

State of Colorado Oil and Gas Conservation Commission

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Document Number:

402542926

Receive Date:

12/01/2020

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 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.

Refer to Rules 340, 905, 906, 907, 908, 909, and 910

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>karen.olson@pdce.com</u>	Mobile: <u>()</u>

PROJECT, PURPOSE & SITE INFORMATION

PROJECT INFORMATION

Remediation Project #: 10672Initial Form 27 Document #: 401452818

PURPOSE INFORMATION

- | | |
|--|--|
| <input type="checkbox"/> 901.e. Sensitive Area Determination | <input checked="" type="checkbox"/> 909.c.(5), Rule 910.b.(4): Remediation of impacted ground water |
| <input checked="" type="checkbox"/> 909.c.(1), Rule 905: Pit or PW vessel closure | <input type="checkbox"/> Rule 909.e.(2)A.: Notice completion of remediation in accordance with Rule 909.b. |
| <input checked="" type="checkbox"/> 909.c.(2), Rule 906: Spill/Release Remediation | <input type="checkbox"/> Rule 909.e.(2)B.: Closure of remediation project |
| <input type="checkbox"/> 909.c.(3), Rule 907.e.: Land treatment of oily waste | <input type="checkbox"/> Rule 906.c.: Director request |
| <input type="checkbox"/> 909.c.(4), Rule 908.g.: Centralized E&P Waste Management Facility closure | <input type="checkbox"/> Other _____ |

SITE INFORMATION

N Multiple Facilities (in accordance with Rule 909.c.)

Facility Type: <u>SPILL OR RELEASE</u>	Facility ID: <u>451116</u>	API #: _____	County Name: <u>WELD</u>
Facility Name: <u>Eldridge 4-23</u>		Latitude: <u>40.475524</u>	Longitude: <u>-104.736213</u>
		** correct Lat/Long if needed: Latitude: <u>40.475525</u>	Longitude: <u>-104.736236</u>
QtrQtr: <u>SENE</u>	Sec: <u>23</u>	Twp: <u>6N</u>	Range: <u>66W</u>
		Meridian: <u>6</u>	Sensitive Area? <u>No</u>

SITE CONDITIONS

General soil type - USCS Classifications SCMost Sensitive Adjacent Land Use agricultureIs domestic water well within 1/4 mile? NoIs surface water within 1/4 mile? YesIs groundwater less than 20 feet below ground surface? Yes

Other Potential Receptors within 1/4 mile

Seeley Lake, various

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	190' x 80'	groundwater sampling
Yes	SOILS	130' x 130'	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 January 15 and 16, 2019, Eagle installed 10 air sparge (AS) wells and 15 soil vapor extraction (SVE) wells at the Eldridge 4-23 site. AS/SVE conveyance lines were installed on January 30 and 31, 2019 and AS/SVE system startup activities commenced on February 15, 2019. Due to generator issues the AS/SVE system ran intermittently until February 22, 2019 when issues were resolved. The system has been operating consistently since that time.

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):

During monitoring well installation activities, Eagle logged the soil samples to identify signs of subsurface impacts. A calibrated photoionization detector (PID) was utilized to detect the presence of volatile organic compounds (VOCs). The soil sample exhibiting the highest PID reading within the unsaturated zone from each replacement well was submitted to Origins Laboratory (Origins) for BTEX, GRO, and DRO analysis. In October 2020 soil borings will be advanced to evaluate SVE system performance. Proposed boring location map is attached.

Proposed Groundwater Sampling

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

On September 20, 2019, Eagle gauged and collected groundwater samples from 18 monitoring wells onsite (MW-03, MW-04, MW-05, MW-06R, MW-07R, MW-08R, MW-10R, MW-11R, MW-12R, MW-14, MW-16R, MW-17R, MW-18R, MW-21R, MW-23R, MW-24R, MW-25R, and MW-26). Monitoring wells MW-01, MW-02, MW-13R, MW-15, MW-19, MW-20, MW-22, and MW-26 were dry and unable to be sampled. Groundwater samples were submitted to Origins Laboratory for analysis of benzene, toluene, ethylbenzene, and total xylenes (BTEX). Quarterly sampling is ongoing.

