X4 Environmental Inc.

Ex-Situ Drill Cuttings Treatment Pilot Test
Prepared for: X4 Environmental Inc.
Prepared by: Benlux Tam
Date: May 28, 2019

Contents:

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1. Introduction

The pilot test was conducted at **14702 Jersey Shore Dr., Houston, TX**, at the **X4 Environmental Inc. facility**. The objective was to reduce the **Total Petroleum Hydrocarbon (TPH) level** in drill cuttings to below **2% (20,000 PPM)**. The drill cuttings sample, mixed with sludge mud, was sourced from **Midland, TX** for this study. A total of **4 gallons** of drill cuttings were used in the pilot test.

2. Technical Procedure

Equipment Used:

- **Cement mixer (½ HP)**
- **2 gallons of diluted X4JH2000-HEP (1:10 ratio)**

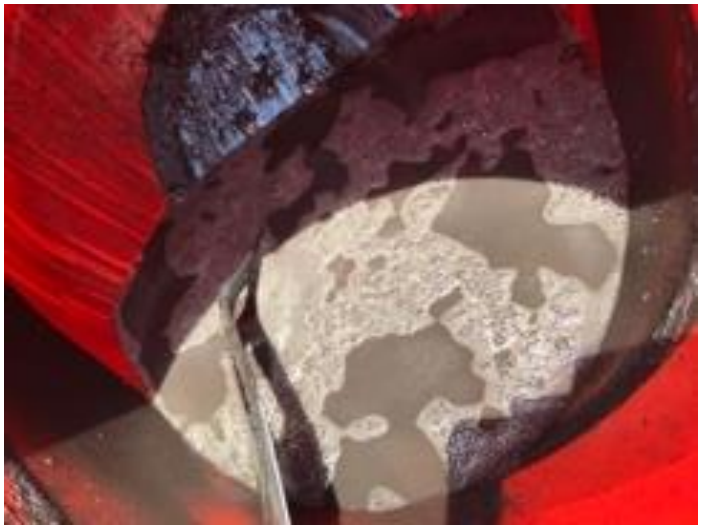
Drill Cuttings Cleaning Process:

1. **Load Sample:** Place **4 gallons of drill cuttings** into the cement mixer.

- **Introduce Solution:** Add 2 gallons of diluted X4JH2000-HEP (1:10 ratio) into the mixer.

2. **Mixing Process:** Activate the cement mixer and allow the solution to rotate with the drill cuttings for **1 hour**. Observe how hydrocarbons are extracted from the drill cuttings during the process.

3. **Rinse:** After mixing, transfer the cleaned drill cuttings from the mixer and rinse thoroughly with fresh water.



4. **Drying Process:** Spread the drill cuttings on the ground and let them dry completely.

5. **TPH Analysis:** Perform laboratory analysis on the dried drill cuttings.

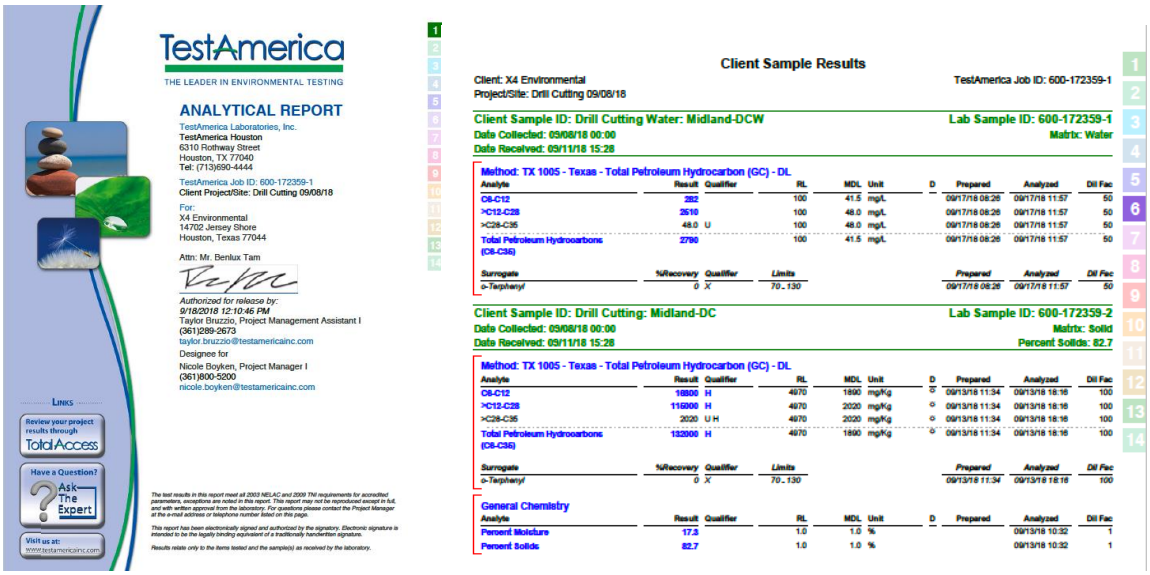
6. Drill Cuttings when TPHPPM level is < 2% (20,000 TPH PPM)

