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State of New Mexico
Energy Minerals and Natural Resources
Oil Conservation Division
1220 South St. Francis Dr.
Santa Fe, NM 87505

RECEIVED

AUG 17 2018

Form C-101
Revised July 18, 2013

AMENDED REPORT

DISTRICT II-ARTESIA O.C.D.

APPLICATION FOR PERMIT TO DRILL, RE-ENTER, DEEPEN, PLUGBACK, OR ADD A ZONE

¹ Operator Name and Address Solaris Water Midstream, LLC 9811 Katy Freeway Suite 900 Houston, TX 77024		² OGRID Number 371643
⁴ Property Code 322266		³ API Number 30-015-45204
⁵ Property Name Mad Cow SWD		⁶ Well No. #1

⁷ Surface Location

UL - Lot	Section	Township	Range	Lot 1/4	Feet from	N/S Line	Feet From	E/W Line	County
I	12	24S	30E		2,441'	SOUTH	1,135'	EAST	EDDY

⁸ Proposed Bottom Hole Location

UL - Lot	Section	Township	Range	Lot 1/4	Feet from	N/S Line	Feet From	E/W Line	County

⁹ Pool Information

Pool Name SWD; Devonian - Silurian	Pool Code 97869
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Additional Well Information

Fed Surf. / Fee Minerals

¹¹ Work Type N	¹² Well Type S	¹³ Cable/Rotary R	¹⁴ Lease Type P	¹⁵ Ground Level Elevation 3,535'
¹⁶ Multiple No	¹⁷ Proposed Depth 17,650'	¹⁸ Formation Devonian-Silurian	¹⁹ Contractor TBD	²⁰ Spud Date Upon Approval
Depth to Ground water 250' (C-03960-POD1)		Distance from nearest fresh water well 11,606' (C-03702-POD1)		Distance to nearest surface water 1,396' SW

☒ We will be using a closed-loop system in lieu of lined pits

²¹ Proposed Casing and Cement Program

Type	Hole Size	Casing Size	Casing Weight/ft	Setting Depth	Sacks of Cement	Estimated TOC
Surface	24"	20"	94.0 lb/ft	600'	600	Surface
Intermediate 1	17-1/2"	13-3/8"	54.5 lb/ft	4,300'	2,600	Surface
Intermediate 2	12-1/4"	9-5/8"	53.50 lb/ft	13,000'	3,500	Surface
Liner	8-1/2"	7-5/8"	39 lb/ft	16,420'	250	12,900' (TOL)

Casing/Cement Program: Additional Comments

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²² Proposed Blowout Prevention Program

Type	Working Pressure	Test Pressure	Manufacturer
Annular, Pipe & Blind/Shear Rams	10,000 psi	7,000 psi	Hydril, Cameron or Equivalent

²³ I hereby certify that the information given above is true and complete to the best of my knowledge and belief.

I further certify that I have complied with 19.15.14.9 (A) NMAC ☐ and/or 19.15.14.9 (B) NMAC ☐ if applicable.

Signature: *Bonnie Atwater*

Printed name: *Bonnie Atwater*

Title: *Reg. Tech*

E-mail Address: *bonnie.atwater@solariswatermidstream.com*

Date: *8.1.18*

Phone: *437.203.9020*

OIL CONSERVATION DIVISION

Approved By:

Raymond W. Ordway

Title:

Geologist

Approved Date: *8-24-18*

Expiration Date: *8-24-20*

Conditions of Approval Attached

APPROVED C-108

SURFACE ELEVATION 3,535' TOTAL DEPTH 17,650

MUD LOGGING E LOGGING/ DIRECTIONAL	CASING SIZE (IN.) CEMENT (SACKS)	RKB DRILL DEPTH MD TVD	BOPE	FORMATION	HOLE SIZE (IN.)	MUD WT.	FRAC GRAD	TUBING
GRND LEVEL	RKB	32						
GL ELEV		3,535						
30"		120 / 120	OPEN		32"	8.8		
GROUT TO SURFACE					24"	8.4		
20"		575		PERMIAN RUSTLER FM (USDW)				
94# J55 BTC		600 / 600	26-3/4"-3M ANNULAR/DIVERTER			8.4		
600 SACKS, CEMENTED TO SURFACE						9.5		
MUD LOGGING TO BEGIN AT 2500'					17.5"	9.5 to 10.0		
13 3/8"		4,320		PERMIAN DELAWARE MTN. GROUP				
54.5# J-55		4,300 / 4,300	21-3/4" -5M ANNULAR			10.0		
2,600 SACKS, CEMENTED TO SURFACE			21-3/4" -5M BOP			9.4		
DV TOOL AT ±3,300' IN 9 5/8" OPEN HOLE, ECP BELOW		8,930		PERMIAN BONE SPRING FM.				
		11,370		PERMIAN WOLFCAMP FM.	12 1/4"	9.4 to 10.0		
TOL		12,900 / 12,900						
9 5/8"		13,000 / 13,000	13-5/8" -10M ANNULAR			10.0		
53.5# P110 BTC			13-5/8" -10M BOP			12.5		
3,500 SACKS, CEMENTED TO SURFACE IN TWO STAGES		13,450		PENNSYLVANIAN STRAWN FM.				
		13,630		PENNSYLVANIAN ATOKA FM.	8 1/2"	12.5 to 14.6		
		14,430		PENNSYLVANIAN MORROW FM.				
7 5/8"		16,420		DEVONIAN				
39# P110, ST-L		16,420 / 16,420	13-5/8" -10M ANNULAR			14.6		
250 SACKS, EST. TOC 12,900' BACK UP INTO THE 9 5/8" CASING (VERIFIED WITH RADIAL CEMENT BOND LOG)			13-5/8" -10M BOP					
RUN #1					6 1/2"	9.0		
GR/NEUTRON 17,650 - 0			13-5/8" -10M ANNULAR	Base of FUSSELMAN FM				
USIT/CBL 16,420 - 0	DUAL 0"	17,550	13-5/8" -10M BOP					
		TD 17,650 / 17,650						

5" (23#) IPC TUBING

12,800

5" (18#) IPC TUBING

16,400'

MAD COW SWD #1

SECTION 12T-24-S, R-30-E
2441' FSL & 1135' FEL
EDDY COUNTY, NEW MEXICO

PN # 1680.NM.00

JULY 2018



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GOVERNMENT RELATIONS · ENERGY · PLANNING · TECHNOLOGY
ENGINEERING · ENVIRONMENTAL

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SIZE
A

SCALE

NTS

WELL BORE DATA SHEET

Solaris Water Midstream, LLC

Solaris Mad Cow SWD #1

2,441' FSL & 1135' FEL

Section 12, Twp 24-S, Rng 30-E

Eddy County, New Mexico

Drilling Program – New Drill

Objective: Drill new well for commercial salt water disposal into the Devonian and Silurian-Fusselman formations (mudlogging and geophysical logging to determine final depths) per SWD-1685.

1. Geologic Information – Devonian to Silurian-Fusselman formations

The Devonian and Silurian-Fusselman formations consist of carbonates including light colored dolomite and chert intervals interspersed with some tight limestone intervals. Several thick sections of porous dolomite capable of taking oilfield fluid wastes are present within the subject formations in the area. Depth control data was inferred from deep wells to the north, south and east. If the base of Silurian-Fusselman and top of Devonian rocks come in as expected the well will only be drilled deep enough for adequate logging rathole.

Estimated Formation Tops:

B/Fresh Water	250
T/Rustler	575
Delaware Sand	4320
Bone Spring	8930
Wolfcamp	11370
Strawn	13450
Atoka	13630
Morrow	14430
Devonian	16420
Total Depth	17650

*Please see narrative portion of drilling/pipe specs for total depth (TD) options.

2. Drilling Procedure

- a. Move in and rig up (MIRU) drilling rig and associated equipment. Set up H₂S wind direction indicators; brief all personnel on Emergency Evacuation Routes.
- b. All contractors conduct Job Safety Analysis (JSA) meeting prior to current task. All equipment inspected daily. Repair/replace as required.
- c. Well spud operations commence.
- d. Mud logger monitoring returns; cuttings & waste hauled to specified facility. (Sundance, Lea County)
- e. After surface casing set/drilled: if H₂S levels >20ppm detected, implement H₂S Plan accordingly. (e.g., cease operations, shut in well, employ H₂S safety trailer & personnel safety devices, install flare line, etc. – refer to plan.)
- f. Spills contained & cleaned up immediately. Repair or otherwise correct the situation within 48 hours before resuming operations. Notify Oil Conservation Division (OCD) within 24 hours. Remediation started as soon as possible (ASAP) if required. Operator shall comply with 19.15.29 NMAC and 19.15.30 NMAC, as appropriate.

