

State of Colorado
Oil and Gas Conservation Commission

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Document Number:
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Receive Date:

Report taken by:

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>		Mobile: <u>()</u>
Contact Person: <u>Karen Olson</u>	Email: <u>COGCCSpillRemediation@pdce.com</u>	

PROJECT, PURPOSE & SITE INFORMATION

PROJECT INFORMATION

Remediation Project #: 18720 Initial Form 27 Document #: 402705254

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: Tank Battery Closure, Wellhead Closure and Flowline Removal

SITE INFORMATION

Yes Multiple Facilities

Facility Type: <u>WELL</u>	Facility ID: _____	API #: <u>123-34145</u>	County Name: <u>WELD</u>
Facility Name: <u>Larson Farms 5-24</u>	Latitude: <u>40.470780</u>	Longitude: <u>-104.499050</u>	
** correct Lat/Long if needed: Latitude: _____		Longitude: _____	
QtrQtr: <u>NESW</u>	Sec: <u>24</u>	Twp: <u>6N</u>	Range: <u>64W</u> Meridian: <u>6</u> Sensitive Area? <u>Yes</u>

Facility Type: <u>LOCATION</u>	Facility ID: <u>424718</u>	API #: _____	County Name: <u>WELD</u>
Facility Name: <u>Larson Farms Directional 3</u>	Latitude: <u>40.470940</u>	Longitude: <u>-104.498670</u>	
** correct Lat/Long if needed: Latitude: <u>40.470977</u>		Longitude: <u>-104.499144</u>	
QtrQtr: <u>NESW</u>	Sec: <u>24</u>	Twp: <u>6N</u>	Range: <u>64W</u> Meridian: <u>6</u> Sensitive Area? <u>Yes</u>

Facility Type: WELL	Facility ID: _____	API #: 123-34146	County Name: WELD
Facility Name: Larson Farms 6-24		Latitude: 40.470760	Longitude: -104.499110
		** correct Lat/Long if needed: Latitude: _____	Longitude: _____
QtrQtr: NESW	Sec: 24	Twp: 6N	Range: 64W Meridian: 6 Sensitive Area? Yes

Facility Type: WELL	Facility ID: _____	API #: 123-34147	County Name: WELD
Facility Name: Larson Farms 3-24		Latitude: 40.470800	Longitude: -104.498980
		** correct Lat/Long if needed: Latitude: _____	Longitude: _____
QtrQtr: NESW	Sec: 24	Twp: 6N	Range: 64W Meridian: 6 Sensitive Area? Yes

Facility Type: WELL	Facility ID: _____	API #: 123-34148	County Name: WELD
Facility Name: Larson Farms 4-24		Latitude: 40.470830	Longitude: -104.498920
		** correct Lat/Long if needed: Latitude: _____	Longitude: _____
QtrQtr: NESW	Sec: 24	Twp: 6N	Range: 64W Meridian: 6 Sensitive Area? Yes

Facility Type: WELL	Facility ID: _____	API #: 123-34149	County Name: WELD
Facility Name: Larson Farms 7-24		Latitude: 40.470730	Longitude: -104.499180
		** correct Lat/Long if needed: Latitude: _____	Longitude: _____
QtrQtr: NESW	Sec: 24	Twp: 6N	Range: 64W Meridian: 6 Sensitive Area? Yes

SITE CONDITIONS

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

Is domestic water well within 1/4 mile? No 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: Freshwater Pond - 42 feet S-SE of tank battery & Crow Creek - 172-193 feet NW of wellheads, FWS Wetlands: Freshwater Pond - 42 feet S-SE of tank battery & Freshwater Emergent Wetland Habitat - 64-88 feet NW of wellheads, HP Habitat: Aquatic Native Species Conservation - 0 feet (located within) & Pronghorn Winter Concentration - 0 feet (located within).

Flowline conflicts apparent as all five wellheads and tank battery are located within a designated Aquatic Native Species Conservation area and Pronghorn Winter Concentration area, < 90 feet from either freshwater pond and/or freshwater emergent wetland, and wellheads are <200 feet from Crow Creek.