7. **Wastewater Treatment:** Transfer the wastewater into a container and circulate it with a pump to break down residual hydrocarbons for **1 hour**. Perform a TPH analysis and discharge when the TPH level is below **2%**.

3. Laboratory Analysis & Results

Initial TPH Levels:

- The drill cuttings and sludge mud sample, taken from **Midland, TX**, initially contained **132,000 PPM TPH**.



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ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Houston
6310 Rothway Street
Houston, TX 77040
Tel: (713)690-4444

TestAmerica Job ID: 600-172359-1
Client Project/Site: Drill Cutting 09/08/18

For:
X4 Environmental
14702 Jersey Shore
Houston, Texas 77044

Attn: Mr. Benlux Tam

Authorized for release by:
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This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

Client Sample Results

Client: X4 Environmental
Project/Site: Drill Cutting 09/08/18

TestAmerica Job ID: 600-172359-1

Client Sample ID: Drill Cutting Water: Midland-DCW — Lab Sample ID: 600-172359-1
Date Collected: 09/08/18 00:00 — Matrix: Water
Date Received: 09/11/18 15:28

Method: TX 1005 - Texas - Total Petroleum Hydrocarbon (GC) - DL

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
C6-C12	282		100	41.5	mg/L		09/17/18 08:26	09/17/18 11:57	50
>C12-C28	2510		100	48.0	mg/L		09/17/18 08:26	09/17/18 11:57	50
>C28-C35	48.0	U	100	48.0	mg/L		09/17/18 08:26	09/17/18 11:57	50
Total Petroleum Hydrocarbons (C6-C35)	2790		100	41.5	mg/L		09/17/18 08:26	09/17/18 11:57	50

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
o-Terphenyl	0	X	70 - 130	09/17/18 08:26	09/17/18 11:57	50

Client Sample ID: Drill Cutting: Midland-DC — Lab Sample ID: 600-172359-2
Date Collected: 09/08/18 00:00 — Matrix: Solid
Date Received: 09/11/18 15:28 — Percent Solids: 82.7

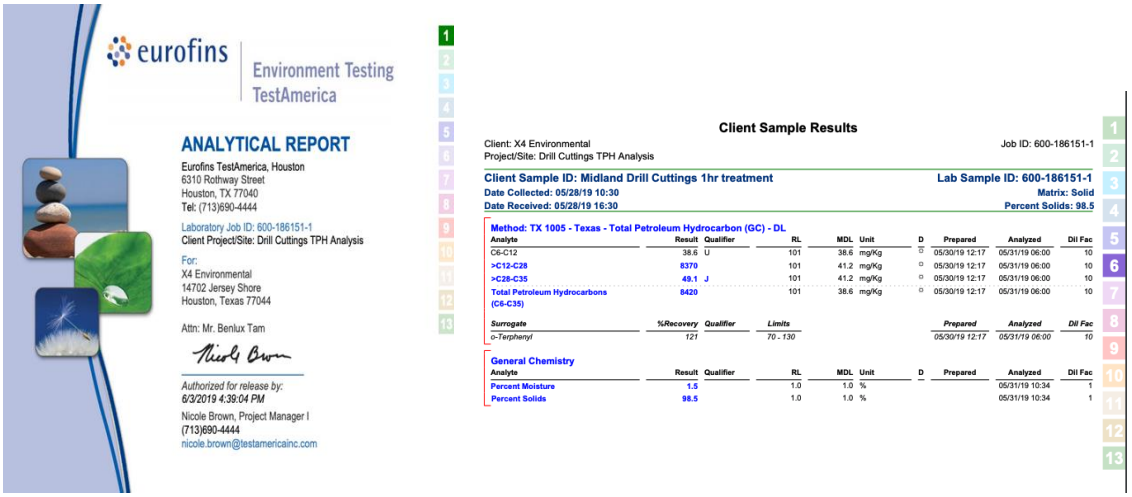
Method: TX 1005 - Texas - Total Petroleum Hydrocarbon (GC) - DL

