

State of Colorado
Energy & Carbon Management Commission

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Report taken by:
RICK ALLISON

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

PROJECT, PURPOSE & SITE INFORMATION

PROJECT INFORMATION

Remediation Project #: 27259 Initial Form 27 Document #: 403303448

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: <u>LOCATION</u>	Facility ID: <u>437494</u>	API #: _____	County Name: <u>WELD</u>
Facility Name: <u>Thornton 18L-HZ Pad</u>	Latitude: <u>40.569500</u>	Longitude: <u>-104.714130</u>	
	** correct Lat/Long if needed: Latitude: <u>40.570139</u>	Longitude: <u>-104.715467</u>	
QtrQtr: <u>SWSW</u>	Sec: <u>18</u>	Twp: <u>7N</u>	Range: <u>65W</u> Meridian: <u>6</u> Sensitive Area? <u>Yes</u>

Facility Type: <u>WELL</u>	Facility ID: _____	API #: <u>123-39562</u>	County Name: <u>WELD</u>
Facility Name: <u>Thornton 18L-401</u>	Latitude: <u>40.569507</u>	Longitude: <u>-104.714141</u>	
	** correct Lat/Long if needed: Latitude: _____	Longitude: _____	
QtrQtr: <u>SWSW</u>	Sec: <u>18</u>	Twp: <u>7N</u>	Range: <u>65W</u> Meridian: <u>6</u> Sensitive Area? <u>Yes</u>

SITE CONDITIONS

General soil type - USCS Classifications SM

Most Sensitive Adjacent Land Use Agricultural

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

Tank Battery: Nearest Well: Irrigation - 679' NNW; Surface Water: Eaton Ditch - 185' SSW; Occupied Building: 201' NE; Livestock: 225' NE; FWS Wetlands: 185' SSW Riverine (R4SBC); HPH Sensitive Wildlife Habitat: Rule 309.e.1: 818' ENE - Bald Eagle Roost Site; 100-Year Floodplain 1,499' W of Tank Battery.

Wellhead (Thornton 18L-401): Nearest Well: Irrigation - 1,032' ESE; Surface Water: Eaton Ditch - 206' SW; Occupied Building: 440' NNW; Livestock: 410' NNW; FWS Wetlands: 206' SSW Riverine (R4SBC); HPH Sensitive Wildlife Habitat: Rule 309.e.1: 637' ENE - Bald Eagle Roost Site.

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	SOILS	Tables 1-5 and Figs 1&2	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.

In accordance with ECMC Rule 911, this form serves as notification for the decommissioning and abandonment of the Thornton 18L-401 production facility, Thornton 18L-401 wellhead, and removal of the associated flowline. The ground and sub-surfaces will be visually inspected for hydrocarbon impacts during equipment decommissioning. In addition, on-site dump lines located between the separator and tank battery will be removed by pulling from either end during decommissioning activities. Field observations and photo documentation will be recorded in a field inspection form for submittal to the ECMC.

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):

Soil samples will be collected from the surface in cardinal directions of the wellhead, as defined in the Rule 911.a.(4) guidance document (9/20/21), for field screening purposes. Grab soil samples will be collected below and/or adjacent to applicable facility equipment, as defined in the Rule 911.a.(4) guidance document (9/20/21), for field screening purposes. Discrete soil samples will be collected for laboratory analysis either in any area of observed hydrocarbon impacts, or in the sample locations designated by the ECMC. GPS data will be collected for all soil sample locations. Soil samples collected at the tank battery will be submitted for laboratory for analysis of BTEX, naphthalene, TPH (C6-C36), 1,2,4-TMB, and 1,3,5-TMB by EPA Methods 8260B and 8015. Soil samples will be collected adjacent to the wellhead from native material and submitted for laboratory analysis of Organic Compounds in Soil, soil suitability, and TPH (C6-C36).

Proposed Groundwater Sampling

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

If groundwater is encountered during decommissioning and/or abandonment activities, a grab sample will be collected as soon as practical. If contaminated soil is in contact with groundwater or if free product/hydrocarbon sheen are observed, the release will be reported in accordance with Rule 912.b. Groundwater samples will be submitted for laboratory analysis of BTEX, naphthalene, 1,2,4-trimethylbenzene, and 1,3,5-trimethylbenzene by EPA Method 8260.

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):

If a produced water vessel is present, discrete soil samples will be collected from the base of the excavation and excavation sidewall in areas most likely to be impacted and exhibiting the highest field screened VOC concentration. The soil samples will be submitted for additional laboratory analysis of EC, pH, SAR, and boron. In addition, tank battery dump lines will be removed by pulling from either end. Assessments will be conducted during the removal of the on-location flowline (estimated to be 199 feet in length) and soil samples will be collected below the flowline risers. The flowline and adjacent sub-surface will be inspected for any visual and olfactory indicators of potential failure and hydrocarbon impacts. Soils will be field screened below the flowline and if suspected impacts are observed, a soil sample will be collected for an initial assessment. Samples will be submitted for laboratory analysis of Organic Compounds in Soil and TPH (C6-C36).

