

State of Colorado
Oil and Gas Conservation Commission

1120 Lincoln Street, Suite 801, Denver, Colorado 80203
Phone: (303) 894-2100 Fax: (303) 894-2109



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Report taken by:
CHRIS CANFIELD

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>KERR MCGEE OIL & GAS ONSHORE LP</u>	Operator No: <u>47120</u>	Phone Numbers
Address: <u>P O BOX 173779</u>		Phone: <u>(720) 929-4306</u>
City: <u>DENVER</u>	State: <u>CO</u>	Zip: <u>80217-3779</u>
Contact Person: <u>Erik Mickelson</u>	Email: <u>Erik.Mickelson@anadarko.com</u>	Mobile: <u>()</u>

PROJECT, PURPOSE & SITE INFORMATION

PROJECT INFORMATION

Remediation Project #: 10711 Initial Form 27 Document #: 401440393

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 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>Annual Groundwater Monitoring Report</u> |

SITE INFORMATION Y Multiple Facilities (in accordance with Rule 909.c.)

Facility Type: <u>TANK BATTERY</u>	Facility ID: <u>446053</u>	API #: _____	County Name: <u>WELD</u>
Facility Name: <u>TROUDT-61N67W 7SESE</u>	Latitude: <u>40.059409</u>	Longitude: <u>-104.925300</u>	
	** correct Lat/Long if needed: Latitude: <u>40.059361</u>	Longitude: <u>-104.925293</u>	
QtrQtr: <u>SESE</u>	Sec: <u>7</u>	Twp: <u>1N</u>	Range: <u>67W</u> Meridian: <u>6</u> Sensitive Area? <u>No</u>
Facility Type: <u>SPILL OR RELEASE</u>	Facility ID: <u>453142</u>	API #: _____	County Name: <u>WELD</u>
Facility Name: <u>SPILL/RELEASE POINT</u>	Latitude: <u>40.059347</u>	Longitude: <u>-104.925269</u>	
	** correct Lat/Long if needed: Latitude: _____	Longitude: _____	
QtrQtr: <u>SESE</u>	Sec: <u>7</u>	Twp: <u>1N</u>	Range: <u>67W</u> Meridian: <u>6</u> Sensitive Area? <u>Yes</u>

SITE CONDITIONS

General soil type - USCS Classifications SC Most Sensitive Adjacent Land Use Floodplain
 Is domestic water well within 1/4 mile? No Is surface water within 1/4 mile? No
 Is groundwater less than 20 feet below ground surface? Yes

Other Potential Receptors within 1/4 mile

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 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	See attached data	Sampling analysis
Yes	SOILS	1392 square feet	Sampling of soils during excavation

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 October 11, 2017, while removing the produced water sump during P&A activities, historical impacts were discovered beneath the dump lines. On October 13, 2017 an Initial Form 19 was submitted to the COGCC, followed by a Supplemental Form 19 on October 23, 2017. Groundwater was encountered at 10 feet below ground surface in the excavation. 200 cubic yards of soil and 100 barrels of groundwater were removed from the excavation. Prior to backfilling the excavation, 50 pounds of Chemically Oxygenated Granular Activated Carbon (COGAC) was applied to the groundwater. A regional topographic facility location map is provided as Figure 1, and a facility layout and sample locations map is attached as Figure 2.

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 the dates of October 11, 2017 and October 16, 2017, the excavation of historical impacts was conducted. These historical impacts were discovered beneath the dump lines while removing the produced water sump during P&A activities. Soil grab samples were collected from each wall of the sump excavation. All soil samples were submitted to Origins Laboratory in Denver, Colorado, for analysis of benzene, toluene, ethylbenzene, and xylenes (BTEX), total petroleum hydrocarbons (TPH) - gasoline range organics (GRO) by USEPA Method 8260C, TPH - diesel range organics and residual range organics (DRO and RRO, respectively) by USEPA Method 8015, electrical conductivity (EC), and pH. All soil samples collected from the excavation's final extent were either not detectable at the lab's detection limits or in full compliance with COGCC Table 910-1 allowable concentrations. Soil sample analytical results are summarized in Table 1, and the laboratory reports are provided.