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
C6-C12	18800	H	4970	1890	mg/Kg	☼	09/13/18 11:34	09/13/18 18:16	100
>C12-C28	116000	H	4970	2020	mg/Kg	☼	09/13/18 11:34	09/13/18 18:16	100
>C28-C35	2020	U H	4970	2020	mg/Kg	☼	09/13/18 11:34	09/13/18 18:16	100
Total Petroleum Hydrocarbons (C6-C35)	132000	H	4970	1890	mg/Kg	☼	09/13/18 11:34	09/13/18 18:16	100

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
o-Terphenyl	0	X	70 - 130	09/13/18 11:34	09/13/18 18:16	100

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture	17.3		1.0	1.0	%			09/13/18 10:32	1
Percent Solids	82.7		1.0	1.0	%			09/13/18 10:32	1



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ANALYTICAL REPORT

Eurofins TestAmerica, Houston
6310 Rothway Street
Houston, TX 77040
Tel: (713)690-4444

Laboratory Job ID: 600-186151-1
Client Project/Site: Drill Cuttings TPH Analysis

For:
X4 Environmental
14702 Jersey Shore
Houston, Texas 77044

Attn: Mr. Benlux Tam

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nicole.brown@testamericainc.com

Client Sample Results

Client: X4 Environmental
Project/Site: Drill Cuttings TPH Analysis

Job ID: 600-186151-1

Client Sample ID: Midland Drill Cuttings 1hr treatment — Lab Sample ID: 600-186151-1
Date Collected: 05/28/19 10:30 — Matrix: Solid
Date Received: 05/28/19 16:30 — Percent Solids: 98.5

Method: TX 1005 - Texas - Total Petroleum Hydrocarbon (GC) - DL

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
C6-C12	38.6	U	101	38.6	mg/Kg	☼	05/30/19 12:17	05/31/19 06:00	10
>C12-C28	8370		101	41.2	mg/Kg	☼	05/30/19 12:17	05/31/19 06:00	10
>C28-C35	49.1	J	101	41.2	mg/Kg	☼	05/30/19 12:17	05/31/19 06:00	10
Total Petroleum Hydrocarbons (C6-C35)	8420		101	38.6	mg/Kg	☼	05/30/19 12:17	05/31/19 06:00	10

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
o-Terphenyl	121		70 - 130	05/30/19 12:17	05/31/19 06:00	10

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture	1.5		1.0	1.0	%			05/31/19 10:34	1
Percent Solids	98.5		1.0	1.0	%			05/31/19 10:34	1

Post-Treatment Results:

After **1 hour** of treatment inside the cement mixer, followed by rinsing and drying, the TPH level was significantly reduced.

Sample Condition	TPH (PPM)	Reduction (%)
Background (Initial)	132,000	0%
After 1 Hour Cleaning	8,420	93.62%

4.

Conclusion

- The **X4JH2000HEP solution** effectively reduced the **TPH level from 132,000 PPM to 8,420 PPM** within **1 hour of treatment**.
- The pilot test confirmed that **X4 Environmental's ex-situ treatment process** is highly effective in breaking down hydrocarbons in drill cuttings.
- The drying process further reduces TPH concentration, ensuring compliance with disposal regulations.
- This method demonstrates a **scalable and efficient** approach for treating drill cuttings in oil and gas operations.

Best Regards,

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