Elm Creek farther south of the discharge point at a lease road crossing. I continued to observe bed and bank along Elm Creek.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Photograph Log

Photo No. 36

36.796696N, -96.276732W (Sect. 19, T 27N, R 10E)		
City: Pawhuska	County: Osage	State: Oklahoma

Photo File Name: Photo 36 (DSC_0023)
Orientation: South
Date of Photo: 08/09/2018
Time of Photo: 4:59 pm
Latitude: 36.791450N
Longitude: -96.275166W
Photographer: K.W. Sanborn
Description: The TDS at the location in Photo 35 was 20,211 mg/L.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Photograph Log

Photo No. 37

36.796696N, -96.276732W (Sect. 19, T 27N, R 10E)		
City: Pawhuska	County: Osage	State: Oklahoma

Photo File Name: Photo 37 (DSC_0027)
Orientation: North
Date of Photo: 08/09/2018
Time of Photo: 5:05 pm
Latitude: 36.790108N
Longitude: -96.275013W
Photographer: K.W. Sanborn
Description: This was a dam that was on Elm Creek the location shown in Photo 35.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Photograph Log

Photo No. 38

36.796696N, -96.276732W (Sect. 19, T 27N, R 10E)		
City: Pawhuska	County: Osage	State: Oklahoma

Photo File Name: Photo 38 (DSC_0028)
Orientation: West
Date of Photo: 08/09/2018
Time of Photo: 5:05 pm
Latitude: 36.790108N
Longitude: -96.275013W
Photographer: K.W. Sanborn
Description: The TDS at the dam location was 3,217 mg/L.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Photograph Log

Photo No. 39

36.796696N, -96.276732W (Sect. 19, T 27N, R 10E)		
City: Pawhuska	County: Osage	State: Oklahoma

Photo File Name: Photo 39 (DSC_0030)
Orientation: West
Date of Photo: 08/09/2018
Time of Photo: 5:14 pm
Latitude: 36.789194N
Longitude: -96.274494W
Photographer: K.W. Sanborn
Description: This was Elm Creek south of the dam shown in Photo 37.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Photograph Log

Photo No. 40

36.796696N, -96.276732W (Sect. 19, T 27N, R 10E)		
City: Pawhuska	County: Osage	State: Oklahoma

Photo File Name: Photo 40 (DSC_0031)
Orientation: West
Date of Photo: 08/09/2018
Time of Photo: 5:31 pm
Latitude: 36.789194N
Longitude: -96.274494W
Photographer: K.W. Sanborn
Description: The TDS at the location in Photo 39 was 6,731 mg/L.