

State of Colorado
Energy & Carbon Management Commission1120 Lincoln Street, Suite 801, Denver, Colorado 80203
Phone: (303) 894-2100 Fax: (303) 894-2109

Document Number:

403655141

Receive Date:

02/15/2024

Report taken by:

Alexander Ahmadian

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 #: 21306 Initial Form 27 Document #: 402886642

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

No Multiple Facilities

Facility Type: TANK BATTERY	Facility ID: 454142	API #: _____	County Name: WELD
Facility Name: Boulter-Kawata Tank Battery	Latitude: 40.318654	Longitude: -104.765803	
	** correct Lat/Long if needed: Latitude: 40.318622	Longitude: -104.765942	
QtrQtr: NENW	Sec: 15	Twp: 4N	Range: 66W Meridian: 6 Sensitive Area? Yes

SITE CONDITIONS

General soil type - USCS Classifications SM Most Sensitive Adjacent Land Use Residential / Agriculture

Is domestic water well within 1/4 mile? Yes Is surface water within 1/4 mile? Yes

Is groundwater less than 20 feet below ground surface? Yes

Other Potential Receptors within 1/4 mile

Nearest Well: domestic - 133' SSW; Surface Water: Freshwater Pond - 1,210' SE, Occupied Building: 470' E; FWS Wetlands: 665' E Freshwater Emergent Wetland (PEM1A).

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 Figure 2	Groundwater Sampling
Yes	SOILS	Refer to Tables 1-4 and Figures 1-3	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 February 14, 2022, field screening and confirmation soil sampling was conducted in accordance with the ECMC Rule 911 during the decommissioning and closure of the Boulter 15-21 Tank Battery (Figure 1). Based on initial results, it was determined that a historic release was discovered below both the former above ground storage tank (AST) and separator. Following the discovery, mitigation activities were initiated to delineate and remove remaining hydrocarbon impacts. Approximately 10,819 cubic yards (CY) of impacted material were removed under a stamped Engineered Excavation Plan and transported to the North Weld Waste Management Facility and Buffalo Ridge Management Facility for disposal under PDC manifests. In addition, groundwater vacuum recovery was conducted concurrent to excavation activities and to date 1,910 barrels (bbls) of groundwater were removed from the excavation and transported to NGL C4 for disposal under PDC waste manifests. Between February 15 and 24, 2022, six (6) soil samples (SEP01-B, SEP01-W @ 4', AST02-S, AST02-B, SS01, & SS12) were collected from impacted source material below and adjacent to the AST and separator between approximately 4 feet and 20 feet bgs. The samples were submitted for laboratory analysis of the full ECMC 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), 1-M, 2-M arsenic, barium, lead, selenium, 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 May 31 and June 30, 2022, ninety (90) soil samples (SS13-SS17, SS24-SS29, SS32-SS109, & SS116) were collected from the base and sidewalls of the engineered excavation and submitted for analysis for the above mentioned COCs. Soil samples (SS110-SS115) 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 ECMC Table 915-1 standards from the engineered excavation extent. Additionally, arsenic, barium, selenium, and/or pH were observed in exceedance of the applicable standards in 86 of the 90 final excavation extent soil samples.

Proposed Groundwater Sampling

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

On February 24, 2022, groundwater was encountered at approximately 20 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 all analyzed constituents were in exceedance of the applicable ECMC 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):

Overburden composite samples (CS01-CS05) were collected from stockpiled material in 5-point composite samples and submitted for the above mentioned COCs as well as soil suitability for reclamation. Analytical results indicated arsenic and selenium returned in exceedance of the applicable ECMC Table 915-1 Standards in all composite samples; however, consistent with levels observed in excavation extent samples. Additionally, CS02 returned with a pH and lead exceedance; therefore, these overburden soil piles were disposed of under PDC waste manifests. Additionally, a five point spoil pile sample (SP01) was collected beneath the excavated soil staging area and analyzed for the above mentioned COCs. Analytical results indicated arsenic, lead, and selenium were in exceedance of the applicable ECMC Table 915-1 standards. Three soil samples (BF01-BF03) was collected from imported backfill material and submitted for laboratory analysis of pH, EC, SAR and boron.

