

State of Colorado Oil and Gas Conservation Commission

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Report taken by:

Kari Brown

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 COGCC 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
Address: <u>1775 SHERMAN STREET - STE 3000</u>		Phone: <u>(303) 860-5800</u>
City: <u>DENVER</u>	State: <u>CO</u>	Zip: <u>80203</u>
Contact Person: <u>Karen Olson</u>	Email: <u>COGCCSpillRemediation@pdce.com</u>	Mobile: <u>()</u>

PROJECT, PURPOSE & SITE INFORMATION

PROJECT INFORMATION

Remediation Project #: 18120 Initial Form 27 Document #: 402688194

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>WELL</u>	Facility ID: _____	API #: <u>123-09749</u>	County Name: <u>WELD</u>
Facility Name: <u>DINNER 2</u>	Latitude: <u>40.308748</u>	Longitude: <u>-104.747662</u>	
** correct Lat/Long if needed: Latitude: _____		Longitude: _____	
QtrQtr: <u>NESW</u>	Sec: <u>14</u>	Twp: <u>4N</u>	Range: <u>66W</u>
Meridian: <u>6</u>	Sensitive Area? <u>Yes</u>		
Facility Type: <u>LOCATION</u>	Facility ID: <u>318704</u>	API #: _____	County Name: <u>WELD</u>
Facility Name: <u>DINNER-64N66W 14NESW</u>	Latitude: <u>40.308575</u>	Longitude: <u>-104.747670</u>	
** correct Lat/Long if needed: Latitude: <u>40.308318</u>		Longitude: <u>-104.747603</u>	
QtrQtr: <u>NESW</u>	Sec: <u>14</u>	Twp: <u>4N</u>	Range: <u>66W</u>
Meridian: <u>6</u>	Sensitive Area? <u>Yes</u>		

SITE CONDITIONS

General soil type - USCS Classifications SM

Most Sensitive Adjacent Land Use 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

Tank Battery: Nearest Well: Monitoring - 445 feet NE, Surface Water: Unnamed Irrigation Pond - 20 feet SW, Occupied Building - 1,125 feet W, Livestock - 1,010 feet W, FWS Wetlands - 250 feet SE.

Wellhead: Nearest Well: Monitoring 355 feet NE, Surface Water: 225 SE, Unnamed Holding/Retention Pond, Occupied Buildings: 1,100 feet W, Livestock: 1,035 feet W, FWS Wetlands: Freshwater Emergent Wetland: 465 feet SE

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	Confirmation Groundwater Sampling
Yes	SOILS	Refer to Tables 1-4 and Figures 1-4	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 July 7, 2021, historic hydrocarbon impacts were discovered near the production lines during decommissioning activities at the Dinner 2, E Unit 2 Tank Battery. Following the discovery, excavation activities were initiated to delineate and remove remaining hydrocarbon impacted material. During excavation activities, groundwater was encountered at approximately 13 feet below ground surface (bgs). Approximately 569.5 cubic yards of impacted material were removed and transported to the North Weld Landfill for disposal under PDC waste manifests. Petroleum hydrocarbon impacted soils were observed at a depth of 22 feet bgs from the excavation. In order to most efficiently determine the extent of soil impacts, eighteen (18) soil borings were advanced between July 20 and September 8, 2021 as detailed in the previously submitted Supplemental Form 27.

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 October 4 and December 14, 2021, twenty-three (23) soil borings (SB19 - SB340, & SB35R) were advanced via hollow-stem drilling methods to approximately 33 feet bgs. Lithologic descriptions and volatile organic compound (VOC) concentrations using a photoionization detector (PID) were recorded for each boring. Soil samples were collected from select depths within the unsaturated and saturated intervals based on the visual observations and VOC concentrations. The samples were submitted for laboratory analysis of BTEX, naphthalene, 1,2,4-TMB, 1,3,5-TMB, and TPH (C6-C36), arsenic, and selenium. Partial analytical results and VOC concentrations indicate organic compounds concentrations in exceedance of applicable COGCC Table 915-1 SSLs have been defined vertically and horizontally. Soil boring locations are illustrated on Figure 1 and the preliminary soil analytical results are summarized on Table 1.

Proposed Groundwater Sampling

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

During excavation activities, groundwater was encountered at approximately 13 feet bgs. On July 7, 2021, one groundwater sample (GW01) was collected from the excavation and submitted for analysis of benzene, toluene, ethylbenzene, total xylenes (BTEX), naphthalene, 1,2,4-trimethylbenzene (TMB), and 1,3,5-TMB. Analytical results indicated that select organic compound concentrations were in exceedance of the applicable Table 915-1 groundwater standards. The groundwater sample location is illustrated on Figure 2 and the groundwater analytical results are summarized in Table 5.

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):

Seven (7) remediation wells were installed on December 20 - 22, 2021, using hollow-stem drilling methodology. The remediation wells were utilized in a pilot test between January 18, and January 22, 2022, to measure the air sparge (AS) and soil vapor extraction (SVE) radius of influence to determine the viability and design of a potential full scale remediation system. The results of the pilot test indicated that the subsurface responded favorably to both AS and SVE remediation techniques.

