January 4, 2016

Mr. Randall Ferguson
EHS Senior Compliance Specialist
PDC Energy, Inc.
1775 Sherman Street, Suite 3000
Denver, CO 80203

Re: **Produced Water Vessel Closure Report**
**Anderson R 1-13 Tank Battery**
**Facility ID: 322607**
**SENW S13 T6N R65W**
**Blanket Remediation #: 9440**

Dear Mr. Ferguson,

On behalf of PDC Energy, Inc. (PDC), Tasman Geosciences, Inc. (Tasman) has prepared this Produced Water Vessel Closure Report (Report) to document environmental sampling activities performed at the above-referenced site. This Report is being submitted under the Form 27 Management Plan for Closure of Produced Water Vessels, which has been assigned Blanket Remediation #9440 by the Colorado Oil and Gas Conservation Commission (COGCC).

A summary of excavation and environmental sampling activities is provided below.

**Site Assessment Activities**

On December 10, 2015, confirmation sampling activities were completed following the removal of the partially buried produced water vessel. Soil encountered in the excavation area was field screened for volatile organic compound (VOC) concentrations using a photoionization detector (PID). One soil sample (SS01) was collected below the former vessel location at approximately 3.5 feet below ground surface (bgs). The sample was submitted to Summit Scientific Laboratories in Golden, Colorado for analysis of benzene, toluene, ethylbenzene, total xylenes (BTEX), naphthalene, and total petroleum hydrocarbons (TPH) - gasoline range organics (GRO) by Environmental Protection Agency (EPA) Method 8260B, TPH - diesel range organics (DRO) by EPA Method 8015, pH, and electrical conductivity (EC).

Analytical results indicated organic compound concentrations and physical parameters in soil sample SS01 are in compliance with COGCC Table 910-1 soil standards.

The excavation extent and soil sample location are illustrated on Figure 1. Soil analytical data is summarized in Table 1 and the laboratory analytical report is provided in Attachment A.

**Conclusions**

Based on the soil analytical data described herein, petroleum hydrocarbon impacts were not encountered during the removal of the produced water vessel. Consequently, no further site investigation is recommended at this time. The facility was decommissioned following site assessment activities.

Please contact me at (720) 409-8791 if you have any questions regarding this report.