SITE INVESTIGATION REPORT

SAMPLE SUMMARY

Soil

Number of soil samples collected 162

Number of soil samples exceeding 915-1 106

Was the areal and vertical extent of soil contamination delineated? No

Approximate areal extent (square feet) 19391

NA / ND

-- Highest concentration of TPH (mg/kg) 420

-- Highest concentration of SAR 1.87

BTEX > 915-1 Yes

Vertical Extent > 915-1 (in feet) 35

Groundwater

Number of groundwater samples collected 1

Was extent of groundwater contaminated delineated? No

Depth to groundwater (below ground surface, in feet) 20

Number of groundwater monitoring wells installed 0

Number of groundwater samples exceeding 915-1 1

-- Highest concentration of Benzene (µg/l) 54

ND Highest concentration of Toluene (µg/l)

ND Highest concentration of Ethylbenzene (µg/l)

-- Highest concentration of Xylene (µg/l) 470

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 April 10, and April 14, 2023, five background soil borings (BKG02-BKG06) were advanced to a depth of approximately 35 feet bgs to assess metals and pH concentrations in native soil on site. Lithologic descriptions and VOC concentrations measured using a PID were recorded for each soil boring. Twenty-five (25) background soil samples were collected at depths ranging from 7 feet to 35 feet bgs and were submitted to Summit for analysis of arsenic, barium, lead, selenium and pH.

Background soil analytical results indicated that arsenic, barium, and lead concentrations were in exceedance of the applicable regulatory standards in native soil on site. In addition, based on the location of hydraulically up- / cross-gradient point of compliance (POC) wells BH03, BH06, BH07, BH10, BH11, BH14, and BH15, outside of the former excavation extent and off of the former tank battery pad, the soil samples collected from the aforementioned wells are considered background material.

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

Volume of solid waste (cubic yards) 1149

Volume of liquid waste (barrels) 0

☐ Is further site investigation required?

Between April 6, and April 12, 2023, 15 monitoring wells (BH01-BH15) were installed to delineate dissolved-phase hydrocarbon impacts within and surrounding the former excavation extent. Lithologic descriptions and VOC concentrations measured using a PID were recorded for each monitoring well. Per the COA issued in the approved Supplemental Form 27 (Document No. 403207174), one soil sample was collected from each monitoring well at the interval exhibiting the highest VOC concentration. Additionally, elevated PID readings and hydrocarbon staining were encountered during the installation of monitoring well BH09. Consequently, one sample was collected from the interval exhibiting the highest PID reading, as well as from the terminus of the soil boring. Sixteen (16) soil samples were collected at depths ranging from approximately 7 feet to 35 feet bgs and submitted to Summit for analysis of BTEX, naphthalene, 1,2,4-TMB, 1,3,5-TMB, TPH(C6-C36), 1-M, 2-M, arsenic, barium, lead, selenium, and pH.

Soil analytical results indicated that organic compound concentrations were in compliance with the applicable ECMC Protection of Groundwater SSLs in all soil sample locations. Arsenic concentrations were in exceedance of the applicable regulatory standard in all soil sample locations, barium was in exceedance of the regulatory standard in BH01, BH02, and BH14, and pH was in exceedance of the regulatory standard in BH05 and BH09.

Supplemental site investigation activities are required to delineate the arsenic, lead, and selenium exceedances recorded in composite soil sample S01. Eleven soil borings will be advanced to approximately 5 feet bgs within and surrounding the former stockpile extent. Four additional background soil borings will be advanced during site investigation activities to assess metals concentrations in the shallow subsurface. Proposed soil boring locations are illustrated on Figure 4.

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.