SITE INVESTIGATION REPORT

SAMPLE SUMMARY

Soil

Number of soil samples collected 16

Number of soil samples exceeding 915-1 5

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

Approximate areal extent (square feet) 100

NA / ND

-- Highest concentration of TPH (mg/kg) 0.55

-- Highest concentration of SAR 4.76

BTEX > 915-1 No

Vertical Extent > 915-1 (in feet) 7

Groundwater

Number of groundwater samples collected 0

Was extent of groundwater contaminated delineated? Yes

Depth to groundwater (below ground surface, in feet)

Number of groundwater monitoring wells installed

Number of groundwater samples exceeding 915-1

Highest concentration of Benzene (µg/l)

Highest concentration of Toluene (µg/l)

Highest concentration of Ethylbenzene (µg/l)

Highest concentration of Xylene (µg/l)

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 11, 2023, five (5) background samples (BKG01 @ 0-6", BKG01 @ 2', BKG01 @ 4', BKG01 @ 5', BKG01 @ 6' and BKG01 @ 7') were collected from native material topographically upgradient of the wellhead and tank battery location and submitted for analysis of EC and metals. Analytical results indicated that EC concentrations were in compliance with the applicable Table 915-1 standard in native material. Additionally, arsenic and barium concentrations were above the applicable ECMC regulatory Table 915-1 standards in all background soil samples.

In addition, on December 28, 2023, thirty-six (36) background samples (BKG02 - BKG05) were collected from native material adjacent to the tank battery location at depths ranging from 2 feet and 10 feet bgs, and submitted for analysis of EC, arsenic and barium. Analytical results indicated that arsenic and barium concentrations exceeded the applicable ECMC Table 915-1 standards in native material.

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

Volume of solid waste (cubic yards)

Volume of liquid waste (barrels)

Is further site investigation required?

Up to four (4) soil borings will be advanced in the vicinity of the former produced water vessel to horizontally and vertically to delineate the EC exceedance observed in soil samples SB10@3', 4', 5' and 6'. Soil Samples will be collected from the soil borings between 2 feet and 10 feet bgs, as appropriate for delineation. The delineation soil samples will be submitted for laboratory analysis of EC.

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 April 11, 2023, during tank battery and wellhead closure activities and the removal of the associated flowline, approximately 9 cubic yards of impacted material was removed from the SEP01-DL excavation and approximately 2 cubic yards of impacted material was removed from the SEP01-FL excavation and transported to the North Weld Waste Management Facility for disposal under PDC waste manifests.

REMEDICATION 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.

On December 28, 2023, eleven soil borings (SB01-SB11) were advanced via hand auger to delineate the vertical and horizontal extents of EC, arsenic and barium exceedances observed during initial decommissioning activities at the Thornton 18L-401 Tank Battery. Five soil samples were collected from SB10 between 2 feet and 6 feet bgs. and one soil sample was collected from SB11 at 2 feet bgs, from soil adjacent to and below PWV01-N@2' and submitted for laboratory analysis of EC. Analytical results indicated that EC levels were in exceedance of the applicable COGCC Table 915-1 standards and background concentrations for soil samples SB10@3', 4' 5' and 6'.

Additionally nineteen (19) soil samples (SB01-SB09) were collected between depths of approximately 5 feet to 8 feet bgs to confirm, as well as vertically and horizontally delineate arsenic and/or barium exceedances observed during decommissioning activities. Soil samples were submitted for laboratory analysis and/or barium as necessary. Analytical results indicated that arsenic was in exceedance of the applicable ECMC Table 915-1 standards and background concentrations in SB01@7', SB02@5', and SB04@7', and barium was in exceedance in soil sample SB05 @5'.

Soil Remediation Summary

In Situ

Ex Situ

_____ Bioremediation (or enhanced bioremediation)

_____ Excavate and offsite disposal

_____ Chemical oxidation

_____ If Yes: Estimated Volume (Cubic Yards) _____

_____ 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

_____ 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.

Groundwater was not encountered during initial decommissioning activities at the tank battery or wellhead.

REMEDIATION PROGRESS UPDATE

PERIODIC REPORTING

Approved Reporting Schedule:

Quarterly Semi-Annually Annually Other

Confirmation Sample Summary and Supplemental Site Investigation Proposal

Request Alternative Reporting Schedule:

Semi-Annually Annually Other

Confirmation Sample Summary and Supplemental Site Investigation Proposal

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 Confirmation Sample Summary and Supplemental Site Investigation Proposal

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.

Operator does not have site-specific financial assurance for this project; however, Operator has inactive well, blanket, and surface bonding including Surety IDs 106077122, 106473808, and 106473820, as well as commercial general liability and/or umbrella/excess insurance meeting the requirements of Rule 705.b. Operator does not anticipate making an insurance claim for this project.

- Investigation of the organics in soils at the tank battery and wellhead has been completed.
- Facility and infrastructure were decommissioned and the location will be reclaimed in accordance with the ECMC 1000 Series.
- Further soil investigation activities are required at the former PWV01-N sample location to delineate elevated EC concentrations.
- Investigation of metals in soils at the tank battery has been completed.

