

**PDC Energy, Inc.**  
**Second Quarter 2022 Remediation Summary**

July 19, 2022

Booth 11, 12, 21, 22-31U & 31AU Tank Battery  
NWNW Section 31 T4N R63W  
Remediation # 4826

This remediation summary has been prepared by Tasman, Inc. (Tasman) on behalf of PDC Energy, Inc. (PDC) to summarize remediation and sampling activities conducted during the second quarter 2022 at the Booth 11, 12, 21-31U & 31AU tank battery (Site).

### **Site History and Background**

On July 28, 2008, petroleum hydrocarbon impacts were discovered below the dump lines during routine maintenance at the Booth 11, 12, 21, 22-31U & 31AU tank battery. Following the discovery, an estimated 3,800 cubic yards of impacted material was removed from the source area and transported to a licensed disposal facility under PDC waste manifests. The approximate dimensions of the excavation were 40 feet wide by 50 feet long with a depth of 35 feet below ground surface (bgs). Excavation oversight and sampling were conducted by LT Environmental (LTE). Soil sample results indicated that organic compound concentrations were in exceedance of COGCC Table 910-1 standards within the final extent of the excavation.

Following initial excavation activities, a site investigation was conducted by LTE to delineate the extent of remaining hydrocarbon impacts and install a passive soil vapor extraction (SVE) well. The 2008 excavation extent and SVE well location are illustrated on Figure 1. A Form 27 Site Investigation and Remediation Work Plan was submitted to the COGCC on March 3, 2009, and Remediation Number 4826 was issued to the project.

A supplemental site investigation was conducted by Tasman between May 6 and June 4, 2019, to determine the extent of potential hydrocarbon impacts and evaluate lithologic conditions adjacent to the 2008 release. Based on the data collected during the assessment, PDC has selected monitored natural attenuation (MNA) as the remedial strategy for this site.

### **Current Remediation Strategy**

Quarterly vapor samples are collected from the existing SVE well to monitor VOC concentrations and evaluate the passive system operation and efficacy. Vapor samples are submitted for laboratory analysis of benzene, toluene, ethylbenzene, total xylenes (BTEX) and total petroleum hydrocarbons (TPH) – Gasoline Range Organics (GRO) by EPA Method TO-15. Analytical results are summarized in Table 1 and the laboratory report is included in Attachment A.

### Path Forward



Monitored natural attenuation (MNA) was selected as the remediation strategy during the second quarter 2019 and will continue as the selected remediation strategy through the third quarter 2022.

Third quarter 2022 vapor sampling will be conducted during July 2022.





**Legend**

-  Excavation Extent (LTE – 2008)
-  8-Inch Passive SVE Well (LTE – 2008)

**Notes**

All locations are approximate unless otherwise noted.

Excavation extent approximated based on March 31, 2009, LT Environmental, Inc. (LTE) report.

SVE – Soil Vapor Extraction

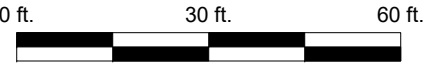


Image Source: Google Earth; 2017 Google  
Projection: WGS 84 UTM Zone 13 North



DATE: February 26, 2021

DESIGNED BY: B. Nelson

DRAWN BY: B. Nelson



**Tasman, Inc.**  
6855 W 119th Ave.  
Broomfield, CO, 80020

**PDC Energy, Inc. – DJ Basin**  
**Booth 11, 12, 21, 22-31U & 31AU Tank Battery**  
NWNW, Section 31, Township 4 North, Range 63 West  
Weld County, Colorado

REMEDIALATION WELL  
LOCATION MAP

FIGURE  
1



**TABLE 1**  
**BOOTH 11, 12, 21, 22, 31U 31AU**  
**VAPOR ANALYTICAL RESULTS SUMMARY TABLE**

Sample ID	Date Sampled	Benzene ( $\mu\text{g}/\text{m}^3$ )	Toluene ( $\mu\text{g}/\text{m}^3$ )	Ethylbenzene ( $\mu\text{g}/\text{m}^3$ )	Total Xylenes ( $\mu\text{g}/\text{m}^3$ )	TVPH - GRO ( $\mu\text{g}/\text{m}^3$ )
V001	7/25/2019	<5.66	14.2	<10.1	43.7	3,570
V001	10/17/2019	3,510	2,810	<193	5,040	1,460,000
V001	1/24/2020	163	212	<125	2,195	542,000
V001	4/27/2020	328	1,320	385	4,568	199,000
V001	8/19/2020	57.8	50.9	<10.0	416.3	22,400
V001	11/11/2020	72.7	42.1	10.2	116.0	2,550
V001	2/4/2021	12,800	18,500	<1,250	37,620	3,650,000
V001	4/27/2021	<5.60	<10.0	<10.0	<38.0	4,060
V001	7/19/2021	<5.60	<10.0	31.6	228.4	14,200
V001	10/21/2021	<12.3	<22.0	<22.0	<20.7	881
V001	1/13/2022	<70.0	<125	<125	<118	465,000
V001	5/23/2022	<70.0	<125	<125	727	56,900

**Notes:**

TVPH - GRO = Total volatile petroleum hydrocarbons - gasoline range organics (C6 - C10)

$\mu\text{g}/\text{m}^3$  = Micrograms per cubic meter

(<) = Analytical result is less than the indicated laboratory reporting limit.

