

1.0 PROJECT INFORMATION

PROJECT DESCRIPTION: Five Rivers 4-16-31 and aboveground oil and water storage tank battery construction

PROJECT LOCATION: NWNW of Section 16, Township 4N, Range 66W, 6th P.M., Weld County, CO

E&P WASTE MANAGEMENT OPTION: Closed Loop Drilling Fluid System

Designated person responsible for E&P Waste Management at Facility

COMPANY: K.P. Kauffman Company, Inc. and Kauffman Well Services

NAME: Susana Lara-Mesa

TITLE: Engineering Project Manager (EPM)

ADDRESS: 1675 Broadway, Suite 2800, Denver, CO 80202-4628

2.0 PLAN PURPOSE AND ADMINISTRATION

This Waste Management Plan (WMP or Plan) has been prepared to: (i) ensure that exploration and production (E&P) waste is properly stored, handled, transported, treated, recycled, or disposed to prevent threatened or actual significant adverse environmental impacts to air, water, soil or biological resources; and (ii) ensure compliance with the concentration levels in Colorado Oil and Gas Conservation Commission (COGCC) Series 900 table 910-1 (Table 910-1) requirements.

This Plan is applicable to K.P. Kauffman Company, Inc. (KPK) oil and gas well development projects in Colorado. The Engineering Project Manager (EPM) is responsible for the implementation and management of this Plan. EPM responsibilities include ensuring that KPK personnel are properly trained and familiar with the information presented in this Plan.

A complete copy of this WMP shall be kept at the following KPK locations:

Copy No. 1: Engineering Project Managers Office

Copy No. 2: Operations Managers Office

Copy No. 3: Project Location (during well development and tank battery construction).

This WMP shall be amended to reflect changes in KPK operating policies and procedures including construction, operation, or maintenance programs that may materially affect the potential for a discharge of E&P waste. The plan will also be reviewed by the EPM on a regular basis in view of new technologies and regulations.

3.0 E&P WASTE

E&P waste generated or potentially generated during well development and/or operation include: produced water; drilling fluids; and oily waste. A description of these waste materials and management options are presented below.

3.1 Produced Water

Produced water is the water generated during drilling and completions and/or operation of an oil or gas well. This water may be recycled and reused during drilling operations. Produced water disposal options include:

- Injection into a Class II well, permitted in accordance with COGCC Rule 325
- Evaporation/percolation in a properly permitted pit
- Disposal at permitted commercial facilities
- Disposal by roadspreading on lease roads outside sensitive areas if approved by surface owner, and if Table 910-1 requirements are met and total dissolved solids are not greater than 3,500 mg/l. Flowback fluids shall not be disposed via roadspreading.

3.2 Drilling Fluid

Drilling fluid is generally comprised of water-based bentonitic drilling fluids. Once well development is complete, these materials may be recycled and reused during drilling operations prior to final disposition. Drilling fluid disposal options include:

- Land treatment/application
- Injection into a permitted Class II well
- Disposal at a commercial solid waste disposal facility
- Drying and burial in drilling pits on non-crop land (if Table 910-1 requirements are met).

3.3 Oily Waste

Oily waste includes those materials containing crude oil, condensate, or other hydrocarbon-containing exploration and production waste, such as soil, frac sand, drilling fluids, workover fluids, pit sludge, tank bottoms, pipeline pigging wastes, and natural gas gathering, processing, and storage waste. Oily waste disposal options include:

- Disposal at a commercial solid waste disposal facility
- Land treatment onsite or at a permitted centralized E&P waste management facility.

4.0 E&P WASTE MANAGEMENT OPTIONS – DRILLING

KPK typically utilizes a closed loop drilling fluid system during well development operations. This system eliminates the need for drilling fluid overflow or water pits and reduces the amount of drilling fluid required to develop the well. As an alternative (although not preferred) KPK may develop a well location with a conventional reserve pit for drilling fluid and water. The following describes how E&P Wastes are managed for each alternative.

4.1 Closed-Loop Drilling Fluid System

A closed-loop drilling system contains E&P wastes including produced water, drilling fluids and any oily wastes and generally results in a dry well location. Closed-loop systems employ a suite of solids control equipment to minimize drilling fluid dilution and provide the economic handling of the drilling wastes. A typical closed-loop system includes a series of linear-motion shakers, mud cleaners and centrifuges followed by a dewatering system. Figure 1 illustrates a typical KPK well location that utilizes a closed-loop system.

Once drilling operations at a well location have terminated, used fluids are transported off-site for treatment and disposal, and solids are disposed via land application. A description of these E&P waste management methods for a closed-loop system at a KPK well location are described below.

4.1.1 Produced Water

Water generated during well development is separated from solids via settling. Once solids have settled, the water is vacuumed from closed-loop system and transported off-site for treatment and disposal. Wattenberg Disposal, LLC, an affiliate of KPK, manages the removal of water from the well location (via vacuum truck) and the ultimate treatment and disposal of the water.

4.1.2 Drilling Fluid Solids

Once water has been removed, water-based bentonitic drilling fluid solids are further stabilized (if necessary) by adding clean soil, loaded and hauled to a designated area for land application by KPK. Land application includes spreading the solids with an average thickness of no more than three inches over the existing ground surface. As the drilling fluid solids are spread, they are shaped and graded into the existing ground surface to prevent ponding or erosion. This beneficial amendment into the soil typically occurs during the spreading operation and no later than ten days of the application of drilling fluid solids. The resulting concentrations of the drilling fluid solids shall not exceed those in Table 910-1.