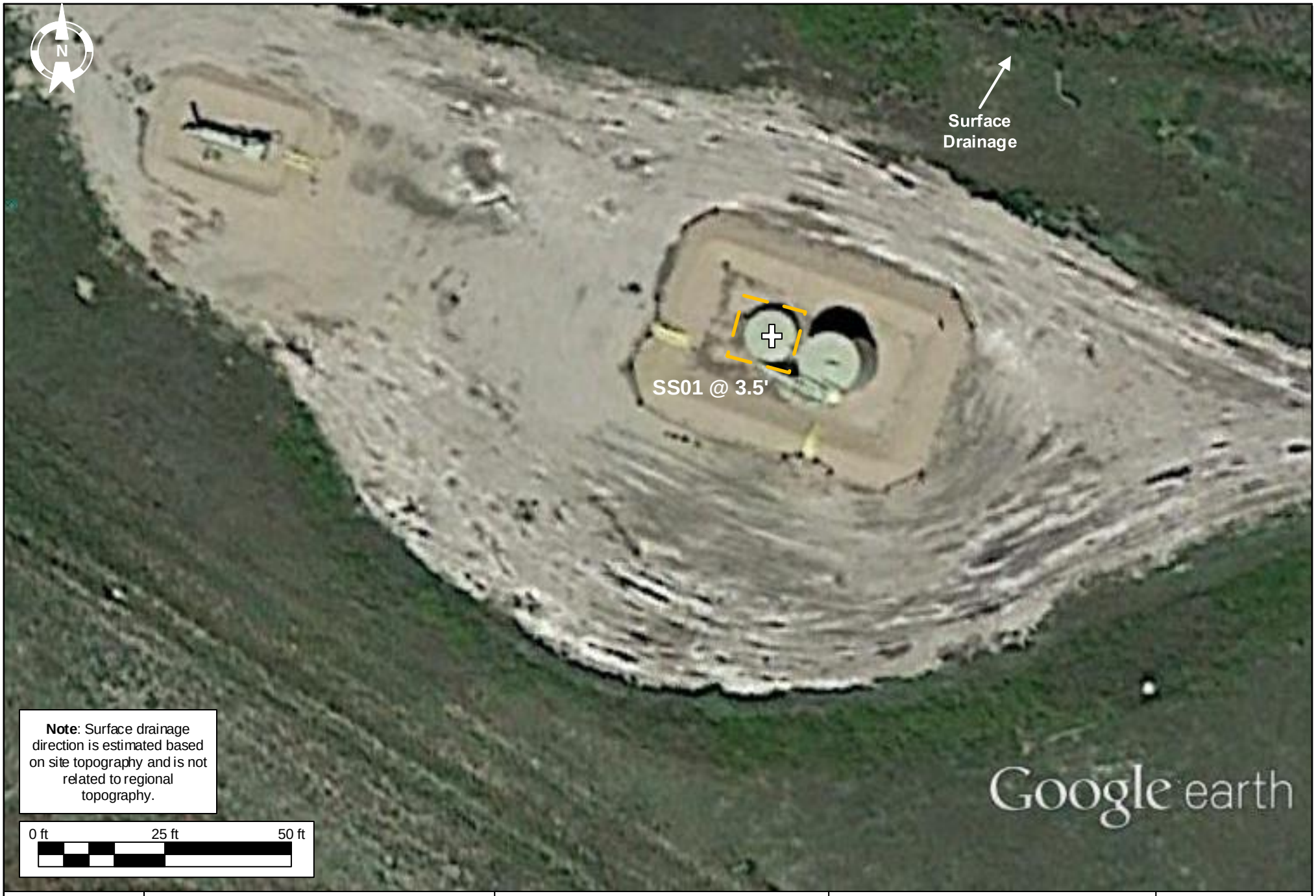
Sincerely,

Christine Wasko

Christine Wasko
Project Manager
Tasman Geosciences, Inc.

**Enclosures:**

Figure 1 – Soil Sample Location Map
Table 1 – Soil Analytical Results Summary Table
Attachment A – Laboratory Analytical Report




DRAWN BY: MAP

DATE: 12/21/2015

**Facility Diagram**
PDC Energy – DJ Basin
Anderson R 1-13 Tank Battery
SENW S13 T6N R65W
Weld County, CO

TASMAN GEOSCIENCES
6899 Pecos St., Unit C
Denver, CO 80221

LEGEND
Excavation Extent
Soil Sample Location

All locations are approximate unless otherwise noted

FIGURE 1

SOIL SAMPLE LOCATION MAP

**TABLE 1**
**ANDERSON R 1-13 TANK BATTERY**
**SOIL ANALYTICAL RESULTS SUMMARY TABLE**

| Sample ID | Date Sampled | Depth (feet bgs) | Benzene (mg/kg) | Toluene (mg/kg) | Ethylbenzene (mg/kg) | Total Xylenes (mg/kg) | Naphthalene (mg/kg) | TPH [2] (mg/kg) | pH (units) | EC (mmhos/cm) |
|---|---|---|---|---|---|---|---|---|---|---|
| **COGCC standards for soil (mg/kg) [1]** | | | **0.17** | **85** | **100** | **175** | **23** | **500** | **6-9** | **<4** |
| SS01 @ 3.5' | 12/10/2015 | 3.5 | <0.0020 | <0.0050 | <0.0050 | <0.010 | <0.010 | <50 | 8.18 | 0.517 |

**Notes:**
1. Standards for soil are taken from 2 CCR 404-1, Table 910-1, effective February 1, 2014.
2. TPH - Total volatile and extractable petroleum hydrocarbons. Value calculated by adding GRO and DRO concentrations.
COGCC = Colorado Oil and Gas Conservation Commission
(<) = Analytical result is less than the indicated laboratory reporting limit.
GRO = Total volatile petroleum hydrocarbons - gasoline range organics
DRO = Total extractable petroleum hydrocarbons - diesel range organics
mg/kg = Milligrams per kilogram
bgs = Below ground surface
EC = Electrical conductivity
mmhos/cm = millimhos per centimeter
**BOLD** = Analytical result is in exceedance of COGCC soil standards.