On June 8, 2022, a release was observed at the ongoing Boulter 15-21 tank battery. The spill occurred during source mass removal excavation activities for remediation project #21306 where a hydraulic line broke on the dewatering pump. During excavation activities the dewatering pump stopped working, upon inspection the leak was found. The hydraulic line failure resulted in the release of 0.5 gallons of hydraulic fluid outside of secondary containment into an open excavation with groundwater. Mitigation activities were initiated immediately and impacts from the hydraulic line leak were removed during excavation and dewatering activities. Additionally, impacted groundwater and soil was removed and transported to the North Weld Waste Management Facility and NGL C4 for disposal under PDC waste manifests. The hydraulic leak occurred at 28 feet bgs in the excavation and impacted material has been removed while continuing excavation activities on-site. The above referenced confirmation soil samples confirm the extent of impacted material has been removed. All work under spill ID 482342 will proceed under current remediation project #21306, the subject of this report.

Between February 14 and June 30, 2022, approximately 10,819 cubic yards of impacted material were removed from the excavation under a stamped Engineered Excavation Plan and transported to the North Weld Waste Management Facility in Ault, Colorado and the Buffalo Ridge Management Facility in Keenesburg, CO for disposal under PDC waste manifests. In addition, groundwater vacuum recovery was conducted concurrent to the excavation activities and approximately 1,910 barrels (bbls) of groundwater were removed from the excavation and transported to NGL C4 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 background soil analytical results, pH remains outside of ECMC Table 915-1 regulatory standards in soil samples SS29 @ 14', SS56 @ 21', BH05 @ 35', BH09 @ 28', and BH09 @ 35'. Based on the depths of these observed inorganic impacts, PDC is requesting to leave the soil in place and will include a reclamation plan on a forthcoming Supplemental Form 27.

Soil analytical results indicated that selenium concentrations were in compliance with the applicable ECMC Table 915-1 regulatory standard in all 25 background soil sample locations and in monitoring wells BH08, BH09, BH12, and BH13, collected from native material beneath the former base of the excavation. Based on these results, and by using the background soil boring locations as delineation points, the selenium exceedances recorded in soil samples collected from the final excavation extent have been successfully delineated on site.

Background and site data for arsenic and barium in soils were compared using the non-parametric Mann-Whitney-Wilcoxon rank-sum test to assess if site concentrations were substantially higher than background concentrations. Based on the results, arsenic and barium concentrations recorded in the site data were not substantially different than background concentrations and consequently, are indicative of native soil conditions. The Mann-Whitney-Wilcoxon rank-sum test calculations, hypotheses test conditions, and conclusions are included in the approved second quarter Supplemental Form 27 (Document No. 403437667).

Monitored natural attenuation (MNA) was selected as the remediation strategy for this location during the second quarter 2023, and will remain the selected remediation strategy for the first quarter 2024.

Soil Remediation Summary

☐ In Situ

Bioremediation (or enhanced bioremediation)

Chemical oxidation

Air sparge / Soil vapor extraction

Natural Attenuation

Other

☒ Ex Situ

Yes

Excavate and offsite disposal

If Yes: Estimated Volume (Cubic Yards)

1149

Name of Licensed Disposal Facility or COGCC Facility ID #

Excavate and onsite remediation

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.

During the first quarter 2024, groundwater samples were submitted for laboratory analysis of benzene, toluene, ethylbenzene, and total xylenes (BTEX), naphthalene, 1,2,4-trimethylbenzene, and 1,3,5-trimethylbenzene by EPA Method 8260B, chloride and sulfate anions by EPA Method 300.0, and TDS by method SM2450C in accordance with Table 915-1.

First quarter 2024 analytical results indicated that the benzene concentration was in exceedance of the applicable ECMC Table 915-1 regulatory standard in monitoring well BH04. Organic compound concentrations were in compliance with the applicable regulatory standards in the remaining 14 monitoring well locations. Additionally, inorganic parameters were in compliance with the applicable regulatory standards or within 1.25x the background concentrations of the up- and cross-gradient monitoring wells (BH03, BH07, BH10, BH11, BH14, and BH15) in all monitoring well locations.