SITE INVESTIGATION REPORT

SAMPLE SUMMARY

Soil

Number of soil samples collected 169
Number of soil samples exceeding 915-1 140
Was the areal and vertical extent of soil contamination delineated? Yes
Approximate areal extent (square feet) 76000

NA / ND

-- Highest concentration of TPH (mg/kg) 5310
-- Highest concentration of SAR 0.749
BTEX > 915-1 Yes
Vertical Extent > 915-1 (in feet) 33

Groundwater

Number of groundwater samples collected 1
Was extent of groundwater contaminated delineated? No
Depth to groundwater (below ground surface, in feet) 13
Number of groundwater monitoring wells installed 0
Number of groundwater samples exceeding 915-1 1

-- Highest concentration of Benzene (µg/l) 160
-- Highest concentration of Toluene (µg/l) 1.7
-- Highest concentration of Ethylbenzene (µg/l) 310
-- Highest concentration of Xylene (µg/l) 6500
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?

Based on the results from the initial drilling investigation conducted on the July 20 and July 21, 2021, the lateral extent of hydrocarbon impacts extend southwest and northwest beyond the lease boundary.

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

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

Volume of solid waste (cubic yards) 570 Volume of liquid waste (barrels) 345

☒ Is further site investigation required?

Based on the analytical results collected during the preliminary drilling investigation conducted from July 20 through December 14, petroleum hydrocarbon impacted soils have been defined vertically and horizontally. Further site investigation activities are required to assess arsenic and selenium concentrations in native soil on site. Additional site investigation activities and groundwater monitoring plan will be determined following land-access approval.

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.

Following the discovery, approximately 569.5 cubic yards of impacted material were removed and transported to the North Weld Waste Management Facility for disposal under PDC waste manifests. During excavation activities, groundwater was encountered within the excavation at approximately 13 feet bgs. Groundwater vacuum recovery activities were conducted concurrent with excavation activities and approximately 345 barrels of groundwater were removed and transported to the NGL C6 Energy facility for disposal.

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.

An AS/SVE pilot test was conducted between January 18, and January 22, 2022 at the 7 remediation wells to assess the efficacy of this remedial approach to address residual petroleum hydrocarbon impacts within the unsaturated and saturated intervals, as well as to acquire design parameters for full-scale implementation. Results of the pilot test indicated that the subsurface responded favorably to AS and SVE. Due to land-access impediments, further remediation implementation will commence at a later date.

Soil Remediation Summary

☐ In Situ

☒ Ex Situ

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

Yes _____ Excavate and offsite disposal
_____ If Yes: Estimated Volume (Cubic Yards) _____ 570
_____ 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
_____ 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.

Based on the analytical data collected during source mass removal activities, PDC will conduct quarterly groundwater monitoring until closure criteria are met. Following land-access agreements and prior to installation, a proposed monitoring well location map will be submitted for COGCC approval.

REMEDIATION PROGRESS UPDATE

PERIODIC REPORTING

Approved Reporting Schedule:

☐ Quarterly

☐ Semi-Annually

☐ Annually

☒ Other

Timeline Update

☐ **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 Timeline Update

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 570

E&P waste (solid) description Hydrocarbon impacted soil.

COGCC Disposal Facility ID #, if applicable: _____

Non-COGCC Disposal Facility: North Weld Waste Management Facility

Volume of E&P Waste (liquid) in barrels 345

E&P waste (liquid) description Hydrocarbon impacted groundwater

COGCC Disposal Facility ID #, if applicable: _____

Non-COGCC Disposal Facility: NGL C6

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 COGCC 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. 07/01/2021

Proposed date of completion of Reclamation. 12/17/2031

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. 11/10/2020

Actual Spill or Release date, or date of discovery. 07/07/2021

SITE INVESTIGATION DATES

Date of Initial Actions described in Site Investigation Plan (start date). 06/03/2021

Proposed site investigation commencement. 07/20/2021

Proposed completion of site investigation. 12/14/2021

REMEDIAL ACTION DATES

Proposed start date of Remediation. 07/01/2021

Proposed date of completion of Remediation. 12/17/2031

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:

OPERATOR COMMENT

The AS/SVE pilot test indicated that the subsurface responded favorably to this remediation strategy. Due to land-access impediments, further remediation implementation will be conducted at a later date. Additionally, per the COA issued by the COGCC in the approved Supplemental Form 27 (Document No. 402902496), a supplemental site investigation will be conducted to assess arsenic and selenium concentrations in native soil on site. Supplemental site investigation activities will be conducted following land-access negotiations. A proposed soil boring location map will be submitted to the COGCC following the current road construction on location.

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: 06/02/2022

Email: COGCCSpillRemediation@pdce.com

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

COGCC Approved: Kari Brown

Date: 06/22/2022

Remediation Project Number: 18120

Condition of Approval**COA Type****Description**

0 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**

403065410	FORM 27-SUPPLEMENTAL-SUBMITTED
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Total Attach: 1 Files

General Comments**User Group****Comment****Comment Date**

		Stamp Upon Approval
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Total: 0 comment(s)