**ATTACHMENT A**

# Summit Scientific

741 Corporate Circle – Suite I ♦ Golden, Colorado 80401

303.277.9310 - laboratory ♦ 303.277.9531 - fax

December 11, 2015

Mark Longhurst
PDC Energy
1775 Sherman St. STE. 3000
Denver, CO 80203

RE: Anderson R1-13

Enclosed are the results of analyses for samples received by Summit Scientific on 12/10/15 18:15. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Paul Shrewsbury
President

| | | |
|---|---|---|
| PDC Energy<br>1775 Sherman St. STE. 3000<br>Denver CO, 80203 | Project: Anderson R1-13<br>Project Number: [none]<br>Project Manager: Mark Longhurst | **Reported:**<br>12/11/15 05:59 |

## ANALYTICAL REPORT FOR SAMPLES

| Sample ID | Laboratory ID | Matrix | Date Sampled | Date Received |
|---|---|---|---|---|
| SS01@3.5' | 1512088-01 | Soil | 12/10/15 14:21 | 12/10/15 18:15 |

# Summit Scientific 1512088

741 Corporate Circle Suite I ♦ Golden, Colorado 80401
303-277-9310 ♦ 303-374-5933 Fax

Page 1 of 1

Client: PDC
Address:
City/State/Zip:
Phone: 970 470 9042 Fax:
Sampler Name: Rob Irvin

Project Manager: Mark Longhurst
E-Mail:
Project Name: Anderson R 1-13
Project Number: mlonghurst@pdce.com

| Sample Description | Date Sampled | Time Sampled | Number of Containers | Preservative: HCl | Preservative: $HNO_3$ | Preservative: None | Preservative: Other (Specify) | Matrix: Groundwater | Matrix: Soil | Matrix: Air - Canister Serial # | Matrix: Other (Specify) | Analyze For: 8260 GBTEXN | 8015 DRO | PH | EC | SAR (hold) | | | Special Instructions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SS01@3.5' | 12/10/15 | 14:21 | 1 | | | X | | | X | | | | | | | | | | Hold SAR based on Results |

Relinquished by: Date/Time: 12/10/2015
Received by: Date/Time: 12-10-15 14:00
Relinquished by: Date/Time: 12-10-15 18:15
Received by: Date/Time:
Relinquished by: Date/Time:
Received in Lab by: Date/Time:

Turn Around Time (Check)
Same Day [X] 72 Hours [ ]
24 Hours [ ] Standard [ ]
48 Hours [ ]

Sample Integrity:
Temperature Upon Receipt: 6.2
Intact: Yes [X] No [ ]

Notes: On Ice

www.s2scientific.com

| | | |
|---|---|---|
| PDC Energy<br>1775 Sherman St. STE. 3000<br>Denver CO, 80203 | Project: Anderson R1-13<br>Project Number: [none]<br>Project Manager: Mark Longhurst | **Reported:**<br>12/11/15 05:59 |

**SS01@3.5'**
**1512088-01 (Soil)**

**Summit Scientific**

## Extractable Petroleum Hydrocarbons by 8015

Date Sampled: **12/10/15 14:21**

| Analyte | Result | Reporting Limit | Units | Dilution | Batch | Prepared | Analyzed | Method | Notes |
|---|---|---|---|---|---|---|---|---|---|
| C10-C28 (DRO) | ND | 50 | mg/kg | 1 | 1512099 | 12/10/15 | 12/10/15 | 8015M | |
| C28-C36 (ORO) | ND | 50 | " | " | " | " | " | " | |

Date Sampled: **12/10/15 14:21**

| Analyte | Result | Reporting Limit | Units | Dilution | Batch | Prepared | Analyzed | Method | Notes |
|---|---|---|---|---|---|---|---|---|---|
| *Surrogate: o-Terphenyl* | | *112 %* | *70-130* | | " | " | " | " | |

