



PDC ENERGY, INC.

E&P Waste Management Plan

DJ Basin Operations

December 14, 2015

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REGULATORY FRAMEWORK - COGCC RULES

As defined in the 100 Series rules, Exploration and Production Waste (E&P Waste) shall mean those wastes associated with operations to locate or remove oil or gas from the ground or to remove impurities from such substances and which are uniquely associated with and intrinsic to oil and gas exploration, development, or production operations that are exempt from regulation under Subtitle C of the Resource Conservation and Recovery Act (RCRA), 42 USC Sections 6921, et seq. For natural gas, primary field operations include those production-related activities at or near the wellhead and at the gas plant (regardless of whether or not the gas plant is at or near the wellhead), but prior to transport of the natural gas from the gas plant to market. In addition, uniquely associated wastes derived from the production stream along the gas plant feeder pipelines are considered E&P wastes, even if a change of custody in the natural gas has occurred between the wellhead and the gas plant. In addition, wastes uniquely associated with the operations to recover natural gas from underground storage fields are considered to be E&P waste.

The 900 Series rules for E&P Waste Management establish the permitting, construction, operating and closure requirements for pits, methods of E&P waste management, procedures for spill/release response and reporting, and sampling and analysis for remediation activities. The 900 Series rules are applicable only to E&P waste, as defined in § 34-60-103(4.5), C.R.S., or other solid waste where the Colorado Department of Public Health And Environment (CDPHE) has allowed remediation and oversight by the Commission.

Furthermore, Rule 907. sets forth requirements for the Management of E&P Waste including the following:

907.a. General Requirements

907.a.(1) – Operator obligations. *Operators shall ensure that 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 or to the extent necessary to ensure compliance with the concentration levels in Table 910-1, with consideration to WQCC ground water standards and classifications.*

907.a.(2) – *E&P waste management activities shall be conducted, and facilities constructed and operated, to protect the waters of the state from significant adverse environmental impacts from E&P waste, except as permitted by applicable laws and regulations.*

907.a.(3) – Reuse and recycling. *To encourage and promote waste minimization, operators may propose plans for managing E&P waste through beneficial use, reuse, and recycling by submitting a written management plan to the Director for approval on a Sundry Notice, Form 4, if applicable. Such plans shall describe, at a minimum, the type(s) of waste, the proposed use of the waste, method of waste treatment, product quality assurance, and shall include a copy of any certification*

or authorization that may be required by other laws and regulations. The Director may require additional information.

WATER-BASED BENTONITIC DRILLING FLUIDS & ASSOCIATED DRILL CUTTINGS

BACKGROUND

In regards to the transport and handling of E&P waste material off-site, the first consideration is compliance under the current Colorado Oil and Gas Conservation Commission (COGCC) Rules and Regulations. Rule 907.d.(3)B. sets forth the applicability, requirements and operator obligations for the land application of water-based bentonitic drilling fluids. Rule 907.d.(3)B.v. states that prior COGCC approval is not required if the drilling fluids are utilized as a soil amendment. However, Rule 907.d. does not address associated drill cuttings. As a result, PDC Energy, Inc. (PDC) has developed this E&P Waste Management Plan in accordance with Rule 907.a.(3) to encourage and promote waste minimization through beneficial use and reuse of water-based bentonitic drilling fluids and associated drill cuttings as a soil amendment.

The second consideration is whether the operation would be classified as a Centralized E&P Waste Management Facility (CWMF) as defined in the COGCC Rules and Regulations. A facility is a CWMF if (1) it is used exclusively by one owner or operator, or used by more than one operator under an operation agreement, *and* (2) is operatory for a period of greater than three (3) years; *and* (3) received for collection, treatment, temporary storage, and/or disposal of exempt E&P wastes from two or more production units or areas or from a set of commonly owned or operated leases. PDC's E&P Waste Management Plan for the land application of water-based bentonitic drilling mud and associated drill cuttings presented herein does not include more than one operator and anticipates operating each site for less than 3 years. Therefore, any individual drilling fluid or drill cuttings land application site will not qualify as a CWMF.

A map showing the locations of the sites (Figure 1) is included as Attachment A and a table listing the land application sites with location and current status (Table 1) is included as Attachment B. Should any new land application sites be utilized by PDC or if any of the current sites be de-commissioned, a revised E&P Waste Management Plan will be submitted accordingly.

