

FORM

27

Rev 6/99

State of Colorado Oil and Gas Conservation Commission

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#8461

FOR OGCC USE ONLY

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 5/27/2014

SITE INVESTIGATION AND REMEDIATION WORKPLAN

This form shall be submitted to the Director for approval prior to the initiation of site investigation and remediation activities. Form 27 is intended to be used whenever possible. Additional documentation will be required when large volumes of soil and groundwater have been impacted or involve large facilities with multiple source areas. See Rule 910. Attach as many pages as needed to fully describe the proposed work.

OGCC Employee:

☐ Spill ☐ Complaint
☐ Inspection ☒ NOAV

Tracking No: 200399090

CAUSE OF CONDITION BEING INVESTIGATED AND REMEDIATED

☐ Spill or Release ☐ Plug & Abandon ☐ Central Facility Closure ☐ Site/Facility Closure ☒ Other (describe): Rice Sensitive Area Determination

OGCC Operator Number: 10352

Name of Operator: CM Production, LLC

Address: 600 17th Street, #2800 South

City: Denver State: CO Zip: 80202

Contact Name and Telephone:

Mr. John Teff

No: 303.534.0199

Fax: 303.479.1318

API Number: 05-075-07216

County: Logan

Facility Name: Rice Production Facility

Facility Number: 116281

Well Name: Rice #2

Well Number:

Location: (QtrQtr, Sec, Twp, Rng, Meridian): SW NW 33 12N 54W Latitude: 40.973494 Longitude: -103.418794

TECHNICAL CONDITIONS

Type of Waste Causing Impact (crude oil, condensate, produced water, etc): Produced Water Pits

Site Conditions: Is location within a sensitive area (according to Rule 901e)? ☐ Y ☒ N If yes, attach evaluation.

Adjacent land use (cultivated, irrigated, dry land farming, industrial, residential, etc.): Rangeland and Wildlife Habitat

Soil type, if not previously identified on Form 2A or Federal Surface Use Plan: Badland, Mitchell - Keota loams (Unit #70)

Potential receptors (water wells within 1/4 mi, surface waters, etc.): No permitted water wells within one mile of the site.

An unnamed intermittent drainage is located to the east of the site. The drainage does not connect to live waters.

Description of Impact (if previously provided, refer to that form or document):

Impacted Media (check):

- ☒ Soils
☐ Vegetation
☐ Groundwater
☐ Surface Water

Extent of Impact:

Erosion and historic EC/SAR impacts

How Determined:

Visual/COGCC Sampling on 01/14/2014

REMEDIALTION WORKPLAN

Describe initial action taken (if previously provided, refer to that form or document):

Olsson has prepared a Sensitive Area Determination consistent with COGCC Rule 901.e. It was previously determined to be in a Non-Sensitive Area. The site is in a Non-Sensitive Area based on a review of the the current criteria.

Describe how source is to be removed:

CM Production proposes to re-construct the earthen berms surrounding the produced water pits, and install stormwater BMPs to prevent erosion from contributing sediment or potential pollutants to the adjacent drainage from the Rice #2 well pad and the Rice production facility. BMPs may include either covering the berms with gravel or a preparing a seed bed, and planting a native grass seed mixture, and erosion control blankets. Other BMPs may include terracing or benching the slope down from the north and east produced water pits to the drainage.

Describe how remediation of existing impacts is to be accomplished, including removal and disposal at an injection well or licensed facility, land treatment on site, removal of impacted groundwater, insitu bioremediation, burning of oily vegetation, etc.:

According to the COGCC records, previous operators historically discharged produced water to the adjacent drainage. It is unknown how long this practice continued. CM Production has not had any produced water releases. The only way to remediate the electrical conductance (EC) and sodium adsorption ratio (SAR) impacted soils from historic releases to the adjacent drainage is to flush the soils with fresh water. The purpose of this would be to drive the salts down below the root depth or dilute the salts out. The badland soils in the drainage do not support vegetation due to erodibility, the shallow depth to bedrock, and a lack of top soil.

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REMEDIAL WORKPLAN (Cont.)

Tracking Number: _____
Name of Operator: _____
OGCC Operator No: _____
Received Date: _____
Well Name & No: _____
Facility Name & No: _____

OGCC Employee: _____

If groundwater has been impacted, describe proposed monitoring plan (# of wells or sample points, sampling schedule, analytical methods, etc.):

The depth to groundwater is reportedly greater than 100 feet. The bedrock exposed near the surface consists of the Brule Formation of the Tertiary age White River Group. According to published geologic sources, the Brule Formation is a confining member for the High Plains aquifer which consists of the overlying Arikaree and Ogallala Formations. The Brule Formation consists of impermeable claystone and is not considered part of the High Plains aquifer.

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. Use additional sheet for description if required.

Areas adjacent to the eastern produced water pit along the bank of the intermittent drainage could be seeded with a native seed mixture as a stormwater BMP. However, this would require terracing the slope, hauling in topsoil to prepare a seed bed, planting with native grasses, and covering with erosion control blankets. Vegetation growth is dependent on precipitation. Alternatively, CM Production could use permanent BMPs consisting of repairing the berm, benching the slope adjacent to the berm, and covering the earthen berm with gravel.

Attach samples and analytical results taken to verify remediation of impacts. Show locations of samples on an onsite schematic or drawing.

Is further site investigation required? ☐ Y ☐ N If yes, describe:

The COGCC collected soil samples on January 14, 2014 from areas in the intermittent drainage to the east of the site that show EC and SAR levels above the Table 910-1 concentration levels. The purpose of these parameters is to remediate produced water impacts to restore cropland. According to the Logan County soil survey, these are Badland soils that are erodible and do not support vegetation. The intermittent drainage does not flow three months out of the year, there is not a significant nexus to live waters, and has no defined connection to waters of the state. CM Production has not had any releases of produced water to the drainage.

Final disposition of E&P waste (landtreated and disposed onsite, name of licensed disposal facility, recycling, reuse, etc.):

The impacted soils are the result of historic produced water discharge to the intermittent drainage adjacent to the east produced water pit. There is also an area to the south of the south produced water pit that appears to have produced water impacts, but these also appear to have occurred prior to CM Production's ownership/operation of the site based on a review of aerial photos (Google Earth July 2003). Any remedy would require the approval of the Castle Canyon Grazing Association (surface owner), but would likely require the use of large volumes of fresh water to flush the salts out of the soils. Due to the erodible nature of these soils and shallow depth to bedrock this would have to be done slowly and the outcome of the end result is questionable. Alternatively soil amendment with Epsom salt and crushed dolomite and limestone could be applied to impacted soil to adjust the SAR and topsoil hauled to the site would be needed to reduce the EC. A seed bed would need to be disked and seeded with a native grass mixture consisting of blue grama, sand dropseed, buffalograss, four-wing saltbush, and winterfat (white sage).

IMPLEMENTATION SCHEDULE

Date Site Investigation Began: _____ Date Site Investigation Completed: _____ Date Remediation Plan Submitted: _____
Remediation Start Date: _____ Anticipated Completion Date: _____ Actual Completion Date: _____

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

Print Name: James Hix as Agent for CM Production, LLC

Signed: James Hix as Agent for CM Production, LLC
Date: 05/27/14

Title: Senior Geologist - Olsson Associates

OGCC Approved: _____ Title: _____ Date: _____