## Volatile Organic Compounds by EPA Method 8260B

Date Sampled: **12/10/15 14:21**

| Analyte | Result | Reporting Limit | Units | Dilution | Batch | Prepared | Analyzed | Method | Notes |
|---|---|---|---|---|---|---|---|---|---|
| Naphthalene | ND | 0.010 | mg/kg | 1 | 1512100 | 12/10/15 | 12/10/15 | EPA 8260B | |
| Benzene | ND | 0.0020 | " | " | " | " | " | " | |
| Toluene | ND | 0.0050 | " | " | " | " | " | " | |
| Ethylbenzene | ND | 0.0050 | " | " | " | " | " | " | |
| Xylenes (total) | ND | 0.010 | " | " | " | " | " | " | |
| Gasoline Range Hydrocarbons | ND | 0.50 | " | " | " | " | " | " | |

Date Sampled: **12/10/15 14:21**

| Analyte | Result | Reporting Limit | Units | Dilution | Batch | Prepared | Analyzed | Method | Notes |
|---|---|---|---|---|---|---|---|---|---|
| *Surrogate: 1,2-Dichloroethane-d4* | | *98.0 %* | *23-173* | | " | " | " | " | |
| *Surrogate: Toluene-d8* | | *97.9 %* | *20-170* | | " | " | " | " | |
| *Surrogate: 4-Bromofluorobenzene* | | *100 %* | *21-167* | | " | " | " | " | |

## Physical Parameters by APHA/ASTM/EPA Methods

Date Sampled: **12/10/15 14:21**

| Analyte | Result | Reporting Limit | Units | Dilution | Batch | Prepared | Analyzed | Method | Notes |
|---|---|---|---|---|---|---|---|---|---|

| | | |
|---|---|---|
| PDC Energy<br>1775 Sherman St. STE. 3000<br>Denver CO, 80203 | Project: Anderson R1-13<br>Project Number: [none]<br>Project Manager: Mark Longhurst | **Reported:**<br>12/11/15 05:59 |

**SS01@3.5'**
**1512088-01 (Soil)**

**Summit Scientific**

**Physical Parameters by APHA/ASTM/EPA Methods**

| Analyte | Result | Reporting Limit | Units | Dilution | Batch | Prepared | Analyzed | Method | Notes |
|---|---|---|---|---|---|---|---|---|---|
| **Specific Conductance (EC)** | **0.517** | 0.0100 | mmhos/cm | 1 | 1512103 | 12/10/15 | 12/10/15 | SM 2510B | |

Date Sampled: **12/10/15 14:21**

| Analyte | Result | Reporting Limit | Units | Dilution | Batch | Prepared | Analyzed | Method | Notes |
|---|---|---|---|---|---|---|---|---|---|
| **pH** | **8.18** | 0.100 | pH Units | " | 1512102 | 12/10/15 | 12/10/15 | EPA 9045 | |

## Extractable Petroleum Hydrocarbons by 8015 - Quality Control

## Summit Scientific

| Analyte | Result | Reporting Limit | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| **Batch 1512099 - EPA 3550A** | | | | | | | | | | |
| **Blank (1512099-BLK1)** | | | | Prepared & Analyzed: 12/10/15 | | | | | | |
| C10-C28 (DRO) | ND | 50 | mg/kg | | | | | | | |
| C28-C36 (ORO) | ND | 50 | " | | | | | | | |
| *Surrogate: o-Terphenyl* | *12.3* | | " | *12.5* | | *98.5* | *70-130* | | | |
| **LCS (1512099-BS1)** | | | | Prepared & Analyzed: 12/10/15 | | | | | | |
| C10-C28 (DRO) | 491 | 50 | mg/kg | 499 | | 98.5 | 50-150 | | | |
| *Surrogate: o-Terphenyl* | *11.7* | | " | *12.5* | | *94.0* | *70-130* | | | |
| **Matrix Spike (1512099-MS1)** | | **Source: 1512083-01** | | Prepared & Analyzed: 12/10/15 | | | | | | |
| C10-C28 (DRO) | 1940 | 50 | mg/kg | 485 | 3040 | NR | 50-150 | | | QM-4X |
| *Surrogate: o-Terphenyl* | *12.4* | | " | *12.2* | | *102* | *70-130* | | | |
| **Matrix Spike Dup (1512099-MSD1)** | | **Source: 1512083-01** | | Prepared & Analyzed: 12/10/15 | | | | | | |
| C10-C28 (DRO) | 2960 | 50 | mg/kg | 484 | 3040 | NR | 50-150 | 41.8 | 20 | QM-4X |
| *Surrogate: o-Terphenyl* | *13.4* | | " | *12.1* | | *110* | *70-130* | | | |