Proposed Groundwater Sampling

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

On October 13, 2017, grab groundwater sample GW01 was collected from the excavation and submitted to Origins Laboratory in Denver, Colorado, for analysis of BTEX by USEPA 8260. The groundwater results indicated that the benzene concentration was 214 ug/L (exceeding Table 910-1 allowable groundwater concentrations). On October 16, 2017 grab groundwater sample GW02 was collected from the excavation and also submitted to Origins Laboratory in Denver, CO for analysis of BTEX by USEPA 8260. The groundwater results indicated that the benzene concentration was 74.8 ug/L (again, exceeding Table 910-1 allowable limits for groundwater). Groundwater sample analytical results are summarized in Table 2, and the laboratory reports are provided.

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):

Based on the analytical results from groundwater sample GW02, a subsurface assessment was conducted at the facility to determine the extent of shallow groundwater impacts. In December of 2017 four (4) groundwater monitoring wells were installed at this location. During site reclamation activities, MW03 and MW04 were damaged. Replacement wells (MW03-R and MW04-R) were installed next to the original monitoring well locations in July of 2018. Groundwater monitoring was conducted on a quarterly basis. Collected groundwater samples were submitted for laboratory analysis of BTEX by USEPA Method 8260. Groundwater monitoring analytical results are summarized in Table 2, and the laboratory reports are provided. Quarterly groundwater elevation contour maps, provided as Figures 3-6, indicate the need for two additional wells to be installed down gradient of the source area. The locations of the proposed monitoring wells (MW05 and MW06) can also be seen on Figures 3-6.

SITE INVESTIGATION REPORT

SAMPLE SUMMARY

Soil

Number of soil samples collected 13
Number of soil samples exceeding 910-1 5
Was the areal and vertical extent of soil contamination delineated? Yes
Approximate areal extent (square feet) 1392

NA / ND

-- Highest concentration of TPH (mg/kg) 3827
NA Highest concentration of SAR
BTEX > 910-1 Yes
Vertical Extent > 910-1 (in feet) 6

Groundwater

Number of groundwater samples collected 22
Was extent of groundwater contaminated delineated? Yes
Depth to groundwater (below ground surface, in feet) 10'
Number of groundwater monitoring wells installed 4
Number of groundwater samples exceeding 910-1 3

-- Highest concentration of Benzene (µg/l) 214
-- Highest concentration of Toluene (µg/l) 254
-- Highest concentration of Ethylbenzene (µg/l) 261
-- Highest concentration of Xylene (µg/l) 2090
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?

A background sample was collected and placed on hold with the laboratory pending the results of the sidewall samples. The background sample was not analyzed due to the analytical results of the confirmation sidewall soil samples not exceeding COGCC Table 910-1 allowable concentrations. Both EC and pH concentrations detected in the soil samples were within the allowable limits, with the exception of the base sample, which was collected below the designated root zone, having a pH of 9.48.

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.

On October 11, 2017, while removing the produced water sump during P&A activities, historical impacts were discovered beneath the dump lines. Environmental testing was conducted during the sump removal activities. Laboratory analysis from the soil samples collected from the excavation's final extent were either not detected or in full compliance with COGCC Table 910- 1 allowable concentrations. Approximately 200 cubic yards of impacted soil and 100 barrels of impacted groundwater were removed from this location.

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.

