

State of Colorado
Oil and Gas Conservation Commission

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BOB CHESSON

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 INFORMATON

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>karen.olson@pdce.com</u>	

PROJECT, PURPOSE & SITE INFORMATION

PROJECT INFORMATION
Remediation Project #: 8954 Initial Form 27 Document #: 2314244

PURPOSE INFORMATION

<input type="checkbox"/> 901.e. Sensitive Area Determination	<input 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 checked="" type="checkbox"/> Other <u>Plug&Abandon/Vault Closure</u>

SITE INFORMATION N Multiple Facilites (in accordance with Rule 909.c.)

Facility Type: <u>LOCATION</u>	Facility ID: <u>319218</u>	API #: _____	County Name: <u>WELD</u>
Facility Name: <u>STEINWALD-61N64W 3NWNW</u>	Latitude: <u>40.084999</u>	Longitude: <u>-104.542962</u>	
** correct Lat/Long if needed: Latitude: _____		Longitude: _____	
QtrQtr: <u>NWNW</u>	Sec: <u>3</u>	Twp: <u>1N</u>	Range: <u>64W</u> Meridian: <u>6</u> Sensitive Area? <u>Yes</u>

SITE CONDITIONS

General soil type - USCS Classifications CL Most Sensitive Adjacent Land Use CROP LAND

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

Residential bldgs 785'N of tank battery loc. Closest water well 815'N of loc & surf water 2430'W

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 type="checkbox"/> Oil | <input type="checkbox"/> Tank Bottoms | |
| <input 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
	GROUNDWATER	Refer to Fig 3 and Table 3	Drilling and groundwater sampling
	SOILS	Refer to Fig 2 and Tables 1 and 2	Excavation and 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.

Excavation activities commenced on April 22, 2014 following the discovery of a historic release during plug and abandon activities, as described in the Form 19 submitted on May 28, 2014. The COGCC issued Spill Tracking # 400615494 to the location.

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):

Confirmation soil samples were collected from the final extent of the 2014 and 2016 excavation areas following chemical treatment activities.

Proposed Groundwater Sampling

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

Yes, groundwater samples will be collected on a quarterly basis at the existing monitoring well network.

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):

The extent of dissolved phase hydrocarbon impacts has not yet been delineated. Additional monitoring wells will be installed cross- and down-gradient to the existing monitoring well network to establish point-of-compliance.

SITE INVESTIGATION REPORT

SAMPLE SUMMARY

Soil

Number of soil samples collected 258
Number of soil samples exceeding 910-1 59
Was the areal and vertical extent of soil contamination delineated? Yes
Approximate areal extent (square feet) 36900

NA / ND

-- Highest concentration of TPH (mg/kg) 11000
NA Highest concentration of SAR
 BTEX > 910-1 Yes
 Vertical Extent > 910-1 (in feet) 45

Groundwater

Number of groundwater samples collected 44
Was extent of groundwater contaminated delineated? No
Depth to groundwater (below ground surface, in feet) 63'
Number of groundwater monitoring wells installed 5
Number of groundwater samples exceeding 910-1 28

-- Highest concentration of Benzene (µg/l) 1000
-- Highest concentration of Toluene (µg/l) 720
-- Highest concentration of Ethylbenzene (µg/l) 51
-- Highest concentration of Xylene (µg/l) 1000
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?

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?

Confirmation drilling and soil sampling will be completed adjacent to the Kerr-McGee gathering line following one year of natural attenuation to assess remaining hydrocarbon impacts in soil. Soil analytical data is summarized in Tables 1 and 2. Based on the groundwater analytical results described herein, the extent of dissolved phase hydrocarbon impacts has been delineated at this site and point of compliance (POC) has been established. Groundwater monitoring will continue on a quarterly basis until four consecutive quarters of monitoring data indicate BTEX concentrations are in compliance with the applicable COGCC Table 910-1 groundwater standards. Groundwater analytical data is summarized in Table 3. The laboratory analytical reports are included as Attachment A.

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.