## Volatile Organic Compounds by EPA Method 8260B - Quality Control

## Summit Scientific

| Analyte | Result | Reporting Limit | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| **Batch 1512100 - EPA 5030 Soil MS** | | | | | | | | | | |
| **Blank (1512100-BLK1)** | | | | Prepared & Analyzed: 12/10/15 | | | | | | |
| Naphthalene | ND | 0.010 | mg/kg | | | | | | | |
| Benzene | ND | 0.0020 | " | | | | | | | |
| Toluene | ND | 0.0050 | " | | | | | | | |
| Ethylbenzene | ND | 0.0050 | " | | | | | | | |
| Xylenes (total) | ND | 0.010 | " | | | | | | | |
| Gasoline Range Hydrocarbons | ND | 0.50 | " | | | | | | | |
| *Surrogate: 1,2-Dichloroethane-d4* | *0.0381* | | " | *0.0400* | | *95.3* | *23-173* | | | |
| *Surrogate: Toluene-d8* | *0.0394* | | " | *0.0400* | | *98.4* | *20-170* | | | |
| *Surrogate: 4-Bromofluorobenzene* | *0.0404* | | " | *0.0400* | | *101* | *21-167* | | | |
| **LCS (1512100-BS1)** | | | | Prepared & Analyzed: 12/10/15 | | | | | | |
| Naphthalene | ND | 0.010 | mg/kg | | | | 66-138 | | | |
| Benzene | 0.0762 | 0.0020 | " | 0.100 | | 76.2 | 58-130 | | | |
| Toluene | 0.0805 | 0.0050 | " | 0.100 | | 80.5 | 61-134 | | | |
| Ethylbenzene | 0.0972 | 0.0050 | " | 0.0992 | | 98.0 | 74-139 | | | |
| m,p-Xylene | 0.188 | 0.010 | " | 0.200 | | 94.4 | 73-137 | | | |
| o-Xylene | 0.0908 | 0.0050 | " | 0.0984 | | 92.3 | 73-141 | | | |
| Xylenes (total) | 0.279 | 0.010 | " | | | | 0-200 | | | |
| Gasoline Range Hydrocarbons | 2.22 | 0.50 | " | | | | 30-150 | | | |
| *Surrogate: 1,2-Dichloroethane-d4* | *0.0387* | | " | *0.0400* | | *96.8* | *23-173* | | | |
| *Surrogate: Toluene-d8* | *0.0385* | | " | *0.0400* | | *96.3* | *20-170* | | | |
| *Surrogate: 4-Bromofluorobenzene* | *0.0391* | | " | *0.0400* | | *97.7* | *21-167* | | | |
| **Matrix Spike (1512100-MS1)** | | **Source: 1512053-01** | | Prepared & Analyzed: 12/10/15 | | | | | | |
| Naphthalene | ND | 0.010 | mg/kg | | ND | | 10-158 | | | |
| Benzene | 0.0708 | 0.0020 | " | 0.0931 | ND | 76.1 | 30-131 | | | |
| Toluene | 0.0764 | 0.0050 | " | 0.0931 | ND | 82.0 | 30-134 | | | |
| Ethylbenzene | 0.0907 | 0.0050 | " | 0.0924 | ND | 98.2 | 22-153 | | | |
| m,p-Xylene | 0.173 | 0.010 | " | 0.186 | ND | 92.9 | 10-159 | | | |
| o-Xylene | 0.0846 | 0.0050 | " | 0.0916 | ND | 92.3 | 31-151 | | | |
| Xylenes (total) | 0.257 | 0.010 | " | | 0.00 | | 30-160 | | | |
| Gasoline Range Hydrocarbons | 2.04 | 0.50 | " | | ND | | 30-160 | | | |
| *Surrogate: 1,2-Dichloroethane-d4* | *0.0370* | | " | *0.0372* | | *99.4* | *23-173* | | | |
| *Surrogate: Toluene-d8* | *0.0358* | | " | *0.0372* | | *96.2* | *20-170* | | | |
| *Surrogate: 4-Bromofluorobenzene* | *0.0358* | | " | *0.0372* | | *96.2* | *21-167* | | | |