ESTIMATED AMOUNT OF MATERIAL

PDC estimates that each vertical well (surface hole and production hole) will generate approximately 250 cubic yards of drill cuttings. PDC estimates that each horizontal well (surface hole and production hole) will generate from 300-500 cubic yards of drill cuttings.

Currently, PDC has four (4) drilling rigs operating in the Greater Wattenberg Area of the DJ Basin. However, changing economics or budgeting concerns may increase or decrease drilling activity.

LANDOWNER AGREEMENT FOR LAND APPLICATION SITES

As per Rule 907.d.(3).iii., written authorization is obtained from private surface owners prior to any land application of material. The agreement identifies the legal description of the land

application site and the name of the well or wells and associated legal description of the drill site where the material was generated.

Additionally, the agreement states that the *“Owner acknowledges that the Colorado Oil and Gas Conservation Commission (“COGCC”) has certain requirements for the disposal of water-based bentonitic drilling fluids (or drill cuttings if applicable) and that such requirements will be followed. Owner agrees to enhance biodegradation by disking, tilling, aerating, addition of nutrients, microbes, water, or other amendments to comply fully with the Rules and Regulations of the COGCC. Owner agrees to abide by the COGCC rules, as they may be amended, and discharges PDC from any and all claims arising from the land application of the drilling fluids.”*

TRANSPORT AND HANDLING

Water-based bentonitic drilling fluids and associated drill cuttings will originate from PDC drilling operations only. PDC will transport the water-based bentonitic drill fluids to the land application sites by vacuum trucks. PDC will transport the drill cuttings to the land application sites by loading the material into 10-18 cubic yard dump trucks. Loads will be transported primarily during normal business hours. The drill cuttings material will not contain free liquids, thus the transportation will not impact local roads or users of the road.

Material will be unloaded from the trucks onto a pre-determined, designated location. In accordance with Rule 907.b.(2), information about the drilling fluid and/or drill cuttings E&P waste transportation will include:

- Name and location of the well(s) where the material was generated
- Volume of the material generated
- Name of material transporter
- Name and location of the land application site.

SAMPLING AND ANALYSIS OF LAND APPLICATION SITES

Water-based bentonitic drilling fluids that have been introduced down-hole and returned to the surface with associated drill cuttings are E&P wastes and as such, management must meet the requirements of Rule 907 of the COGCC Rules and Regulations. Rule 907.a.(1) indicates that the primary responsibility of the operator is to protect the environment and to comply with Table 910-1 which contains regulatory limits for metals, organics, and inorganics in soil and water.

Prior to any application of drilling fluids or drill cuttings at a land application site, PDC conducts baseline soil sampling and percolation tests. Each soil type at a particular site is identified through National Resource Conservation Service (NRCS) reports. Representative samples are collected from and percolation tests (falling hydrostatic head) performed on each NRCS soil type. Soil samples are composited vertically from ground surface to 18 inches using a hand auger. Standard analytical sampling protocols for soils will be followed; including collection procedures, collection containers, holding times, and chain of custody. Each sample is typically analyzed for Electrical Conductivity (EC), Sodium Adsorption Ratio (SAR), pH, and total metals listed in Table 910-1 (excluding boron).

PDC will also sample each location on a periodic basis (typically annual) using the approximate sampling locations and percolation points as in the baseline program. Post-application analyses include the same analyte list as in the baseline sampling program. Additionally, Total Petroleum Hydrocarbons (TPH) and BTEX constituents will be analyzed on all samples collected during post-application sampling events. Should post-application sampling results indicate conditions that exceed the Table 910-1 Concentration Levels, the COGCC will be notified to determine appropriate corrective action, if necessary.

RECLAMATION OF LAND APPLICATION SITES

Upon the decision to discontinue land application at a particular site, a final sampling and percolation event will be conducted to document closure conditions. Final analyses will include the same analyte list as in the baseline sampling program, as well as TPH and BTEX constituents. Should final sampling results indicate conditions that exceed the Table 910-1 Concentration Levels, the COGCC will be notified to determine appropriate corrective action, if necessary.