Well Program – New Drill (cont.)

- g. Sundry forms filed as needed – casing, cement, etc. – operations continue to completion.

3. Casing program – Casing designed as follows:

STRING	HOLE SZ	DEPTH	CSG SZ	COND	WT/GRD	CLLPS/BRS	TNSN
						<i>(Minimum Safety Factors)</i>	
Conductor	32.0"	0-120'	30.0"	n/a	n/a	n/a	n/a
Surface	24.0"	0-600'	20.0"	New	94.0 lb. J-55	1.125/1.1	1.8
Intermediate	17.5"	0-4,300'	13.375"	New	54.5 lb. J-55	1.125/1.1	1.8
2 nd Inter	12.25"	0-13,000'	9.625"	New	53.5 lb. P-110	1.125/1.1	1.8
Prod/Liner*	8.5"	12,900 -16,420'	7.625"	New	39 lb. P-110	1.125/1.1	1.8
Openhole*	6.5" hole	16,420'-17,650'	OH	n/a	n/a	n/a	n/a

Notes:

- ✓ On both Intermediate casing strings, the cement will be designed to circulate to surface. Both strings will have cement bond logs run (radial, CET or equivalent) to surface.
- ✓ While running all casing strings, the pipe will be kept a minimum of 1/3 full at all times to avoid approaching the collapse pressure of casing.
- ✓ *Based on mudlogging and geophysical logs, 7.625" casing shoe is expected to be set at 16,420'. Similarly, TD may be approximately from 17,500' to 17,659' as determined by logging and suitable porosity has been exposed. IN ANY EVENT, maximum openhole interval would be from 16,420' to 17,650' and sundry notice will document such events as a C-105 completion report filed within 60 days.

4. Cementing Program:

Surface – Cemented with approximately 600 sacks of cement with 100% excess and circulated to the surface.

1st Intermediate – Cemented with approximately 2,600 sacks of cement with 50% excess and cemented to surface.

2nd Intermediate – Cemented with approximately 3,500 sacks of cement with 30% excess and cemented to surface in two stages. Placement of DV tool will be determined during drilling operations.

Prod Liner – Cement with approximately 250 sacks of cement with 30% excess and cement back up at least 200 feet inside the 9-5/8" 2nd intermediate casing string. Cement top to be confirmed by cement bond logging after cement has cured to appropriate compressive strength.

5. **Pressure Control** – All Blowout Preventers (BOP) and related equipment will comply with well control requirements as described NMOCD Rules and Regulations and API RP 53, Section 17. Minimum working pressure of the BOP and related equipment required for the drilling shall be 500 psi. The New Mexico Oil Conservation Division (NMOCD) Hobbs district office shall be notified a minimum of 4 hours in advance for a representative to witness all BOP pressure tests. The test shall be performed by an independent service company utilizing a test plug (no cup of J-packer). The results of the test shall be recorded on a calibrated test chart submitted to the OCD district office. Test shall be conducted at:

- a. Installation;
- b. After equipment or configuration changes;

Well Program – New Drill (cont.)

- c. At 30 days from any previous test, and;
- d. Any time operations warrant, such as well conditions.

The blowout preventer specifications to be used during the various phases of the drilling/casing are included in the table below:

Casing Size	Annular Preventer	Rams
20"	26-3/4" – 3M, with diverter	None
13-3/8"	21-3/4" – 5M	Pipe & Blind/Shear – 5M
9-5/8"	13-5/8" – 10M	Pipe & Blind/Shear – 10M

A diagram showing the representative BOP setup is included as Attachment 1.

6. **Mud Program & Monitoring** – Mud will be balanced for all operations with adjustment as needed based on actual wellbore conditions and is proposed as follows:

DEPTH	MUD TYPE	WEIGHT	FV	PV	YP	FL	Ph
0-575'	FW Spud Mud	8.5-9.2	70-40	20	12	NC	10.0
575'-2,725'	Brine Water	9.8-10.2	28-32	NC	NC	NC	10.0
2,725'-10,175'	FW/Gel	8.7-9.0	28-32	NC	NC	NC	9.5-10.5
10,175'-17,650'	XCD Brine Mud	11.0-	45-48	20	10	<5	9.5-10.5

Mud and all cuttings monitored w/ cuttings recovered for disposal. Returns shall be visually and electronically monitored. In the event of H₂S, mud shall be adjusted appropriately by weight and H₂S scavengers.