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):

On August 14, 2019, Eagle installed six replacement monitoring wells (MW-16R, MW-18R, MW-21R, MW-23R, MW-24R, and MW-25R) utilizing a 7822DT Series Geoprobe track rig at the Eldridge 4-23 site per the COA on the previously approved SF27. Each well was advanced to a total depth of approximately 17 feet below ground surface (bgs). Each replacement well was completed with 10 feet of 2-inch, 0.010-inch slotted polyvinyl chloride (PVC) screen, followed by 7 feet of 2-inch PVC riser to grade. Silica sand (10/20) was placed approximately 1 foot above the screened interval followed by bentonite. All monitoring wells were completed at the surface with traffic-rated, 8-inch steel flush mounts.

On September 24, 2020 replacement monitoring wells MW-26R, as well as an additional monitoring well MW 27 located inbetween MW-18 and MW-19 were installed. On October 6, 2020 six additional remediation wells (3 AS and 3 SVE) were installed and 5 borings were advanced.

SITE INVESTIGATION REPORT

SAMPLE SUMMARY

Soil

Number of soil samples collected 6

Number of soil samples exceeding 910-1 2

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

Approximate areal extent (square feet) 20

NA / ND

-- Highest concentration of TPH (mg/kg) 896

NA Highest concentration of SAR

BTEX > 910-1 Yes

Vertical Extent > 910-1 (in feet) 10

Groundwater

Number of groundwater samples collected 18

Was extent of groundwater contaminated delineated? Yes

Depth to groundwater (below ground surface, in feet) 7

Number of groundwater monitoring wells installed 25

Number of groundwater samples exceeding 910-1 3

-- Highest concentration of Benzene (µg/l) 2820

-- Highest concentration of Toluene (µg/l) 2.9

-- Highest concentration of Ethylbenzene (µg/l) 85

-- Highest concentration of Xylene (µg/l) 1150

NA Highest concentration of Methane (mg/l)

Surface Water

0 Number of surface water samples collected

0 Number of surface water samples exceeding 910-1

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

OTHER INVESTIGATION INFORMATION

☒ Were impacts to adjacent property or offsite impacts identified?

Impacted soil above Table 910-1 in MW-18R. No soil impacts identified in the two soil boring completed as replacement MW-26R and MW-27. See attached figures, tables, and lab analytical reports. Remediation system expansion in the area of MW-18R was completed. See attached figure.

☐ 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)

Volume of liquid waste (barrels)

☒ Is further site investigation required?

PDC will continue to sample the monitoring wells on a quarterly basis to assess the dissolved - phase petroleum hydrocarbon impacts in groundwater using USEPA Method 8260. Groundwater sampling will continue until four consecutive quarters of groundwater monitoring data indicate that BTEX concentrations are in compliance with COGCC Table 910-1 groundwater standards. As groundwater impacts decrease monitoring wells may be removed from the sampling plan as long as point of compliance is maintained. Periodic soil resamples to check AS/SVE system remediation progress.

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.

Initial source removal was completed via excavation in June 2017. Additional 1800 cubic yards of impacted soil were excavated to finish source removal activities in September 2018, and more carbon and gypsum amendment placed in the excavation before backfill in the SW corner of the site where the trench was opened up for amendment placement.

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.

On January 15 and 16, 2019, Eagle installed 10 air sparge (AS) wells and 15 soil vapor extraction (SVE) wells at the Eldridge 4-23 site. AS/SVE conveyance lines were installed on January 30 and 31, 2019 and AS/SVE system startup activities commenced on February 15, 2019. Due to generator issues the AS/SVE system ran intermittently until February 22, 2019 when issues were resolved. The system has been operating consistently since that time.