FORM 4 – SUNDRY NOTICE

As stated previously, Rule 907.d.(3) does not specifically address the land application of associated drill cuttings. In accordance with Rule 907.a.(3), PDC has developed this E&P Waste Management Plan to also manage drill cuttings by land application as a soil amendment. As per COGCC requirements, a Form 4 – Sundry Notice will be submitted for consideration by the COGCC staff and will include a Site Location Map and a Soil Sample Location Map from the baseline sampling event of the proposed drill cuttings application site.

The locations of all land application sites are also depicted on the attached Figure 1 (Attachment A). The attached Table 1 (See Attachment B) summarizes the active, inactive, and decommissioned land application sites where PDC has incorporated drilling mud and/or associated drill cuttings. If PDC determines subsequent land application sites are no longer necessary, a Sundry Form 4/closure request will be submitted for approval by COGCC staff. Should any new drill cuttings sites be created, a revised E&P Waste Management Plan will accompany the Form 4 – Sundry Notice regarding the proposed land application site.

COMPLETION FLOW-BACK FLUIDS

Flow-back fluids recovered during post-hydraulic fracturing operations are stored in temporary tanks (450 barrels or 500 barrels) on the location. As necessary, vacuum trucks with an approximate 80-120 barrel capacity will transport this fluid to the nearest commercial Class II injection well operated by High Sierra Water Services, LLC. (see attached Table 2 and Figure 2) for disposal. PDC will ensure that the completion flow-back fluids are properly transported, stored, and handled to prevent adverse environmental impacts. PDC will maintain appropriate records of E&P waste that is transported to and from the facility in accordance with Rule 907.b.

PRODUCED WATER

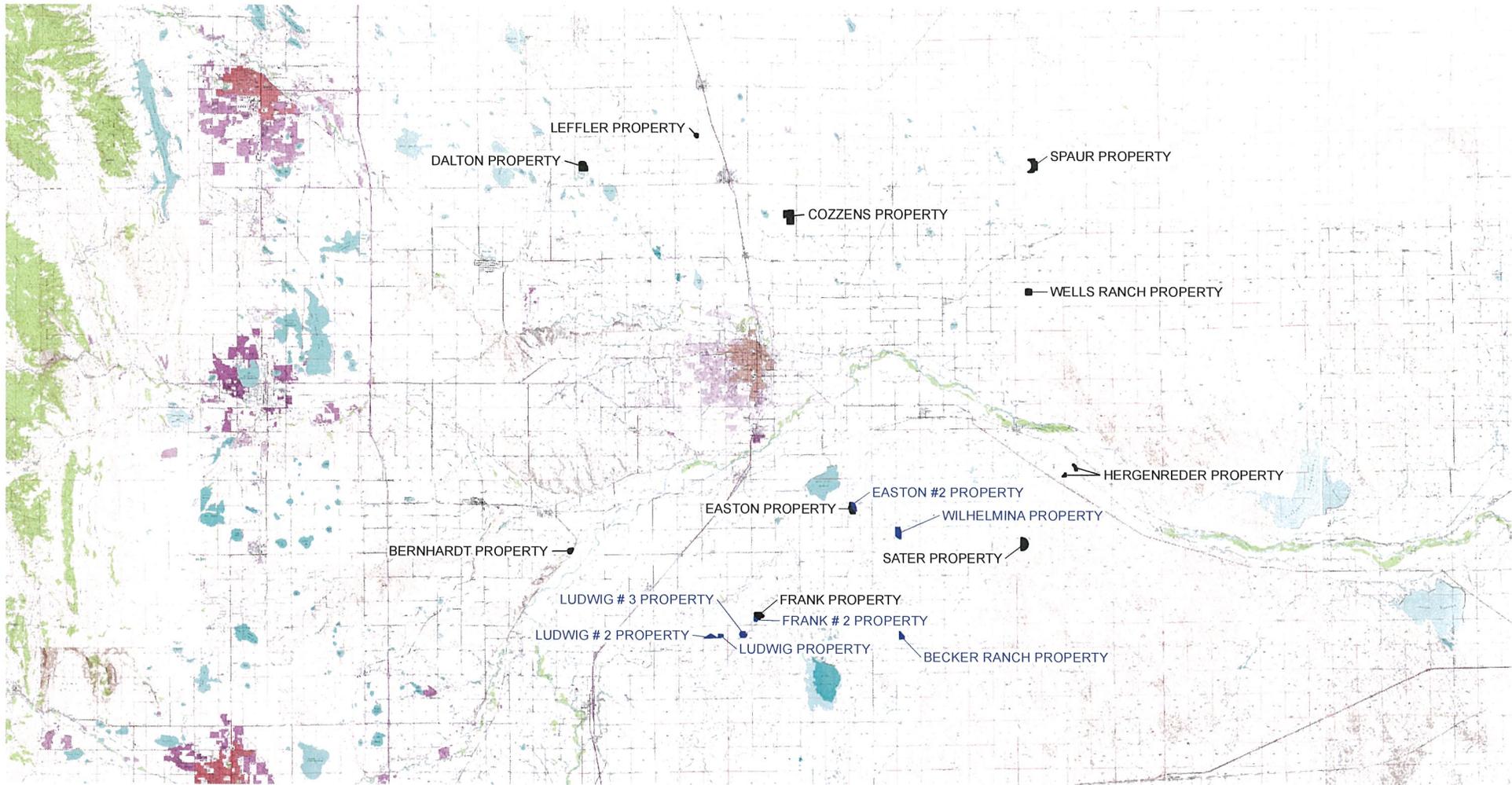
Produced water (predominately a sodium-chloride type in the DJ Basin) is a waste by-product associated with oil and gas production. This waste stream is segregated at the tank battery by the separator and stored in designated tanks or in buried or partially buried vessels. Vacuum trucks with an approximate 80-120 barrel capacity make scheduled runs to these tank batteries to collect produced water. The fluid is then transported to the nearest commercial Class II injection well operated by High Sierra Water Services, LLC. (see attached Table 2 and Figure 2) for disposal. PDC will ensure that the produced water is properly transported, stored, and handled to prevent adverse environmental impacts. PDC will maintain appropriate records of E&P waste that is transported to and from the facility in accordance with Rule 907.b.

