

State of Colorado
Energy & Carbon Management Commission1120 Lincoln Street, Suite 801, Denver, Colorado 80203
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07/25/2024

Report taken by:

Chris Sanchez

Site Investigation and Remediation Workplan (Supplemental Form)

This form shall be submitted to the Director for approval prior to the initiation of site investigation and remediation activities. However, this shall not preclude the Operator from taking immediate action to protect public health or safety, the environment, wildlife, or livestock.

This Form 27 describes site conditions as currently understood by the Operator; approval of this Form 27 by ECMC is based on the site conditions accurately described herein; any changes in site conditions identified during or subsequent to the performance of the approved workplan may necessitate additional investigation or remediation which shall be described on a supplemental Form 27. This Form 27 is intended to provide basic information regarding the proposed site investigation and remediation actions, but the workplan may be more fully described in attached documentation.

Closure request is not available for an Initial Site Investigation and Remediation Workplan.

OPERATOR INFORMATION

Name of Operator: PDC ENERGY INC	Operator No: 69175	Phone Numbers
Address: 1099 18TH STREET SUITE 1500		Phone: (303) 860-5800
City: DENVER	State: CO	Zip: 80202
Contact Person: Karen Olson	Email: taspillremediationcontractor@pdce.com	Mobile: ()

PROJECT, PURPOSE & SITE INFORMATION

PROJECT INFORMATION

Remediation Project #: 22370 Initial Form 27 Document #: 402982089

PURPOSE INFORMATION

- ☐ Rule 913.c.(1): Pit or Cuttings Trench closure.
- ☒ Rule 913.c.(2): Buried or partially buried vessel closure, which will be by removal.
- ☐ Rule 913.c.(3): Remediation of Spill and Releases pursuant to Rule 912.
- ☐ Rule 913.c.(4): Land treatment of Oily Waste pursuant to Rule 905.e.
- ☐ Rule 913.c.(5): Closure of Centralized E&P Waste Management Facilities pursuant to Rule 907.h.
- ☐ Rule 913.c.(6): Remediation of impacted Groundwater pursuant to Rule 915.e.(3).D, and the contaminant concentrations in Table 915-1.
- ☐ Rule 913.c.(7): Investigation and remediation of natural gas in soil or Groundwater.
- ☐ Rule 913.c.(8): When requested by the Director due to any potential risk to soil, Groundwater, or surface water.
- ☒ Rule 913.c.(9): Decommissioning of Oil and Gas Facilities.
- ☐ Rule 913.g: Changes of Operator.
- ☒ Rule 915.b: Request to leave elevated inorganics in situ.
- ☐ Other: _____

SITE INFORMATION

Yes Multiple Facilities

Facility Type: WELL	Facility ID: _____	API #: 123-14193	County Name: WELD
Facility Name: TWO E RANCH 2-11	Latitude: 40.245390	Longitude: -104.520890	
** correct Lat/Long if needed: Latitude: _____		Longitude: _____	
QtrQtr: NENW	Sec: 11	Twp: 3N	Range: 64W
Meridian: 6	Sensitive Area? Yes		

Facility Type: LOCATION	Facility ID: 327122	API #: _____	County Name: WELD
Facility Name: TWO E RANCH-63N64W 11NENW	Latitude: 40.245337	Longitude: -104.520812	
** correct Lat/Long if needed: Latitude: 40.245571		Longitude: -104.521170	
QtrQtr: NENW	Sec: 11	Twp: 3N	Range: 64W
Meridian: 6	Sensitive Area? Yes		

SITE CONDITIONS

General soil type - USCS Classifications SM

Most Sensitive Adjacent Land Use Ranch land

Is domestic water well within 1/4 mile? No

Is surface water within 1/4 mile? No

Is groundwater less than 20 feet below ground surface? No

Other Potential Receptors within 1/4 mile

Tank Battery: Livestock: 0' (within ranch land).

Wellhead (Two E Ranch 2-11): Livestock: 0' (within ranch land).

SITE INVESTIGATION PLAN

TYPE OF WASTE:

- ☒ E&P Waste ☐ Other E&P Waste ☐ Non-E&P Waste
- ☒ Produced Water ☐ Workover Fluids
- ☒ Oil ☐ Tank Bottoms
- ☒ Condensate ☐ Pigging Waste
- ☐ Drilling Fluids ☐ Rig Wash
- ☐ Drill Cuttings ☐ Spent Filters
- ☐ Pit Bottoms
- ☐ Other (as described by EPA)

DESCRIPTION OF IMPACT

Impacted?	Impacted Media	Extent of Impact	How Determined
Yes	GROUNDWATER	Refer to Table 5 and Figures 3-5	Confirmation Groundwater Sampling
Yes	SOILS	Refer to Tables 1-4 and Figures 1-5	Confirmation Soil Sampling

INITIAL ACTION SUMMARY

Description of initial action or emergency response measures take to abate, investigate, and/or remediate impacts associated with E&P Waste.