On October 6, 2020, Eagle expanded the remediation system, adding three 3 AS wells AS 11-13, and three SVE wells SVE 16-18 wells and advanced five borings (SB-08-SB12) to assess soil impacts beneath the site due to water table fluctuations.

Soil Remediation Summary

☒ In Situ

_____ Bioremediation (or enhanced bioremediation)

Yes _____ Chemical oxidation

Yes _____ Air sparge / Soil vapor extraction

_____ Natural Attenuation

_____ Other _____

☒ Ex Situ

Yes _____ Excavate and offsite disposal

If Yes: Estimated Volume (Cubic Yards) _____ 1800

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)

Yes _____ Chemical oxidation

Yes _____ 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.

PDC will continue to sample the monitoring wells on a quarterly basis to assess the dissolved - phase petroleum hydrocarbon impacts in groundwater using USEPA Method 8260. Groundwater sampling will continue until four consecutive quarters of groundwater monitoring data indicate that BTEX concentrations are in compliance with COGCC Table 910-1 groundwater standards. As groundwater impacts decrease monitoring wells may be removed from the sampling plan as long as point of compliance is maintained. Periodic soil resamples to check AS/SVE system remediation progress.

REMEDIATION PROGRESS UPDATE

PERIODIC REPORTING

Frequency: ☒ Quarterly ☐ Semi-Annually ☐ Annually ☐ Other _____

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

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:

impacted soil

Volume of E&P Waste (solid) in cubic yards 1800

E&P waste (solid) description hydrocarbon impacted soils

COGCC Disposal Facility ID #, if applicable: _____

Non-COGCC Disposal Facility: North Weld Landfill

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

E&P waste (liquid) description _____

COGCC Disposal Facility ID #, if applicable: _____

Non-COGCC Disposal Facility: _____

REMEDIATION COMPLETION REPORT

REMEDIATION COMPLETION SUMMARY

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

Do all soils meet Table 910-1 standards? No _____

Does the previous reply indicate consideration of background concentrations? _____

Are the only residual soil impacts pH, SAR, or EC at depths greater than 3 feet below ground surface? No _____

Does Groundwater meet Table 910-1 standards? No _____

Is additional groundwater monitoring to be conducted? Yes _____

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.

Location has been reclaimed and seeded per COGCC 1000 series rules.

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 approve the seed mix? Yes _____

If NO, does the seed mix comply with local soil conservation district recommendations? Yes _____

IMPLEMENTATION SCHEDULE

PRIOR DATES

Date of Surface Owner notification/consultation, if required. 09/11/2020

Actual Spill or Release date, if known. 06/14/2017

SITE INVESTIGATION DATES

Date of Initial Actions described in Site Investigation Plan (start date). 06/14/2017

Date of commencement of Site Investigation. 06/14/2017

Date of completion of Site Investigation. 03/01/2018

REMEDIAL ACTION DATES

Date of commencement of Remediation. 02/15/2019

Date of completion of Remediation.

SITE RECLAMATION DATES

Date of commencement of Reclamation. 02/04/2019

Date of completion of Reclamation. 02/08/2019

OPERATOR COMMENT

This SF27 is to report 3Q20 activities conducted at the Eldridge 4-23 location, including a summary of continued soil assessment activities, summary of the remediation system expansion, operational results for the remediation system and the 3Q20 quarterly groundwater monitoring results.

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

Signed: Karen Olson

Title: Snr. Program Manager

Submit Date: 12/01/2020

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: RICK ALLISON

Date: 12/28/2020

Remediation Project Number: 10672

COA Type

Description

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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

402542926	FORM 27-SUPPLEMENTAL-SUBMITTED
402542948	MONITORING REPORT

Total Attach: 2 Files

General Comments

User Group

Comment

Comment Date

		Stamp Upon Approval
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Total: 0 comment(s)