IMPACTED SOIL AND/OR GROUNDWATER

As per Rule 906.a, spill/releases of E&P waste, including produced fluids, shall be controlled and contained immediately upon discovery. Impacts resulting from spill/releases shall be investigated and remediated as soon as practicable. Spill/releases shall be reported to the appropriate regulatory agencies in accordance with Rule 906.b. Impacted soils are typically removed and transported to a commercial landfill for disposal. Impacted groundwater or surface water that is recovered as a result of a spill is typically transported to the nearest commercial Class II injection well operated by High Sierra Water Services, LLC. (see attached Table 2 and Figure 2) for disposal.

ATTACHMENT A

FIGURE 1 – MAP OF LAND APPLICATION SITES



LEGEND

- WATER - BASED BENTONITIC DRILLING MUD/CUTTINGS LAND APPLICATION AREA
- CLOSED LAND APPLICATION AREA

IMAGE COURTESY OF USDA/NRCS, VARIOUS DATES



FIGURE 1
LAND APPLICATION FACILITY MAP
WELD COUNTY, COLORADO



PDC ENERGY, INC.

ATTACHMENT B

TABLE 1 – LAND APPLICATION SITES

**TABLE 1: WATER-BASED BENTONITIC DRILLING FLUIDS AND DRILL CUTTINGS LAND APPLICATION SITES
PDC ENERGY / WELD COUNTY, CO**