To support the hydrocarbon natural attenuation process for the remaining dissolved-phase impacts, 50 pounds of Chemically Oxygenated Granular Activated Carbon (COGAC) were applied to the groundwater prior to backfilling the excavation. In order to determine the extent and magnitude of the dissolved-phase hydrocarbon impacts, four (4) groundwater monitoring wells were installed in the source area, crossgradient, and downgradient of the excavation footprint in December 2017. During site reclamation activities, MW03 and MW04 were damaged. Replacement wells (MW03-R and MW04-R) were installed next to the original monitoring well locations in July of 2018. Groundwater monitoring was conducted for five consecutive quarters. Quarterly groundwater elevation contour maps indicate the need for two additional wells to be installed down gradient of the source area. The installation of these additional wells is tentatively planned for March of 2019.

Soil Remediation Summary

In Situ

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

Ex Situ

Yes _____ Excavate and offsite disposal
If Yes: Estimated Volume (Cubic Yards) _____ 200
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
 _____ Air sparge / Soil vapor extraction
Yes _____ Natural Attenuation
Yes _____ Other Chemically Oxygenated Granular Activated Carbon (COGAC) and groundwater removal.

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.

Anadarko will install two additional monitoring wells (MW05 and MW06) downgradient of the excavation footprint. Groundwater monitoring will be conducted at all six wells onsite for one event. Collected groundwater samples will be submitted for laboratory analysis of BTEX by USEPA Method 8260. The locations of the additional monitoring wells are illustrated on the quarterly groundwater elevation contour maps (Figures 3-6).

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:

NA

Volume of E&P Waste (solid) in cubic yards _____ 200

E&P waste (solid) description Hydrocarbon impacted soil

COGCC Disposal Facility ID #, if applicable: _____

Non-COGCC Disposal Facility: Front Range Landfill, Erie, CO

Volume of E&P Waste (liquid) in barrels _____ 100

E&P waste (liquid) description Hydrocarbon impacted water

COGCC Disposal Facility ID #, if applicable: _____

Non-COGCC Disposal Facility: Kerr-McGee Aggregate Recycling Facility, Weld County, CO

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? Yes

Does the previous reply indicate consideration of background concentrations? No

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? Yes

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.

The excavation was backfilled and graded to match the adjacent topography. Kerr-McGee's tank battery and associated components were permanently removed from the facility location. Future reclamation activities at the facility location will be compliant with COGCC regulations.

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? _____

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. 10/14/2017

Actual Spill or Release date, if known. _____

SITE INVESTIGATION DATES

Date of Initial Actions described in Site Investigation Plan (start date). 10/11/2017

Date of commencement of Site Investigation. 10/11/2017

Date of completion of Site Investigation. _____

REMEDIAL ACTION DATES

Date of commencement of Remediation. 10/17/2017

Date of completion of Remediation. _____

SITE RECLAMATION DATES

Date of commencement of Reclamation. _____

Date of completion of Reclamation. _____

OPERATOR COMMENT

This form serves as an annual update to the remediation activities performed at this site under Remediation Project #10711, as well as to document the installation of two additional monitoring wells. Groundwater monitoring will be conducted at all six wells onsite for one event, so long as BTEX concentrations remain in full compliance with COGCC Table 910-1 groundwater standards. Subsequent Form 27 Supplemental documents will be submitted on an annual basis as a groundwater monitoring report update.

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

Signed: Erik Mickelson

Title: Senior Environmental Rep.

Submit Date: 03/12/2019

Email: Erik.Mickelson@anadarko.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: CHRIS CANFIELD

Date: 03/18/2019

Remediation Project Number: 10711

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**

401965445	FORM 27-SUPPLEMENTAL-SUBMITTED
401969086	MAP
401969095	ANALYTICAL RESULTS
401969650	SITE MAP
401969651	GROUND WATER ELEVATION MAP
401969652	GROUND WATER ELEVATION MAP
401969654	GROUND WATER ELEVATION MAP
401969656	GROUND WATER ELEVATION MAP
401969657	ANALYTICAL RESULTS
401969659	ANALYTICAL RESULTS

Total Attach: 10 Files

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

		Stamp Upon Approval
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Total: 0 comment(s)