## Attachment A



June 01, 2022

Tasman Geosciences

Brock Nelson

6855 West 119th Avenue

Broomfield CO 80020

**Project Name - PDC - Booth 11,12,21-31U & 31AU Project Number - [none]**

Attached are your analytical results for PDC - Booth 11,12,21-31U & 31AU received by Origins Laboratory, Inc. May 23, 2022. This project is associated with Origins project number Y205585-01.

The analytical results in the following report were analyzed under the guidelines of EPA Methods. These methods are identified as follows; "SW" are defined in SW-846, "EPA" are defined in 40CFR part 136 and "SM" are defined in the most current revision of Standard Methods For the Examination of Water and Wastewater.

The analytical results apply specifically to the samples and analyses specified per the attached Chain of Custody. As such, this report shall not be reproduced except in full, without the written approval of Origin's laboratory.

Unless otherwise noted, the analytical results for all soil samples are reported on a wet weight basis. All analytical analyses were performed under NELAP guidelines unless noted by a data qualifier.

Any holding time exceedances, deviations from the method specifications or deviations from Origins Laboratory's Standard Operating Procedures are outlined in the case narrative.

Thank you for selecting Origins for your analytical needs. Please contact us with any questions concerning this report, or if we can help with anything at all.

Origins Laboratory, Inc.  
303.433.1322  
o-squad@oelabinc.com



1725 Elk Place, Denver, CO 80211 | Phone: 303.433.1322 | Fax: 303.265.9645

Tasman Geosciences  
6855 West 119th Avenue  
Broomfield CO 80020

Brock Nelson  
Project Number: [none]  
Project: PDC - Booth 11,12,21-31U & 31AU

### CROSS REFERENCE REPORT

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
V001	Y205585-01	Air	May 23, 2022 13:05	05/23/2022 15:55

Origins Laboratory, Inc.



*The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.*

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Tasman Geosciences  
6855 West 119th Avenue  
Broomfield CO 80020

Brock Nelson  
Project Number: [none]  
Project: PDC - Booth 11,12,21-31U & 31AU

Origins Laboratory

F-012207-01-R1  
Effective Date: 01/09/12

## Sample Receipt Checklist

Origins Work Order: Y205585

Client: Tasman

Client Project ID: Booth 11,12,21,22-31U + 31A

Checklist Completed by: JG

Shipped Via: HD

(UPS, FedEx, Hand Delivered, Pick-up, etc.)

Date/time completed: 5/24/22

Airbill #: N/A

Matrix(s) Received: (Check all that apply): Soil/Solid Water X Other: Air

Cooler Number/Temperature: 1 °C 1 °C 1 °C (Describe) °C

Thermometer ID: T004

Requirement Description	Yes	No	N/A	Comments (if any)
If samples require cooling, was the temperature between 0°C to ≤ 6°C <sup>(1)</sup> ?			<input checked="" type="checkbox"/>	
Is there ice present (document if blue ice is used)			<input checked="" type="checkbox"/>	
Are custody seals present on cooler? (if so, document in comments if they are signed and dated, broken or intact)			<input checked="" type="checkbox"/>	
Are custody seals present on each sample container? (if so, document in comments if they are signed and dated, broken or intact)			<input checked="" type="checkbox"/>	
Were all samples received intact <sup>(1)</sup> ?	<input checked="" type="checkbox"/>			
Was adequate sample volume provided <sup>(1)</sup> ?	<input checked="" type="checkbox"/>			
Are short holding time analytes or samples with HTs due within 48 hours present <sup>(1)</sup> ?			<input checked="" type="checkbox"/>	
Is a chain-of-custody (COC) present and filled out completely <sup>(1)</sup> ?	<input checked="" type="checkbox"/>			
Does the COC agree with the number and type of sample bottles received <sup>(1)</sup> ?	<input checked="" type="checkbox"/>			
Do the sample IDs on the bottle labels match the COC <sup>(1)</sup> ?	<input checked="" type="checkbox"/>			
Is the COC properly relinquished by the client with date and time recorded <sup>(1)</sup> ?	<input checked="" type="checkbox"/>			
For volatiles in water – is there headspace (> ¼ inch bubble) present? If yes, contact client and note in narrative.			<input checked="" type="checkbox"/>	
Are samples preserved that require preservation and was it checked <sup>(1)</sup> ? (note ID of confirmation instrument used in comments) / (preservation is not confirmed for subcontracted analyses in order to insure sample integrity)(pH < 2 for samples preserved with HNO <sub>3</sub> , HCL, H <sub>2</sub> SO <sub>4</sub> ) / (pH > 10 for samples preserved with NaAsO <sub>2</sub> +NaOH, ZnAc+NaOH)			<input checked="" type="checkbox"/>	
Additional Comments (if any):				

<sup>(1)</sup> If NO, then contact the client before proceeding with analysis and note date/time and person contacted as well as the corrective action to in the additional comments (above) and the case narrative.