On June 24, 2022, field screening and confirmation soil sampling was conducted in accordance with the ECOM Rule 911 during the decommissioning and closure of the Two E Ranch 2-11 tank battery and wellhead (Figure 1). Based on initial analytical results, it was determined that a historic release was discovered below the former above ground storage tank (AST). Following the discovery, mitigation activities were initiated to delineate and remove remaining hydrocarbon impacts. Between June 24 and September 7, 2022, approximately 5,186 cubic yards (CY) of impacted material were removed and transported to the Buffalo Ridge Waste Management Facility for disposal under PDC manifests. Between June 24 and July 12, 2022, three (3) soil samples (AST01, SS01, and SS02) were collected from impacted source material below and adjacent to the AST between approximately 0-6 inches and 10 feet bgs. The samples were submitted for laboratory analysis of the full ECOM Table 915-1 analyte suite. Laboratory analytical results from the source samples indicated COCs include BTEX, 1,2,4-TMB, 1,3,5-TMB, naphthalene, TPH (C6-C36), acenaphthene, benz(a)anthracene, benzo(a)pyrene, chrysene, fluoranthene, fluorene, pyrene, 1-M, 2-M, and pH.

PROPOSED SAMPLING PLAN

Proposed Soil Sampling

- ☒ Will soil samples be collected as part of this investigation? (Number, type (grab/composite), analyses, and locations of samples):

Between August 12 and September 7, 2022, one hundred fourteen (114) soil samples (SS03-SS65, SS68-SS89, SS96-SS124) were collected from the base and sidewalls of the excavation and submitted for analysis for the above mentioned COCs. Additionally, soil samples (SS66, SS67, SS90, SS92) were collected from approximately 2.5 feet bgs and submitted for laboratory analysis of pH, EC, SAR, and boron. Analytical results indicated that organic compounds were in compliance of applicable ECOM Table 915-1 standards from the final excavation extent.

Proposed Groundwater Sampling

- ☒ Will groundwater samples be collected as part of this investigation? (Number, analyses, and locations of samples):

On August 16 2022, groundwater was encountered at approximately 22 feet bgs in the excavation. Consequently, one groundwater sample (GW01) was collected from the excavation and submitted for laboratory analysis of BTEX, naphthalene, 1,2,4-TMB, and 1,3,5-TMB. Analytical results indicated that total xylenes, 1,2,4-TMB, and 1,3,5-TMB were in exceedance of the applicable ECOM Table 915-1 Standards.

Proposed Surface Water Sampling

- ☐ Will surface water samples be collected as part of this investigation? (Number, analyses, and locations of samples):

Additional Investigative Actions

- ☐ Additional alternative investigative actions described in attached Site Investigation Plan (summary):

During decommissioning activities soil samples were collected below the wellhead and wellhead flowline riser and submitted for laboratory analysis of Table 915-1 Organic Compounds in Soil, TPH (C6-C36), and Soil Suitability for Reclamation. Additionally, soil samples were collected at the separator flowline, separator dump-line, and above ground storage tank and submitted for analysis of BTEX, naphthalene, 1,2,4-TMB, 1,3,5-TMB, and TPH (C6-C36). Soil samples were also collected from the produced water vessel (PWV) base and sidewall which exhibited the highest PID response and were submitted for laboratory analysis of BTEX, naphthalene, 1,2,4-TMB, 1,3,5-TMB, TPH (C6-C36), pH, EC, SAR, and boron.

Nine (9) five-point spoil pile composite samples (SP01-SP09) were collected from the staged excavated soil and analyzed for the above mentioned COCs, pH, EC, SAR, and boron. Analytical results indicated all spoil pile samples were in compliance of the applicable ECOM Table 915-1 standards.