## Volatile Organic Compounds by EPA Method 8260B - Quality Control

## Summit Scientific

| Analyte | Result | Reporting Limit | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| **Batch 1512100 - EPA 5030 Soil MS** | | | | | | | | | | |
| **Matrix Spike Dup (1512100-MSD1)** | | **Source: 1512053-01** | | Prepared & Analyzed: 12/10/15 | | | | | | |
| Naphthalene | ND | 0.010 | mg/kg | | ND | | 10-158 | | 42 | |
| Benzene | 0.0722 | 0.0020 | " | 0.0940 | ND | 76.8 | 30-131 | 1.92 | 34 | |
| Toluene | 0.0772 | 0.0050 | " | 0.0940 | ND | 82.1 | 30-134 | 1.05 | 30 | |
| Ethylbenzene | 0.0921 | 0.0050 | " | 0.0932 | ND | 98.8 | 22-153 | 1.52 | 24 | |
| m,p-Xylene | 0.175 | 0.010 | " | 0.188 | ND | 93.5 | 10-159 | 1.60 | 68 | |
| o-Xylene | 0.0845 | 0.0050 | " | 0.0925 | ND | 91.3 | 31-151 | 0.127 | 38 | |
| Xylenes (total) | 0.260 | 0.010 | " | | 0.00 | | 30-160 | 1.03 | 30 | |
| Gasoline Range Hydrocarbons | 2.04 | 0.50 | " | | ND | | 30-160 | 0.0803 | 30 | |
| *Surrogate: 1,2-Dichloroethane-d4* | *0.0375* | | " | *0.0376* | | *99.7* | *23-173* | | | |
| *Surrogate: Toluene-d8* | *0.0363* | | " | *0.0376* | | *96.5* | *20-170* | | | |
| *Surrogate: 4-Bromofluorobenzene* | *0.0370* | | " | *0.0376* | | *98.6* | *21-167* | | | |

## Physical Parameters by APHA/ASTM/EPA Methods - Quality Control

## Summit Scientific

| Analyte | Result | Reporting Limit | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|
| **Batch 1512102 - General Preparation** | | | | | | | | | | |
| **LCS (1512102-BS1)** | | | | Prepared & Analyzed: 12/10/15 | | | | | | |
| pH | 6.04 | 0.100 | pH Units | 6.00 | | 101 | 95-105 | | | |
| **Duplicate (1512102-DUP1)** | | **Source: 1512088-01** | | Prepared & Analyzed: 12/10/15 | | | | | | |
| pH | 8.21 | 0.100 | pH Units | | 8.18 | | | 0.366 | 20 | |
| **Batch 1512103 - General Preparation** | | | | | | | | | | |
| **Blank (1512103-BLK1)** | | | | Prepared & Analyzed: 12/10/15 | | | | | | |
| Specific Conductance (EC) | ND | 0.0100 | mmhos/cm | | | | | | | |
| **LCS (1512103-BS1)** | | | | Prepared & Analyzed: 12/10/15 | | | | | | |
| Specific Conductance (EC) | 0.998 | 0.00200 | mmhos/cm | 1.00 | | 99.8 | 90-110 | | | |
| **Duplicate (1512103-DUP1)** | | **Source: 1512088-01** | | Prepared & Analyzed: 12/10/15 | | | | | | |
| Specific Conductance (EC) | 0.506 | 0.0100 | mmhos/cm | | 0.517 | | | 2.05 | 20 | |

## Notes and Definitions

| | |
|---|---|
| QM-4X | The spike recovery was outside of QC acceptance limits for the MS and/or MSD due to analyte concentration at 4 times or greater the spike concentration. The QC batch was accepted based on LCS and/or LCSD recoveries within the acceptance limits. |
| DET | Analyte DETECTED |
| ND | Analyte NOT DETECTED at or above the reporting limit |
| NR | Not Reported |
| dry | Sample results reported on a dry weight basis |
| RPD | Relative Percent Difference |