Reviewed by (Project Manager) JG

Date/Time Reviewed 5/25/22

Origins Laboratory, Inc.

*J. Bynon*

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Tasman Geosciences  
6855 West 119th Avenue  
Broomfield CO 80020

Brock Nelson  
Project Number: [none]  
Project: PDC - Booth 11,12,21-31U & 31AU

V001

5/23/2022 1:05:00PM

Analyte	Result	Limit	Units	Dilution	Batch	Analyst	Prepared	Analyzed	Notes
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Origins Laboratory, Inc.  
Y205585-01 (Air)

## GBTEX by TO-15M GC/MS

									T
Gasoline Range Hydrocarbons	56900	5000	ug/m <sup>3</sup> Air	25	B2E2411	EPC	05/24/2022	05/25/2022	
Benzene	ND	70.0	"	"	"	EPC	"	"	U
Toluene	ND	125	"	"	"	EPC	"	"	U
Ethylbenzene	ND	125	"	"	"	EPC	"	"	U
m,p-Xylene	727	475	"	"	"	EPC	"	"	
o-Xylene	ND	118	"	"	"	EPC	"	"	U
Surrogate: 1,2-Dichloroethane-d4	107 %	70-130			"	"	"	"	
Surrogate: Toluene-d8	115 %	70-130			"	"	"	"	
Surrogate: 4-Bromofluorobenzene	92.1 %	70-130			"	"	"	"	

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Broomfield CO 80020

Brock Nelson  
Project Number: [none]  
Project: PDC - Booth 11,12,21-31U & 31AU

## Volatile Organic Compounds by TO-15 in Air - Quality Control Origins Laboratory, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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### Batch B2E2411 - Default Prep - Air

Blank (B2E2411-BLK1)						Prepared: 05/24/2022 Analyzed: 05/24/2022			T	
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Gasoline Range Hydrocarbons	ND	200	ug/m <sup>3</sup> Air							U
Benzene	ND	2.80	"							U
Toluene	ND	5.00	"							U
Ethylbenzene	ND	5.00	"							U
m,p-Xylene	ND	19.0	"							U
o-Xylene	ND	4.70	"							U

Surrogate: 1,2-Dichloroethane-d4	9.70		ppbv	10.0		97.0	70-130			
Surrogate: Toluene-d8	9.95		"	10.0		99.5	70-130			
Surrogate: 4-Bromofluorobenzene	9.25		"	10.0		92.5	70-130			

LCS (B2E2411-BS1)						Prepared: 05/24/2022 Analyzed: 05/24/2022			T	
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Benzene	36.5	2.80	ug/m <sup>3</sup> Air	31.9		114	70-130			
Toluene	41.4	5.00	"	37.7		110	70-130			
Ethylbenzene	44.0	5.00	"	43.4		101	70-130			
m,p-Xylene	183	19.0	"	174		105	70-130			
o-Xylene	45.8	4.70	"	43.4		105	70-130			

Surrogate: 1,2-Dichloroethane-d4	9.10		ppbv	10.0		91.0	70-130			
Surrogate: Toluene-d8	9.66		"	10.0		96.6	70-130			
Surrogate: 4-Bromofluorobenzene	10.0		"	10.0		100	70-130			

LCS Dup (B2E2411-BSD1)						Prepared: 05/24/2022 Analyzed: 05/24/2022			T	
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Benzene	36.2	2.80	ug/m <sup>3</sup> Air	31.9		113	70-130	0.878	25	
Toluene	41.1	5.00	"	37.7		109	70-130	0.731	25	
Ethylbenzene	43.7	5.00	"	43.4		101	70-130	0.792	25	
m,p-Xylene	168	19.0	"	174		96.8	70-130	8.46	25	
o-Xylene	45.1	4.70	"	43.4		104	70-130	1.43	25	

Surrogate: 1,2-Dichloroethane-d4	8.91		ppbv	10.0		89.1	70-130			
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Broomfield CO 80020

Brock Nelson  
Project Number: [none]  
Project: PDC - Booth 11,12,21-31U & 31AU

**Volatile Organic Compounds by TO-15 in Air - Quality Control**  
**Origins Laboratory, Inc.**

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Batch B2E2411 - Default Prep - Air

LCS Dup (B2E2411-BSD1)

Prepared: 05/24/2022 Analyzed: 05/24/2022

T

Surrogate: Toluene-d8	8.85		ppbv	10.0		88.5	70-130			
Surrogate: 4-Bromofluorobenzene	10.2		"	10.0		102	70-130			

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Tasman Geosciences  
6855 West 119th Avenue  
Broomfield CO 80020

Brock Nelson  
Project Number: [none]  
Project: PDC - Booth 11,12,21-31U & 31AU

### Notes and Definitions

U Sample is Non-Detect.

T The TO-15 analysis is not part of the NELAC accreditation

ND Analyte NOT DETECTED at or above the reporting limit

RPD Relative Percent Difference

All soil results are reported at a wet weight basis.

Origins Laboratory, Inc.



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