During the first quarter 2024, four consecutive quarters of inorganic compound concentrations in compliance with the applicable regulatory standards were achieved. Consequently, PDC is requesting to remove TDS, chloride, and sulfate from the quarterly sampling and analysis plan.

Groundwater monitoring will continue on a quarterly basis at the 15 site monitoring wells (BH01 - BH15). Groundwater will be monitored for BTEX, naphthalene, 1,2,4-TMB, and 1,3,5-TMB until closure criteria are achieved.

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 third quarter 2023 Supplemental Form 27 (Document No. 403500902). 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: \$ 35000

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 1149

E&P waste (solid) description Hydrocarbon impacted soils

ECMC Disposal Facility ID #, if applicable:

Non-ECMC Disposal Facility: North Weld Waste Management & Buffalo Ridge 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 supplemental source mass removal activities at the former tank battery location, the location will be 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? _____

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. 02/15/2022

Proposed date of completion of Reclamation. 01/05/2028

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. 07/26/2021

Actual Spill or Release date, or date of discovery. 02/16/2022

SITE INVESTIGATION DATES

Date of Initial Actions described in Site Investigation Plan (start date). 12/24/2021

Proposed site investigation commencement. 06/30/2024

Proposed completion of site investigation. 06/30/2024

REMEDIAL ACTION DATES

Proposed start date of Remediation. 02/15/2022

Proposed date of completion of Remediation. 01/05/2028

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 are required to delineate the arsenic, lead, and selenium exceedances recorded in composite soil sample S01. Eleven soil borings will be advanced to approximately 5 feet bgs within and surrounding the former stockpile extent. Four additional background soil borings will be advanced during site investigation activities to assess metals concentrations in the shallow subsurface. Proposed soil boring locations are illustrated on Figure 4.

OPERATOR COMMENT

This Supplemental Form 27 was submitted to summarize quarterly groundwater monitoring activities and analytical results collected during the first quarter 2024 at the former Boulder 15-21 tank battery location.

First quarter 2024 analytical results indicated that the benzene concentration was in exceedance of the applicable ECMC Table 915-1 regulatory standard in monitoring well BH04. Organic compound concentrations were in compliance with the applicable regulatory standards in the remaining 14 monitoring well locations. Additionally, inorganic parameters were in compliance with the applicable regulatory standards or within 1.25x the background concentrations of the up- and cross-gradient monitoring wells in all monitoring well locations.

During the first quarter 2024, four consecutive quarters of inorganic parameters in compliance with the applicable regulatory standards were achieved. Consequently, PDC is requesting to remove TDS, chloride, and sulfate from the quarterly sampling and analysis plan.

Supplemental site investigation activities are required to delineate the arsenic, lead, and selenium exceedances recorded in composite soil sample S01. Eleven soil borings will be advanced to approximately 5 feet bgs within and surrounding the former stockpile extent. Four additional background soil borings will be advanced during site investigation activities to assess metals concentrations in the shallow subsurface. The proposed soil boring locations are illustrated on Figure 4.

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

Signed: Karen Olson

Title: Senior Program Manager

Submit Date: 02/15/2024

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: Alexander Ahmadian

Date: 03/06/2024

Remediation Project Number: 21306

COA Type

Description

	ECMC agrees to the amended sampling plan. Inorganic parameters at this location appear to be in compliance with up gradient and cross gradient samples.
1 COA	

Attachment Check 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

403655141	INVESTIGATION/REMEDIATION WORKPLAN (SUPPLEMENTAL)
403686329	MONITORING REPORT
403710404	FORM 27-SUPPLEMENTAL-SUBMITTED

Total Attach: 3 Files

General Comments

User Group

Comment

Comment Date

		Stamp Upon Approval
--	--	---------------------

Total: 0 comment(s)