Prior to land application of drilling fluid solids, KPK shall obtain written authorization from the surface owner. In addition, KPK shall maintain in appropriate format and have available for review (within five days of the COGCC written request) record of the source, the volume, and the location where the land application of the drilling fluid solids occurred. KPK shall retain responsibility for the land application operation, and shall diligently cooperate with the COGCC in responding to complaints regarding land application of drilling fluid solids. Prior COGCC approval is not required for reuse of water-based bentonitic drilling fluids for land application as a soil amendment.

4.1.3 Oily Waste

Oily waste is not typically generated or observed during well development using a closed-loop system. If it is observed during drilling operations, the oily waste shall be segregated and transported off-site (via vacuum truck) by Wattenberg Disposal, LLC.

4.2 Conventional Reserve Pit System

A conventional reserve pit system includes provisions for storing drilling fluids and water in open pits. Figure 2 illustrates a typical KPK well location that utilizes open pits. As shown on Figure 2, the pits are located near the well location and typically include one unlined overflow pit for drilling fluids and one lined pit for water.

Once drilling operations at a well location have terminated, used fluids are transported off-site for treatment and disposal, and solids are disposed via land application. A description of these E&P waste management methods for a closed-loop system at a KPK well location are described below.

4.2.1 Produced Water

Water from the lined water pit and freestanding water in the overflow pit are vacuumed from the pits and transported off-site for treatment and disposal. Wattenberg Disposal, LLC, an affiliate of KPK, manages the removal of water from the well location (via vacuum truck) and the ultimate treatment and disposal of the water.

4.2.2 Drilling Fluid Solids

Once water has been removed, water-based bentonitic drilling fluid solids are further stabilized (if necessary) by adding clean soil, loaded and hauled to a designated area for land application by KPK. Land application includes spreading the solids with an average thickness of no more than three inches over the existing ground surface. As the drilling fluid solids are spread, they are shaped and graded into the existing ground surface to prevent ponding or erosion. This beneficial amendment into the soil typically occurs during the spreading operation and no later than ten days of the application of drilling fluid solids. The resulting concentrations of the drilling fluid solids shall not exceed those in Table 910-1.

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4.2.3 Oily Waste

Oily waste observed during well development in the water or overflow pit is vacuumed from the pit surface and transported off-site (via vac truck) by Wattenberg Disposal, LLC for treatment and disposal.

5.0 E&P WASTE MANAGEMENT OPTIONS – COMPLETIONS

Production water and oily waste materials (e.g., tank bottoms) are managed on a routine basis during inspection and maintenance operations on appurtenances including, but not limited to: pig launch and receiving stations; piping and equipment; and storage tanks. These inspection and maintenance operations are administered and/or performed by KPK personnel in accordance with procedures outlined in the KPK Spill Prevention Control and Countermeasure (SPCC) plan and Storm Water Management Plan (SWMP) for well development and operations. In the event of a release, the notification and response procedure outlined in the KPK SPCC plan shall be followed. For convenience, SPCC emergency response information is included with this Plan.

6.0 SAMPLE COLLECTION AND TESTING

With the exception of drilling fluid solids, residual drilling materials are transported off-site for proper analysis, treatment and disposal. The designated final disposition for drilling fluid solids is land application. Prior to land application of drilling fluid solids, the following two sampling programs shall be completed.

6.1 Sample Program 1 - Background Sample Collection and Testing

The first sampling program is comprised of collecting two soil samples from within the designated land application area. These two background samples shall be tested at a Colorado licensed laboratory for total Arsenic, Sodium Adsorption Ratio (SAR), electrical conductivity (EC) and pH.

6.2 Sample Program 2 – Drilling Fluid Solids Sample Collection and Testing

The second sampling program is comprised of collecting drilling fluid solid samples at a rate of one sample per 100 cubic yards of drilling fluid solids to be land applied. Each sample shall be tested at a Colorado licensed laboratory for total petroleum hydrocarbons (TPH), total Arsenic, Sodium Adsorption Ratio (SAR), electrical conductivity (EC) and pH. Current acceptable levels (COGCC 900 Series rules, Table 910-1) for these parameters are as follows:

- TPH – 500 mg/kg
- Arsenic – 0.39 mg/kg
- SAR – less than 12
- EC – less than 4 mmhos/cm or 2x background
- pH – 6 to 9.

6.2.1 Results At or Below Acceptable Levels

If the analytical results for the drilling fluid solids are at or below acceptable levels noted above or below background levels, the materials may be applied to the designated land area in accordance with COGCC 900 Series rules and landowner agreement requirements and/or conditions.

6.2.2 Results Above Acceptable Levels

If the analytical results for the drilling fluid solids are above acceptable levels, the following procedure shall be followed:

- The drilling fluid solids shall be temporarily stockpiled at the drilling location, in an area designated by the EPM that has been secured with storm water control best management practices (BMP's) in accordance with project SWMP requirements
- The stockpiled drilling fluid solids shall be uniformly mixed with clean soil
- Upon completion of the soil mixing activity, two composite samples (each comprised of material from three locations within the stockpile) shall be collected. Each composite sample shall be tested at a Colorado licensed laboratory for only the parameters that were above acceptable levels
 - If the analytical results for the drilling fluid solids/soil mixture are at or below acceptable levels, the materials may be applied to the designated land area in accordance with COGCC 900 Series rules and landowner agreement requirements and/or conditions
 - If the analytical results above acceptable levels, the EPM shall determine if adding additional clean soil to the stockpile is warranted prior to retesting or off-site transport and disposal is warranted
- The EPM shall determine if COGCC reporting forms including, but not limited to Form 27 and Form 4 should be submitted to COGCC for review and approval prior to final disposition of the drilling fluid solids.