SITE INVESTIGATION REPORT

SAMPLE SUMMARY

Soil

Number of soil samples collected 139

Number of soil samples exceeding 915-1 88

Was the areal and vertical extent of soil contamination delineated? Yes

Approximate areal extent (square feet) 9343

NA / ND

-- Highest concentration of TPH (mg/kg) 6890

-- Highest concentration of SAR 3.69

BTEX > 915-1 Yes

Vertical Extent > 915-1 (in feet) 21

Groundwater

Number of groundwater samples collected 1

Was extent of groundwater contaminated delineated? No

Depth to groundwater (below ground surface, in feet) 22

Number of groundwater monitoring wells installed 0

Number of groundwater samples exceeding 915-1 1

-- Highest concentration of Benzene (µg/l) 1.2

ND Highest concentration of Toluene (µg/l)

-- Highest concentration of Ethylbenzene (µg/l) 110

-- Highest concentration of Xylene (µg/l) 2400

NA Highest concentration of Methane (mg/l)

Surface Water

0 Number of surface water samples collected

Number of surface water samples exceeding 915-1

If surface water is impacted, other agency notification may be required.

OTHER INVESTIGATION INFORMATION

☐ Were impacts to adjacent property or offsite impacts identified?

☒ Were background samples collected as part of this site investigation?

On June 24, 2022, two (2) background soil samples (BKG01) were collected from native material up-gradient of the wellhead at approximately 3 feet and 6 feet bgs and submitted for laboratory analysis of pH. Analytical results indicated that pH was in compliance of the applicable regulatory standards in native soil.

Additionally, between June 27 and August 15, 2022, eight (8) background soil samples (BKG02 & BKG03) were collected from native material up-gradient of the wellhead at approximately 0-6 inches, 1 foot, 2 feet, 2.5 feet, 4 feet, 6 feet, 12 feet, and 17 feet bgs and submitted for laboratory analysis of ECMCTable 915-1 metals and pH. Analytical results indicated pH in exceedance of the applicable regulatory standards in BKG02 @ 1' and BKG02 @ 2'; however, these samples will not be utilized due to being located within the final excavation extent. In addition, arsenic and selenium was observed in exceedance of the applicable regulatory standards in native material.

☒ Was investigation derived waste (IDW) generated as part of this investigation?

Volume of solid waste (cubic yards) 5186

Volume of liquid waste (barrels) 0

☒ Is further site investigation required?

On December 20, 2022, five soil borings (BKG04 – BKG08) were advanced to a depth of approximately 22 feet bgs to assess pH concentrations in native soil on site. Lithologic descriptions and volatile organic compound (VOC) concentrations measured using a photoionization detector (PID) were recorded for each soil boring. Thirty-seven (37) background soil samples were collected at depths ranging from 0-6 inches to 22 feet bgs and were submitted to Summit Scientific Laboratory (Summit) for analysis of pH.

Background soil analytical results indicated that pH was in exceedance of the applicable ECMC Table 915-1 regulatory standard in all five background soil boring locations. Based on the analytical results, pH levels recorded during source mass removal activities are below background concentrations and indicative of native soil conditions.

Between December 21, and December 30, 2022, 12 monitoring wells (BH01 – BH12) were installed to delineate dissolved-phase hydrocarbon impacts within and adjacent to the former excavation extent. Lithologic descriptions and VOC concentrations measured using a PID were recorded for each monitoring well.

REMEDIAL ACTION PLAN

Does this Supplemental Form 27A include changes to a previously approved Remedial Action Plan? No

SOURCE REMOVAL SUMMARY

Describe how source is to be removed.

Between February 14 and June 30, 2022, approximately 5,186 cubic yards of impacted material were removed from the tank battery excavation and transported to the Buffalo Ridge Waste Management Facility in Keenesburg, CO for disposal under PDC waste manifests.

REMEDIATION SUMMARY

Describe how remediation of existing impacts to soil and groundwater is to be accomplished (i.e. summarize remedial action plan). Provide a brief narrative description including: technical justification, schedule for implementation, estimated time to attain NFA status, plus plans and specifications for the selected remedial action technology.

Based on analytical results received for the initial groundwater monitoring assessment, monitored natural attenuation (MNA) was the selected remediation strategy during the first quarter 2023 and will remain the selected remediation strategy through the third quarter 2024.

Soil Remediation Summary

<input type="checkbox"/> In Situ	<input checked="" type="checkbox"/> Ex Situ
_____ Bioremediation (or enhanced bioremediation)	Yes _____ Excavate and offsite disposal
_____ Chemical oxidation	_____ If Yes: Estimated Volume (Cubic Yards) _____ 5186
_____ Air sparge / Soil vapor extraction	_____ Name of Licensed Disposal Facility or ECMC Facility ID # _____
_____ Natural Attenuation	_____ Excavate and onsite remediation
_____ Other _____	_____ Land Treatment
	_____ Bioremediation (or enhanced bioremediation)
	_____ Chemical oxidation
	_____ Other _____

Groundwater Remediation Summary

_____ Bioremediation (or enhanced bioremediation)
_____ Chemical oxidation
_____ Air sparge / Soil vapor extraction
Yes _____ Natural Attenuation
_____ Other _____

GROUNDWATER MONITORING

If groundwater has been impacted, describe proposed monitoring plan, including # of wells or sample points, monitoring schedule, analytical methods, points of compliance. Attach a groundwater monitoring location diagram.