A historic release was discovered below the partially buried produced water vessel during the plugging and abandoning of the Steinwald #1 tank battery. On April 22, 2014, sub-surface site assessment and excavation activities subsequently commenced below the former vessel location. The vertical and lateral extent of the excavation was determined in the field using a photoionization detector (PID) to measure volatile organic compounds (VOCs) in soil. Between April 22, 2014 - May 21, 2014, approximately 9,530 cubic yards [CY] of impacted material were excavated and transported to the Buffalo Ridge Landfill in Keenesburg, Colorado for disposal under PDC waste manifests. Following initial excavation efforts, the remedial strategy for the site was modified to chemical oxidant (chemox) soil treatment. This remediation method was selected due to the close proximity of private residences and the anticipated volume of remaining impacted material. Between May 22, 2014 - August 26, 2014, approximately 32,900 CY of impacted material were chemically treated using hydrogen peroxide. One composite soil sample was collected per 100 CY of treated material to confirm hydrocarbon concentrations were reduced below applicable COGCC Table 910-1 standards and could be used for subsequent backfilling. Clean backfill was also brought in to bring the excavation up to existing grade. A total of 354 confirmation samples (CS01-CS15, WCS01-WCS14, SCS01-SCS300, NWCS01-NWSC12) were collected and submitted to Summit Scientific Laboratories (Summit) in Golden, Colorado for laboratory analysis of benzene, toluene, ethylbenzene, and total xylenes (BTEX), naphthalene, and total petroleum hydrocarbons (TPH) - gasoline range organics (GRO) by USEPA Method 8260B. Samples were also analyzed for TPH - diesel range organics (DRO) by USEPA Method 8015. Treated material that exhibited elevated constituent concentrations above regulatory standards was further treated and subsequently re-sampled (sample designation - XX@XXR). Final analytical results indicated constituent concentrations were below COGCC Table 910-1 regulatory standards for the 32,900 CY of treated material used for backfill. Soil analytical data for samples collected from treated material are summarized in Table 2. Between April 22, 2014 - August 26, 2014, 213 soil samples (SS01 through SS213) were collected from the sidewalls and base of the excavation area at depths varying between 9 feet and 44 feet below ground surface (bgs). Soil samples were submitted to Summit for laboratory analysis of BTEX, naphthalene, TPH-GRO and TPH-DRO. Analytical results indicated constituent concentrations were below COGCC Table 910-1 soil standards in the soil samples collected from the final excavation extent, with the exception of four samples (SS14 and SS135 - SS137) located adjacent to the buried Kerr-McGee (KMG) gathering line. Groundwater was not encountered during excavation and remedial activities. The final excavation extent and soil sample locations are illustrated on Figure 2. Soil analytical data for samples collected from the excavation area are summarized in Table 1. The laboratory analytical reports are included as Attachment A. The tank battery was abandoned following remedial activities and the site was reclaimed for agricultural use.

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.

See attached Form 27 Addendum - Summary of Remediation Activities.

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
- _____ 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 October 10 - November 26, 2014, groundwater monitoring was completed at the five temporary well locations (BH01 - BH05). Groundwater samples were submitted to Summit Scientific Laboratories in Golden, Colorado for analysis of benzene, toluene, ethylbenzene, and total xylenes (BTEX) by USEPA Method 8260B. Analytical results indicate benzene concentrations are in exceedance of COGCC Table 910-1 regulatory standards in BH04. BTEX concentrations are below regulatory standards in the remaining four monitoring well locations. Groundwater analytical results are summarized in Table 3. Quarterly groundwater monitoring will be completed until four consecutive quarters of BTEX concentrations are in compliance with regulatory standards.

REMEDIATION PROGRESS UPDATE

PERIODIC REPORTING

Frequency: Quarterly Semi-Annually Annually Other As completed _____

Report Type: Groundwater Monitoring Land Treatment Progress Report O&M Report

Other Form 27 Addendum: Summary of Remediation Activities _____

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 excavation was backfilled and re-contoured to match pre-existing conditions. The tank battery and wellhead were plugged and abandoned following excavation activities and the area was reclaimed for agricultural use.

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. 04/22/2014

Date of completion of Site Investigation. 08/26/2014

REMEDIAL ACTION DATES

Date of commencement of Remediation. 05/22/2014

Date of completion of Remediation. 10/01/2015

SITE RECLAMATION DATES

Date of commencement of Reclamation. _____

Date of completion of Reclamation. _____

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 EHS Manager

Submit Date: 01/18/2017

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: BOB CHESSON

Date: 01/19/2017

Remediation Project Number: 8954

COA Type

Description

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

Attachment Check List

Att Doc Num

Name

401183398	FORM 27-SUPPLEMENTAL-SUBMITTED
401183494	REMEDATION PROGRESS REPORT

Total Attach: 2 Files

General Comments

User Group

Comment

Comment Date

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

Total: 0 comment(s)