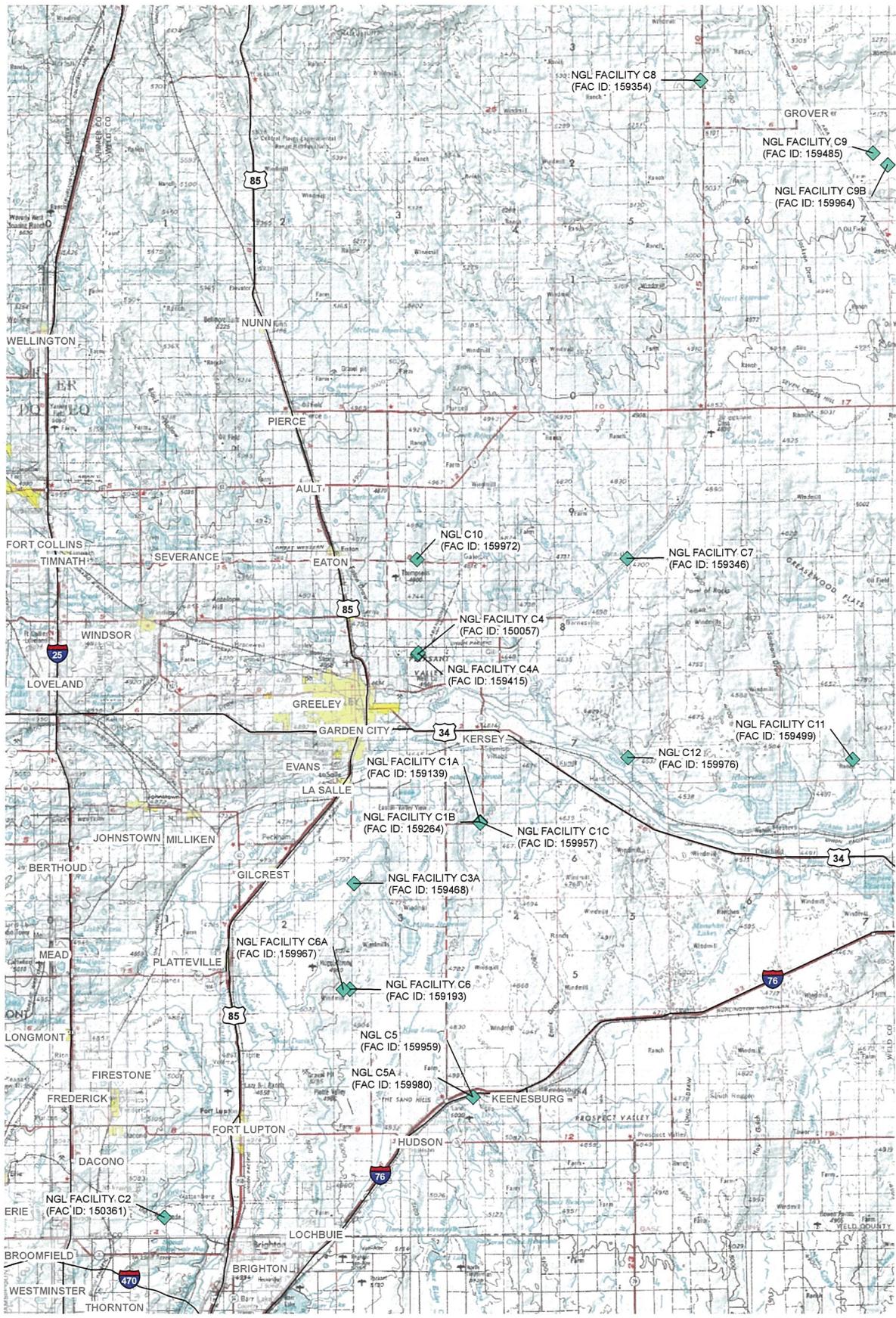
FACILITY NAME	FACILITY ID	LOCATION	BASELINE SAMPLING DATE	CURRENT STATUS
Ludwig #3 Beneficial Reuse Area	444255	SWNE 6 T3N - R65W	10/29/2015	Active
Becker Ranch Beneficial Reuse Area	159534	5 T3N - R64W	10/24/2014	Active
Wilhelmina #1 Beneficial Reuse Area	436033	NWNW 17 - T4N - R64W	1/15/2014	Active
Frank #2 Beneficial Reuse Area	434889	NWSW 32 T4N - R65W	9/19/2013	Active
Ludwig #2 Beneficial Reuse Area	431183	NW 1 T3N - R66W	11/29/2012	Inactive
Ludwig #1 Beneficial Reuse Area	430649	NW 1 T3N - R66W	10/12/2012	Inactive
Easton #2 Beneficial Reuse Area	429629	NW 12 T4N - R65W	7/2/2012	Inactive
Spaur Beneficial Reuse Area	425114	NE 31 T7N - R63W	2/25/2011	Closed 7/9/2013
Frank Beneficial Reuse Area	425112	NESW 32 T4N - R65W	10/14/2010	Closed 10/22/2014
Bernhardt Beneficial Reuse Area	425121	SE 13 T4N - R67W	7/8/2010	Closed 8/31/2011
Leffler Beneficial Reuse Area	425120	NENE 26 T7N - R66W	3/12/2010	Closed 2/18/2010
Cozzens Beneficial Reuse Area	425119	NWNE 9 T6N - R65W	3/10/2010	Closed 4/26/2010
Dalton Beneficial Reuse Area	425118	NW 31 T7N - R66W	2/24/2010	Closed 4/26/2011
Hergenruder Beneficial Reuse Area	425117	NESW 33 T5N - R63W	12/18/2009	Closed 1/11/2010
Paul Sater Beneficial Reuse Area	425116	SW 18 T4N - R63W	11/19/2009	Closed 11/21/2013
Easton Beneficial Reuse Area	425115	NW 12 T4N - R65W	7/27/2009	Closed 1/27/2014
Well Ranch Beneficial Reuse Area	428254	30 T6N - R63W	10/15/2008	Closed 1/27/2014