SITE INVESTIGATION PLAN

TYPE OF WASTE:

<input checked="" type="checkbox"/> E&P Waste	<input type="checkbox"/> Other E&P Waste	<input type="checkbox"/> Non-E&P Waste
<input checked="" type="checkbox"/> Produced Water	<input type="checkbox"/> Workover Fluids	_____
<input checked="" type="checkbox"/> Oil	<input type="checkbox"/> Tank Bottoms	
<input checked="" type="checkbox"/> Condensate	<input type="checkbox"/> Pigging Waste	
<input type="checkbox"/> Drilling Fluids	<input type="checkbox"/> Rig Wash	
<input type="checkbox"/> Drill Cuttings	<input type="checkbox"/> Spent Filters	
	<input type="checkbox"/> Pit Bottoms	
	<input type="checkbox"/> Other (as described by EPA)	_____

DESCRIPTION OF IMPACT

Impacted?	Impacted Media	Extent of Impact	How Determined
Yes	GROUNDWATER	Refer to Figure 2 and Table 6	Confirmation Groundwater Sampling
Yes	SOILS	Refer to Figures 1-4 and Tables 1-4	Confirmation Soil Sampling

INITIAL ACTION SUMMARY

Between August 4 and 6, 2021, field screening and confirmation soil sampling activities were conducted in accordance with the COGCC Rule 911 during the decommissioning of the Larson Farms 3,4,5,6,7-24 Tank Battery (TB) (Figure 1), as well as the Larson Farms 3-24, 4-24, 5-24, 6-24, and 7-24 wellheads (WH) (Figures 7-16). Based on the initial analytical results, it was determined that a historic release was discovered adjacent to the former separator (SEP), center produced water vessel (PWV) and west PWV. Following the discovery, mitigation activities were initiated to delineate and remove remaining hydrocarbon impacts. Approximately 40 cubic yards (CY) of impacted material from the center PWV, 40 CY of impacted material from the west PWV, and 49.5 CY of impacted material from the separator were removed and transported to North Weld Waste Management Facility for disposal under PDC manifests. During excavation activities, groundwater was encountered in the separator excavation at approximately 8 feet bgs.

On August 5, 2021, one soil sample (SEP02-SS01) was collected from the separator source area at approximately 5 feet bgs. The sample was submitted for laboratory analysis of the full COGCC Table 915-1 analyte list. Preliminary analytical results indicated that site specific COCs include BTEX, N, TPH, 1,2,4-TMB, 1,3,5-TMB, chrysene, fluorene, 1-M, and 2-M. Between May 5 and 6, 2021, 10 soil samples (SEP02-SS02 - SEP02-SS11) were collected from the sidewalls and base of the excavation at depths ranging between 7 and 8 feet bgs and were submitted for the above referenced COCs. In addition, one sample (SEP02-SS12) was collected at 2.5 feet bgs and submitted for Table 915 soil suitability constituents. Analytical results indicated that organic compound concentrations were below the applicable COGCC Table 915-1 Protection of Groundwater SSLs in the samples collected from the final excavation extent.

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):

On August 4, 2021, one soil sample (S01) was collected from the center PWV source area at approximately 5 feet bgs. The sample was submitted for laboratory analysis of the full COGCC Table 915-1 analyte list. Preliminary analytical results indicated that site specific COCs include BTEX, N, TPH, 1,2,4-TMB, 1,3,5-TMB, fluorene, 1-M, and 2-M. On May 5, 2021, 6 soil samples (S02 - S07) were collected from the sidewalls and base of the excavation at depths ranging between 2.5 and 7 feet bgs and were submitted for the above referenced COCs. In addition, one sample (S07) was collected at 2.5 feet bgs and submitted for Table 915 soil suitability constituents. Analytical results indicated that organic compound concentrations were below the applicable COGCC Table 915-1 Protection of Groundwater SSLs in the samples collected from the final excavation extent.

