

State of Colorado Oil and Gas Conservation Commission

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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 #: 7846 Initial Form 27 Document #: 2145375

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 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 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>LOCATION</u>	Facility ID: <u>305118</u>	API #: _____	County Name: <u>WELD</u>
Facility Name: <u>BARRELL-66N64W 4NENE</u>		Latitude: <u>40.521140</u>	Longitude: <u>-104.548720</u>
** correct Lat/Long if needed: Latitude: _____		Longitude: _____	
QtrQtr: <u>NENE</u>	Sec: <u>4</u>	Twp: <u>6N</u>	Range: <u>64W</u>
Meridian: <u>6</u>		Sensitive Area? <u>Yes</u>	

SITE CONDITIONS

General soil type - USCS Classifications SM Most Sensitive Adjacent Land Use CULTIVATED

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

SURFACE WATER ~200' N, RESIDENTIAL BLDG ~975' W, AND A WATER WELL ~980' SW OF THE 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	GROUNDWATER	Refer to 4th Qtr 2017 GMA Report	Completion of site investigation plan.
Yes	SOILS	Refer to Figure 1 and Table 1	Completion of site investigation plan.

INITIAL ACTION SUMMARY

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

A FORM 19 WAS SUBMITTED ON MARCH 25, 2011 AND THE COGCC ASSIGNED SPILL TRACKING NUMBER 2213128 FOR THE SITE. IN ADDITION, PDC SUBMITTED A NO FURTHER ACTION REQUEST TO THE COGCC ON JULY 30, 2012. AN AERIAL MAP OF THE SITE IS INCLUDED AS FIGURE 1.

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 September 25, 2015, and November 3, 2017, supplemental site investigation activities were conducted to delineate the remaining petroleum hydrocarbon impacts within the unsaturated interval. 23 soil samples were collected from ten (10) boreholes (BH01-R, SS02A-R, SS02A-R2, and BH03 - BH09) at depths ranging between 22 feet and 34.5 feet below ground surface (bgs). Soil samples were submitted to Summit Scientific for laboratory analysis of benzene, toluene, ethylbenzene, total xylenes (BTEX), naphthalene, total petroleum hydrocarbons (TPH) – gasoline range organics (GRO) by USEPA Method 8260B, and TPH – diesel range organics (DRO) by USEPA Method 8015. Analytical results indicated that TPH concentrations remained in exceedance of regulatory standards below the former 2011 excavation extent between 22 feet and 35 feet bgs. Soil analytical results are summarized in Table 1 and sample locations are illustrated in Figure 1.

Proposed Groundwater Sampling

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

During supplemental site investigations, groundwater was encountered at approximately 36 feet bgs. Temporary monitoring wells were installed in each borehole for monitoring and remediation purposes. Groundwater samples were collected from 8 monitoring wells (SS02A-R2, and BH03 – BH09) and submitted for laboratory analysis of benzene, toluene, ethylbenzene, and total xylenes (BTEX) by USEPA Method 8260B. Analytical results indicated that benzene concentrations were above the applicable COGCC Table 910-1 standard in sample location SS02A-R2.

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):

SITE INVESTIGATION REPORT

SAMPLE SUMMARY

Soil

Number of soil samples collected 23

Number of soil samples exceeding 910-1 6

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

Approximate areal extent (square feet) 200

NA / ND

-- Highest concentration of TPH (mg/kg) 2760

NA Highest concentration of SAR

BTEX > 910-1 No

Vertical Extent > 910-1 (in feet) 35

Groundwater

Number of groundwater samples collected 8

Was extent of groundwater contaminated delineated? Yes

Depth to groundwater (below ground surface, in feet) 36

Number of groundwater monitoring wells installed 7

Number of groundwater samples exceeding 910-1 1

-- Highest concentration of Benzene (µg/l) 120

-- Highest concentration of Toluene (µg/l) 150

-- Highest concentration of Ethylbenzene (µg/l) 120

-- Highest concentration of Xylene (µg/l) 1200

NA Highest concentration of Methane (mg/l)

Surface Water

0 Number of surface water samples collected

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?

☐ 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?

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.

THE SOURCE AREA WAS PREVIOUSLY EXCAVATED AND IMPACTED MATERIAL WAS TRANSPORTED AND DISPOSED OF AS DESCRIBED IN THE FORM 19 SUBMITTED ON MARCH 25, 2011.

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.

Monitored natural attenuation (MNA) was selected as the remediation strategy for this site during the fourth quarter 2017 and will remain as the selected remediation strategy through the fourth quarter 2018. Additional remediation strategies are being evaluated to address remaining petroleum hydrocarbon concentrations in soil and groundwater. Source mass removal activities are scheduled for December 2018 and will be summarized in a forthcoming report.

Soil Remediation Summary

☐ In Situ

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

☐ Ex Situ

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

Between September 21 and November 3, 2017, eight monitoring wells (BH03 – BH09, and SS02A-R2) were installed to delineate the extent of dissolved-phase hydrocarbons in groundwater associated with the release discovered on February 10, 2011. On November 16, 2017, groundwater monitoring was conducted at all eight monitoring well locations (BH03 – BH09, and SS02A-R2). Quarterly groundwater monitoring will continue using USEPA Method 8260B. The extent of remaining groundwater impacts will be delineated following the plug and abandonment (P&A) of the facility. P&A activities are tentatively scheduled for August or September 2018.

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? _____

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

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

E&P waste (solid) description _____

COGCC Disposal Facility ID #, if applicable: _____

Non-COGCC Disposal Facility: _____

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

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? _____

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? _____

Does Groundwater meet Table 910-1 standards? _____

Is additional groundwater monitoring to be conducted? _____

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.

The area where the tank battery was located has been backfilled and compacted with clean material and the ground surface was contoured to match pre-existing conditions.

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 approve the seed mix? _____

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

IMPLEMENTATION SCHEDULE

PRIOR DATES

Date of Surface Owner notification/consultation, if required. _____

Actual Spill or Release date, if known. _____

SITE INVESTIGATION DATES

Date of Initial Actions described in Site Investigation Plan (start date). _____

Date of commencement of Site Investigation. 02/10/2011

Date of completion of Site Investigation. 06/21/2011

REMEDIAL ACTION DATES

Date of commencement of Remediation. 04/18/2012

Date of completion of Remediation. _____

SITE RECLAMATION DATES

Date of commencement of Reclamation. _____

Date of completion of Reclamation. _____

OPERATOR COMMENT

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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: _____

Email: Karen.Olson@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: _____

Date: _____

Remediation Project Number: 7846

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

401819073	REMEDIATION PROGRESS REPORT
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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)