7. **Auxiliary Well Control and Monitoring** – Hydraulic remote BOP operation, mudlogging to monitor returns.

8. **H₂S Safety** – This well and related facilities are not expected to have H₂S releases. However, there may be H₂S in the area. There are no private residences or public facilities in the area but a contingency plan has been developed. Solaris Water Midstream, LLC will have a company representative available to personnel throughout all operations. If H₂S levels greater than 10ppm are detected or suspected, the H₂S Contingency Plan will be implemented at the appropriate level.

H₂S Safety – There is a low risk of H₂S in this area. The operator will comply with the provisions of New Mexico Administrative Code (NMAC) 19.15.11 and Bureau of Land Management (BLM) Onshore Oil and Gas Order #6.

- a. Monitoring – all personnel will wear monitoring devices.
- b. Warning Sign – a highly visible H₂S warning sign will be placed for obvious viewing at the vehicular entrance point onto location.
- c. Wind Detection – two (2) wind direction socks will be placed on location.
- d. Communications – will be via cellular phones and/or radios located within reach of the driller, the rig floor and safety trailer when applicable.
- e. Alarms – will be located at the rig floor, circulating pump/reverse unit area and the flareline and will be set for visual (red flashing light) at 15 ppm and visual and audible (115 decibel siren) at 20 ppm.
- f. Mud program – If H₂S levels require, proper mud weight, safe drilling practices and H₂S scavengers will minimize potential hazards.

Well Program – New Drill (cont.)

- g. Metallurgy – all tubulars, pressure control equipment, flowlines, valves, manifolds and related equipment will be rated for H₂S service if required.

The Solaris Water Midstream, LLC H₂S Contingency Plan will be implemented if levels greater than 10ppm H₂S are detected.

- 9. **Logging, Coring and Testing** – Solaris Water Midstream, LLC expects to run:
 - a. Mud logging through the interval will ensure the target interval remains Devonian and Silurian.
 - b. Cement bond log (Radial, CET or equivalent) on 2nd deep intermediate casing string and liner.
 - c. Standard gamma ray, compensated density- neutron and resistivity log suite from TD to approximately 10,000'.
 - d. No corings or drill tests will be conducted. (The well may potentially be step rate tested in the future if additional injection pressures are required.)

- 10. **Potential Hazards** – No abnormal pressure or temperatures are expected, but drilling operations will be prepared in the event that those conditions occur.

No loss of circulation is expected to occur with the exception of drilling into the target disposal zone. All personnel will be familiar with the safe operation of the equipment being used to drill this well.

The maximum anticipated bottom-hole pressure is 9500 psi and the maximum anticipated bottom-hole temperature is 210°F.

- 11. **Waste Management** – All drill cuttings and other wastes associated with and drilling operations will be transported to the Lea County Sundance facility (or alternate), permitted by the Environmental Bureau of the New Mexico Oil Conservation Division.

- 12. **Anticipated Start Date** – Upon approval of all permits for saltwater disposal (SWD), operations would begin within 30 days based on rig availability. Completion of the well operations will take approximately six to seven weeks. Installation of the tank battery, berms, plumbing and other associated equipment would be occurring during the same interval. In any event, it is not expected for the construction phase of the project to last more than 60 days, pending on availability of contractors and equipment.

- 13. **Configure for Salt Water Disposal** – Subsequent to SWD permit approval from OCD and prior to commencing any work, a Notice of Intent (NOI) sundry(ies) will be submitted to configure the well for SWD and will detail the completion workover including all work otherwise described above, any change to the procedure noted herein and to perform mechanical integrity pressure test per BLM and OCD test procedures. (Notify NMOCD 24 hours prior.) The casing/tubing annulus will be monitored for communication with injection fluid or loss of internal mechanical integrity. Anticipated daily maximum volume is 30,000 bpd and average of 15,000 bpd at a maximum surface injection pressure of 3284 psi (0.2 psi/ft to uppermost injection interval, i.e., casing shoe). If satisfactory disposals rates cannot be achieved at default pressure of .2 psi/ft, Solaris Water Midstream, LLC will conduct a step-rate test and apply for an injection pressure increase 50 psi below parting pressure.

Attachment 1 – Representative BOP Setup