Proposed Groundwater Sampling

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

On August 5, 2021, one groundwater sample (GW01) was collected adjacent to the Larson 3-24 WH and one groundwater sample (GW02) was collected from the Larson 4-24 WH. On August 6, 2021, one groundwater sample (GW01) was collected from the separator excavation. All three samples were submitted for laboratory analysis of BTEX, N, 1,2,4-TMB, and 1,3,5-TMB. Analytical results indicated that organic compounds were below the applicable COGCC Table 915-1 Standards. Analytical results for the separator groundwater sample is detailed on Table 6 of the separator attachment A. Analytical results for the wellhead groundwater samples are detailed on Table 4 of the 3-24 WH and 4-24 WH of the wellhead attachment A.

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 4, 2021, one soil sample (SS01) was collected from the west PWV source area at approximately 5 feet bgs. The sample was submitted for laboratory analysis of the full COGCC Table 915-1 analyte list. Preliminary analytical results indicated that site specific COCs include BTEX, N, TPH, 1,2,4-TMB, 1,3,5-TMB, chrysene, fluorene, 1-M, and 2-M. On May 4, 2021, 5 soil samples (SS02 - SS06) were collected from the sidewalls and base of the excavation at depths ranging between 5 and 7 feet bgs and were submitted for the above referenced COCs. In addition, one sample (SS07) was collected at 2.5 feet bgs and submitted for Table 915 soil suitability constituents. Analytical results indicated that analyzed constituents were below the applicable COGCC Table 915-1 Protection of Groundwater SSLs in the samples collected from the final excavation extent.

SITE INVESTIGATION REPORT

SAMPLE SUMMARY

Soil	NA / ND
Number of soil samples collected <u>55</u>	-- Highest concentration of TPH (mg/kg) <u>952</u>
Number of soil samples exceeding 915-1 <u>3</u>	-- Highest concentration of SAR <u>30.6</u>
Was the areal and vertical extent of soil contamination delineated? <u>No</u>	BTEX > 915-1 <u>Yes</u>
Approximate areal extent (square feet) <u>783</u>	Vertical Extent > 915-1 (in feet) <u>7</u>
Groundwater	
Number of groundwater samples collected <u>3</u>	ND Highest concentration of Benzene (µg/l) _____
Was extent of groundwater contaminated delineated? <u>Yes</u>	ND Highest concentration of Toluene (µg/l) _____
Depth to groundwater (below ground surface, in feet) <u>8'</u>	ND Highest concentration of Ethylbenzene (µg/l) _____

Number of groundwater monitoring wells installed 0

ND Highest concentration of Xylene (µg/l) _____

Number of groundwater samples exceeding 915-1 0

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 August 6, 2021, two background soil samples (BKG01) were collected at approximately 5 feet and 7 feet bgs and submitted for analysis of pH, EC, SAR and COGCC Table 915-1 metals. Analytical results indicated pH, SAR, arsenic, barium and selenium were in exceedance of the applicable regulatory standards.

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

Volume of solid waste (cubic yards) 130

Volume of liquid waste (barrels) 0

Is further site investigation required?

Five (5) groundwater monitoring wells will be installed via direct-push drilling methods to confirm the absence of dissolved-phase hydrocarbon impacts within and surrounding the former separator excavation extent of the tank battery separator. Proposed monitoring well locations are illustrated on Figure 5.

Two (2) additional background soil borings will be advanced to approximately 8 feet bgs via hand auger drilling methods. The background soil borings will be advanced adjacent to the former center PWV excavation extent to evaluate EC concentrations in native material. Confirmation sampling will be completed by the end of the first quarter 2022.

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.

Between August 4 and August 6, 2021, approximately 49.5 CY of impacted material were removed from the separator, approximately 40 CY of impacted material were removed from the center PWV, and approximately 40 CY of impacted material were removed from the west PWV. All impacted material was transported to North Weld Waste Management Landfill in Ault, Colorado 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.

A remediation strategy will be selected following the evaluation of groundwater analytical results.