Costs included herein are estimates only and may change over time based on numerous factors. Accordingly, Operator makes no guarantees as to the accuracy of such cost estimates, thus providing an estimate for the next year below.

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 11

E&P waste (solid) description Hydrocarbon impacted material

ECMC Disposal Facility ID #, if applicable: _____

Non-ECMC Disposal Facility: North Weld Waste Management Facility

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 tank battery, 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 COGCC 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. 04/11/2023

Proposed date of completion of Reclamation. 03/19/2025

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. 01/16/2023

Actual Spill or Release date, or date of discovery. _____

SITE INVESTIGATION DATES

Date of Initial Actions described in Site Investigation Plan (start date). 02/16/2023

Proposed site investigation commencement. 04/01/2024

Proposed completion of site investigation. 06/30/2024

REMEDIAL ACTION DATES

Proposed start date of Remediation. 04/11/2023

Proposed date of completion of Remediation. 03/19/2025

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:

Based on the evaluation of the soil analytical results and the need for supplemental site investigation activities, the proposed date of site investigation commencement and the proposed date of the completion of site investigation was adjusted to span through the second quarter of 2024.

OPERATOR COMMENT

This Supplemental Form 27 was submitted to summarize supplemental site investigation activities and EC, arsenic, and barium analytical results collected during December of 2023 at the former Thornton 18L-401 Tank Battery location.

Arsenic:

Soil analytical results received for soil samples collected during supplemental site investigation and delineation activities indicated that arsenic concentrations were in compliance with the ECMC Table 915-1 standard or within 1.25x the average background concentration in all soil boring locations, excluding SB01@7', SB02@5', and SB04@7'. Consequently, a statistical analysis was conducted to evaluate the arsenic concentrations recorded in confirmation soil samples and background samples collected on site. Due to the non-parametric distribution of the data, the Mann-Whitney-Wilcoxon rank-sum test was utilized to assess if site concentrations were representative of native background conditions. The analysis indicated arsenic concentrations were not significantly higher than background concentrations and consequently, representative of background conditions. Please see the attached Metals Statistical Evaluation, Attachment C, for further discussion on the arsenic assessment and supporting data.

Barium:

Soil analytical results received for soil samples collected during supplemental site investigation and delineation activities indicated that barium was horizontally and vertically delineated to below ECMC Table 915-1 standards or within 1.25x the average background concentrations (146 mg/kg) in all soil boring locations, excluding SB05@5' with a concentration of 221 mg/kg. Additionally, the barium exceedance originally observed in soil sample location SEP01-FL-B@6' (434 mg/kg) could not be replicated in the resample location SB06@6' (127 mg/kg). Despite the few locations remaining above 1.25x the average barium background concentration, similarities were observed between confirmation and background datasets, as identified below.

- Approximately 90% of the barium concentrations in both datasets are generally consistently distributed between 15.1 mg/kg and 249 mg/kg. (Site samples: 12 of 14 samples; Background samples: 39 of 42 samples).

- The remaining approximately 10% of the soil samples exist significantly higher than the aforementioned datasets, and are present between 386 mg/kg and 789 mg/kg. Elevated barium concentrations are present as follows: Site samples: 429 mg/kg & 434 mg/kg; Background samples: 386 mg/kg, 527 mg/kg, & 789 mg/kg.

The data suggests that soils in this location generally exist between a specific range and may exhibit high naturally occurring barium concentrations in soil. Due to the similarities in the confirmation and background barium datasets distributions, PDC believes the confirmations samples are representative of native material conditions. The graph illustrating distribution of barium concentrations at this location are included in Attachment D.

Should the ECMC agree with the assessment of arsenic and barium concentrations observed at this location, PDC will proceed with future site investigation efforts focused solely on delineating EC levels remaining on location.

Following approval of this form and land owner approval, PDC will conduct a supplemental site investigation to advance soil borings in order to delineate EC exceedances in the vicinity of the former produced water vessel at the former Thornton 18L-401 tank battery. Supplemental Form 27s will be prepared and submitted on a quarterly schedule to provide updates and progress of the remediation until closure criteria has been achieved.

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: 03/22/2024

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: RICK ALLISON

Date: 05/03/2024

Remediation Project Number: 27259

<u>COA Type</u>	<u>Description</u>
0 COA	

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.

<u>Att Doc Num</u>	<u>Name</u>
403697987	INVESTIGATION/REMEDATION WORKPLAN (SUPPLEMENTAL)
403699030	SOIL SAMPLE LOCATION MAP
403725169	ANALYTICAL RESULTS

403725174	SOIL SAMPLE LOCATION MAP
403727637	OTHER
403728722	OTHER
403778898	FORM 27-SUPPLEMENTAL-SUBMITTED

Total Attach: 7 Files

General Comments

<u>User Group</u>	<u>Comment</u>	<u>Comment Date</u>
		Stamp Upon Approval

Total: 0 comment(s)