ATTACHMENT C

TABLE 2 – DISPOSAL WELL SITES
FIGURE 2 – MAP OF DISPOSAL WELL SITES

**TABLE 2: NGL WATER SOLUTIONS DJ LLC / DISPOSAL WELL INFORMATION SUMMARY
WELD COUNTY, CO**

Facility Type	Facility ID/ API	Facility Name/ Number	Operator Name/ Number	Status	Location
<u>UIC DISPOSAL</u>	150361	NGL FACILITY C2	NGL WATER SOLUTIONS DJ LLC 10373	AC	WELD 123 SESE 28 1N 67W 6
<u>UIC Disposal</u>	159980	NGL C5A	NGL WATER SOLUTIONS DJ LLC 10373	AC	WELD 123 NESW 29 2N 64W 6
<u>UIC Disposal</u>	159959	NGL C5	NGL WATER SOLUTIONS DJ LLC 10373	AC	WELD 123 SWSW 29 2N 64W 6
<u>UIC DISPOSAL</u>	159193	NGL FACILITY C6	NGL WATER SOLUTIONS DJ LLC 10373	AC	WELD 123 SESE 30 3N 65W 6
<u>UIC DISPOSAL</u>	159967	NGL FACILITY C6A	NGL WATER SOLUTIONS DJ LLC 10373	AC	WELD 123 SWSE 30 3N 65W 6
<u>UIC DISPOSAL</u>	159957	NGL FACILITY C1C	NGL WATER SOLUTIONS DJ LLC 10373	AC	WELD 123 SESE 8 4N 64W 6
<u>UIC DISPOSAL</u>	159264	NGL FACILITY C1B	NGL WATER SOLUTIONS DJ LLC 10373	AC	WELD 123 SESE 8 4N 64W 6
<u>UIC DISPOSAL</u>	159139	NGL FACILITY C1A	NGL WATER SOLUTIONS DJ LLC 10373	AC	WELD 123 SESE 8 4N 64W 6
<u>UIC DISPOSAL</u>	159468	NGL FACILITY C3A	NGL WATER SOLUTIONS DJ LLC 10373	AC	WELD 123 NWNW 32 4N 65W 6
<u>UIC DISPOSAL</u>	159976	NGL C12	NGL WATER SOLUTIONS DJ LLC 10373	AC	WELD 123 NESE 27 5N 63W 6
<u>UIC DISPOSAL</u>	150057	NGL FACILITY C4	NGL WATER SOLUTIONS DJ LLC 10373	AC	WELD 123 SWSE 26 6N 65W 6
<u>UIC DISPOSAL</u>	159415	NGL FACILITY C4A	NGL WATER SOLUTIONS DJ LLC 10373	AC	WELD 123 SWSE 26 6N 65W 6
<u>UIC DISPOSAL</u>	159346	NGL FACILITY C7	NGL WATER SOLUTIONS DJ LLC 10373	AC	WELD 123 SESE 34 7N 63W 6
<u>UIC Disposal</u>	159972	NGL C10	NGL WATER SOLUTIONS DJ LLC 10373	AC	WELD 123 SWSE 35 7N 65W 6



LEGEND
 ◆ INJECTION FACILITY
 FAC ID: FACILITY ID

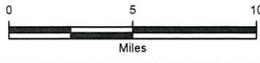


FIGURE 2
 NGL WATER SOLUTIONS DJ LLC.
 SALT WATER DISPOSAL WELLS
 WELD COUNTY, COLORADO



PDC ENERGY, INC.