Soil Remediation Summary

In Situ

Ex Situ

 Bioremediation (or enhanced bioremediation)

Yes Excavate and offsite disposal

 Chemical oxidation

 If Yes: Estimated Volume (Cubic Yards) 130

 Air sparge / Soil vapor extraction

 Name of Licensed Disposal Facility or COGCC 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.

Based on the analytical data collected during source mass removal activities, PDC will conduct quarterly groundwater monitoring at the 5 proposed monitoring wells until closure criteria are met. Groundwater samples will be submitted for laboratory analysis of BTEX, naphthalene, 1,2,4-TMB, and 1,3,5-TMB by EPA Method 8260B in accordance with Table 915-1. In addition, site-specific inorganic parameters, including total dissolved solids (TDS), chlorides, and sulfates, will be evaluated at the source, up-gradient, and down-gradient monitoring wells during the first quarter of 2022. Contingent on analytical results, inorganic parameter analysis will be discontinued after one sampling event.

REMEDIATION PROGRESS UPDATE

PERIODIC REPORTING

Approved Reporting Schedule:

- Quarterly Semi-Annually Annually Other Confirmation Sampling Summary, Analyte Reduction Request, Supplemental Site Investigation Proposal

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 Confirmation Sampling Summary, Analyte Reduction Request, Supplemental Site Investigation Proposal

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 _____ 130

E&P waste (solid) description Hydrocarbon impacted soil

COGCC Disposal Facility ID #, if applicable: _____

Non-COGCC Disposal Facility: North Weld Waste Management

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

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? No

Does the previous reply indicate consideration of background concentrations? _____

Does Groundwater meet Table 915-1 standards? Yes

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.

Reclamation will be conducted in accordance with COGCC 1004 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 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. _____

Proposed date of completion of Reclamation. _____

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. 05/13/2021

Actual Spill or Release date, or date of discovery. 08/04/2021

SITE INVESTIGATION DATES

Date of Initial Actions described in Site Investigation Plan (start date). 06/28/2021

Proposed site investigation commencement. 06/28/2021

Proposed completion of site investigation. _____

REMEDIAL ACTION DATES

Proposed start date of Remediation. _____

Proposed date of completion of Remediation. _____

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

Based on analytical results for the waste characterization sample SEP02-SS01 collected from the separator source area, PDC is requesting that the COCs for the historic release discovered at the Larson Farms 3,4,5,6,7-24 Tank Battery separator be reduced to the following: BTEX, naphthalene, 1,2,4-TMB, 1,3,5-TMB, TPH, chrysene, fluorene, 1-M, and 2-M.

Based on analytical results for the waste characterization sample S01 collected from the center PWV source area, PDC is requesting that the COCs for the historic release discovered at the Larson Farms 3,4,5,6,7-24 Tank Battery center PWV be reduced to the following: BTEX, naphthalene, 1,2,4-TMB, 1,3,5-TMB, TPH, fluorene, 1-M, 2-M, and EC.

Based on analytical results for the waste characterization sample SS01 collected from the west PWV source area, PDC is requesting that the COCs for the historic release discovered at the Larson Farms 3,4,5,6,7-24 Tank Battery west PWV be reduced to the following: BTEX, naphthalene, 1,2,4-TMB, 1,3,5-TMB, TPH, chrysene, fluorene, 1-M, and 2-M.

Following the approval of this form, PDC will install and conduct quarterly groundwater monitoring at the 5 proposed monitoring wells until closure criteria are met. Additionally, PDC will conduct a supplemental site investigation to evaluate EC concentrations in native material. This site investigation will be conducted by the end of the first quarter 2022.

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: 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:

Date:

Remediation Project Number: 18720

COA Type

Description

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

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.

<u>Att Doc Num</u>	<u>Name</u>
402860713	SOIL SAMPLE LOCATION MAP
402860715	ANALYTICAL RESULTS
402860716	ANALYTICAL RESULTS
402860717	ANALYTICAL RESULTS
402860718	PHOTO DOCUMENTATION
402860722	ANALYTICAL RESULTS
402860723	PHOTO DOCUMENTATION

Total Attach: 7 Files

General Comments

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

Total: 0 comment(s)