PDC will conduct quarterly groundwater monitoring at the 12 site monitoring wells (BH01 - BH12) until closure criteria are met. Groundwater samples will be submitted for laboratory analysis chloride anions by EPA Method 300.0 in accordance with Table 915-1. Per the approved Supplemental Form 27 (Document No. 403609904), benzene, toluene, ethylbenzene, total xylenes (BTEX), naphthalene, 1,2,4-trimethylbenzene (TMB), 1,3,5-TMB, total dissolved solids (TDS), and sulfates were removed from the quarterly sampling and analysis plan following the fourth quarter 2023.

Second quarter 2024 analytical results indicated that the chloride anion concentration was in exceedance of the applicable ECMC Table 915-1 regulatory standard and greater than 1.25x the background concentrations of the up- and cross-gradient monitoring wells (BH01, BH05, and BH06) in monitoring well BH03.

Prior to the second quarter 2024 groundwater monitoring event, a re-development event was conducted at monitoring well BH03 to attempt to clear out any sediment from the screen and bottom of the well casing. Based on the results from the second quarter 2024 groundwater monitoring event, a path forward will be determined for the chloride exceedance following receipt of third quarter 2024 groundwater analytical results.

Chlorine anion concentration trends were examined over time and compared to historic background data and groundwater flow direction. Based on the data, there is a steady rise in both groundwater elevation and the chloride anion concentrations in monitoring well BH03 over time. This trend will continue to be monitored in the third quarter 2024. The graph illustrating the data is included as Attachment A.

REMEDIATION PROGRESS UPDATE

PERIODIC REPORTING

Approved Reporting Schedule:

☒ Quarterly☐ Semi-Annually☐ Annually☐ Other

☐ Request Alternative Reporting Schedule:

☐ Semi-Annually☐ Annually☐ Other

Rule 913.e:

After initial approval of a Form 27, the Operator will provide quarterly update reports in a Supplemental Form 27 to document progress of site investigation and remediation, unless an alternative reporting schedule has been requested by the Operator and approved by the Director. The Director may request a more frequent reporting schedule based on site-specific conditions.

Report Type:

☒ Groundwater Monitoring☐ Land Treatment Progress Report☐ O&M Report☐ Other

Adequacy of Operator's General Liability Insurance and Financial Assurance

Describe the adequacy of the Operator's general liability insurance and Financial Assurance to fully address the anticipated costs of Remediation, including the estimated remaining cost for this project (below).

If this information has been provided on a Form 27 within the last 12 months, provide the Document Number of that form.

Financial assurance information was included in the fourth quarter 2023 Supplemental Form 27 (Document No. 403609904). This section and estimate will be updated on an annual basis until closure criteria are achieved.

Operator anticipates the remaining cost for this project to be: \$ 10000

WASTE DISPOSAL INFORMATION

Was E&P waste generated as part of this remediation? Yes

Describe beneficial use, if any, of E&P Waste derived from this remediation project:

No beneficial use

Volume of E&P Waste (solid) in cubic yards 5186

E&P waste (solid) description Hydrocarbon impacted soils

ECMC Disposal Facility ID #, if applicable:

Non-ECMC Disposal Facility: Buffalo Ridge Waste Management

Volume of E&P Waste (liquid) in barrels 0

E&P waste (liquid) description

ECMC Disposal Facility ID #, if applicable:

Non-ECMC Disposal Facility:

REMEDIATION COMPLETION REPORT

REMEDIATION COMPLETION SUMMARY

Is this a Final Closure Request for this Remediation Project? No

If YES:

☐ Compliant with Rule 913.h.(1).

☐ Compliant with Rule 913.h.(2).

☐ Compliant with Rule 913.h.(3).

Do all soils meet Table 915-1 standards?

Does the previous reply indicate consideration of background concentrations?

Does Groundwater meet Table 915-1 standards?

Is additional groundwater monitoring to be conducted? _____

Operator shall comply with the ECMC 1000-Series Reclamation Requirements for all impacted and disturbed areas.

RECLAMATION PLAN

RECLAMATION PLANNING

Describe reclamation plan. Discuss existing and new grade recontouring; method and testing of compaction alleviation; and reseeding program, including location of new seed, seed mix and noxious weed prevention. Attach diagram or drawing.

Following wellhead and flowline abandonment activities, the location was backfilled, compacted, and re-contoured to match pre-existing conditions. The location will be reclaimed in accordance with the ECMC 1000 series.

Following supplemental source mass removal activities at the former tank battery location, the location was backfilled, compacted, and re-contoured to match pre-existing conditions. The location will be reclaimed in accordance with the ECMC 1000 series.

Is the described reclamation complete? Yes

Does the reclamation described herein constitute interim or final reclamation of the Oil and Gas Location?

☒ Interim ☐ Final

Did the Surface Owner provide the seed mix? _____

If YES, does the seed mix comply with local soil conservation district recommendations? _____

Did the local soil conservation district provide the seed mix? _____

SITE RECLAMATION DATES

Proposed date of commencement of Reclamation. 06/24/2022

Proposed date of completion of Reclamation. 09/16/2027

IMPLEMENTATION SCHEDULE

Per Rule 913.d.(2): Any change from the approved implementation schedule will be requested at least 14 days in advance, and the Operator may not make the change without the Director's approval.

PRIOR DATES

Date of Surface Owner notification/consultation, if required. 12/03/2021

Actual Spill or Release date, or date of discovery. 06/24/2022

SITE INVESTIGATION DATES

Date of Initial Actions described in Site Investigation Plan (start date). 04/01/2022

Proposed site investigation commencement. 12/20/2022

Proposed completion of site investigation. 12/30/2022

REMEDIAL ACTION DATES

Proposed start date of Remediation. 06/24/2022

Proposed date of completion of Remediation. 09/16/2027

Per Rule 913.d.(2): Any change from the approved implementation schedule will be requested at least 14 days in advance, and the Operator may not make the change without the Director's approval.

☒ Change from approved implementation schedule per Rule 913.d.(2).

Basis for change in implementation schedule:

Supplemental site investigation activities were completed during monitoring well installation activities. No further site investigation is required at this time.

OPERATOR COMMENT

This Supplemental Form 27 was submitted to summarize quarterly groundwater monitoring activities and analytical results collected during the second quarter 2024 at the former Two E Ranch 2-11 tank battery location.

Second quarter 2024 analytical results indicated that the chloride anion concentration was in exceedance of the applicable ECMC Table 915-1 regulatory standard and greater than 1.25x the background concentrations in monitoring well BH03.

Prior to the second quarter 2024 groundwater monitoring event, a re-development event was conducted at monitoring well BH03 to attempt to clear out any sediment from the screen and bottom of the well casing. Based on the results from the second quarter 2024 groundwater monitoring event, a path forward will be determined for the chloride exceedance following receipt of third quarter 2024 groundwater analytical results.

Chlorine anion concentration trends were examined over time and compared to historic background data and groundwater flow direction. Based on the data, there is a steady rise in both groundwater elevation and the chloride anion concentrations in monitoring well BH03 over time. This trend will continue to be monitored in the third quarter 2024. The graph illustrating the data is included as Attachment A.

I hereby certify all statements made in this form are to the best of my knowledge true, correct, and complete.

Signed: Karen Olson

Title: Remediation Advisor

Submit Date: 07/25/2024

Email: taspillremediationcontractor@pdce.com

Based on the information provided herein, this Application for Site Investigation and Remediation Workplan complies with ECMC Rules and applicable orders and is hereby approved.

ECMC Approved: Chris Sanchez

Date: 08/30/2024

Remediation Project Number: 22370

COA Type

Description

	Operator shall add Spill ID # 482506 to Site information, Facility Type on the next Supplemental Form 27. In Addition, the Operator shall check the box for Rule 913.c.(3): Remediation of Spill and Releases pursuant to Rule 912.
	Operator shall continue Quarterly Reporting until the Site Assessment is completed and the remediation area demonstrates Compliance with Table 915-1 Standards.
2 COAs	

ATTACHMENT LIST

Upon approval, the approved Form 27 and all listed attachments will be indexed to the Remediation Project file. Only the approved Form 27 will also be indexed to the related Facilities.

Att Doc Num

Name

403830537	INVESTIGATION/REMEDATION WORKPLAN (SUPPLEMENTAL)
403863777	MONITORING REPORT
403906397	FORM 27-SUPPLEMENTAL-SUBMITTED

Total Attach: 3 Files

General Comments

User Group

Comment

Comment Date

		Stamp Upon Approval
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Total: 0 comment(s)