



For Department Use Only:

Agency Interest Number \_\_\_\_\_  
PRD Assigned \_\_\_\_\_

1. Name and mailing address of person or group performing research (Responsible Person):

Joseph Olson  
Devon Energy Production Company, L.P.  
333 West Sheridan Ave. Oklahoma City, OK 73102

Work Phone: (405)228-2444  
Cell/Home Phone: (918)894-1080  
Email: joseph.olson@dvn.com

2. Name and position of person completing form:

3. Paul Barbour  
Devon Energy Production Company, L.P.  
333 West Sheridan Ave. Oklahoma City, OK 73102

Work Phone: (405)228-4308  
Cell/Home Phone: (405)850-8404  
Email: paul.barbour@dvn.com

3. Research Focus (PWRC Research Category): Water quality and cost effectiveness.

4. Is the proposed use of the treated produced water to be used inside or outside of the oil and gas industry? Inside \_\_\_\_\_

5. Does the location for testing the technology take place inside or outside of the oil and gas field? Inside\_

6. Physical location of the research site including size and boundaries of site (include, street address, township, range, section, county, distance from closest town or landmark, directions to facility. There is no street address for the location. The location is in section 22 Township 25 South and Range 31 East in Eddy County New Mexico. The location is at latitude 32.113744 and Longitude -103.758072.

7. Topographic and aerial map(s) showing: See attachment 2RF-141 permit approval. (Attachment 1)

- a. land status and adjacent land status
- b. 100-year flood plain,
- c. dwellings and occupied establishments,
- d. watercourses including irrigation ditches, wetlands, lakes, karst and soils
- e. water wells (types) or springs
- f. site security
- g. site plan showing locations of relevant structures

8. List any regulatory, governmental and non-governmental agencies, including municipalities or counties that have authority on the testing location.  
New Mexico Oil Conservation Division

9. Provide a description of your signage plan for the testing site. Provide as an attachment.

10. Provide a description of your site security plan, including training and site restriction methods.

The site will be manned 24 hours per day by Crystal Clearwater Resources personnel. All personnel and visitors to the location will be required to sign in at the CCR office on location. Upon arriving at the location, all visitors will be briefed on safety protocols such as a muster point, eye wash station locations, etc. Unauthorized persons or persons without the appropriate personal protection equipment at the location will immediately be asked to leave.

11. List of adjacent landowners and confirmation that adjacent landowners have been notified of the proposed pilot project.

None. This is in a remote location.

12. List the source(s) of the produced water including basin of origin. Describe how the produced water will be transported to and from the site including origin and disposal locations and onsite storage safety precautionary methods. Provide as an attachment.

13. Provide the disposal and decommissioning plan for the expected byproducts, waste products and other potentially contaminated materials. Plan should include disposition of equipment, soils, plants and piping requiring disposal and the expected disposal locations for each. Provide as an attachment.



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- 14. Describe the expected contaminants in the untreated produced water and the treated produced water (e.g. contaminants being studied, known contaminants, known additives). Include estimated concentrations if known, and copies of laboratory analyses of untreated and treated produced water. Provide as an attachment.
- 15. Describe all components of the produced water processing, treatment, storage, secondary containment, and produced water system (e.g., pre-treatment units, above ground storage tanks, etc.). Include sizes, site layout map, closed loop processing plans, and specifications. Provide as an attachment.
- 16. Describe your disposal plan for all produced water, treated produced water, permeate or brine concentrate into a SWD. Provide as an attachment.
- 17. Describe your final closure plan after completion of the pilot project. Provide as an attachment.
- 18. Estimated depth to ground water (ft): 325 ft.. the estimate comes from Envirotech's review of area water wells as plotted by the Office of the State Engineers (OSE). See section 1.2 of the attached permit.

Direction of groundwater flow: The direction of the ground water flow has not been determined; however, the available data suggest the ground water is significantly deeper than the 50ft below bottom containment as required by New Mexico Oil and Gas Division for a recycling pond.

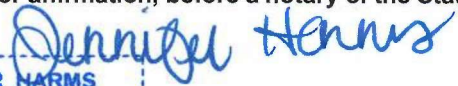
- 19. Current Total Dissolved Solids Concentration in Groundwater Approximately 123,000 mg/l TDS. See attached DAF treated water from the CD 22 pond.

Signature:  Date: 1/17/2024  
 Printed name: Joseph Olson Title: Manager Construction/Facilities

Certification by Responsible Person

I, Joseph S. Olson, hereby certify that the information and data submitted in this application are true and accurate as possible, to the best of my knowledge and professional expertise and experience.

Signed this 17 day of January, 2024, upon my oath or affirmation, before a notary of the State of Oklahoma.





Please return this form to:  
NMED Ground Water Quality Bureau  
P.O. Box 5469  
Santa Fe, New Mexico 87502-5469

Telephone: 505-827-2900  
Fax: 505-827-2965



New Mexico Environment Department  
Ground Water Quality Bureau

## Produced Water Pilot Project Notice of Intent to Discharge

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### Attachment 1 – Question 7.

C147 Registration Package  
Cotton Draw Recycling Facility  
Section 22, T25S, R31E  
Eddy County, New Mexico



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**Attachment 2 – Question 9**

**Provide a description of your signage plan for the testing site.**

Devon has a sign posted at the treatment location that a person can easily read the legend and other details. The sign provides the following information:

1. Operators name,
2. The location of the site by quarter-quarter or unit letter, section, township and range, and,
3. Emergency telephone numbers.



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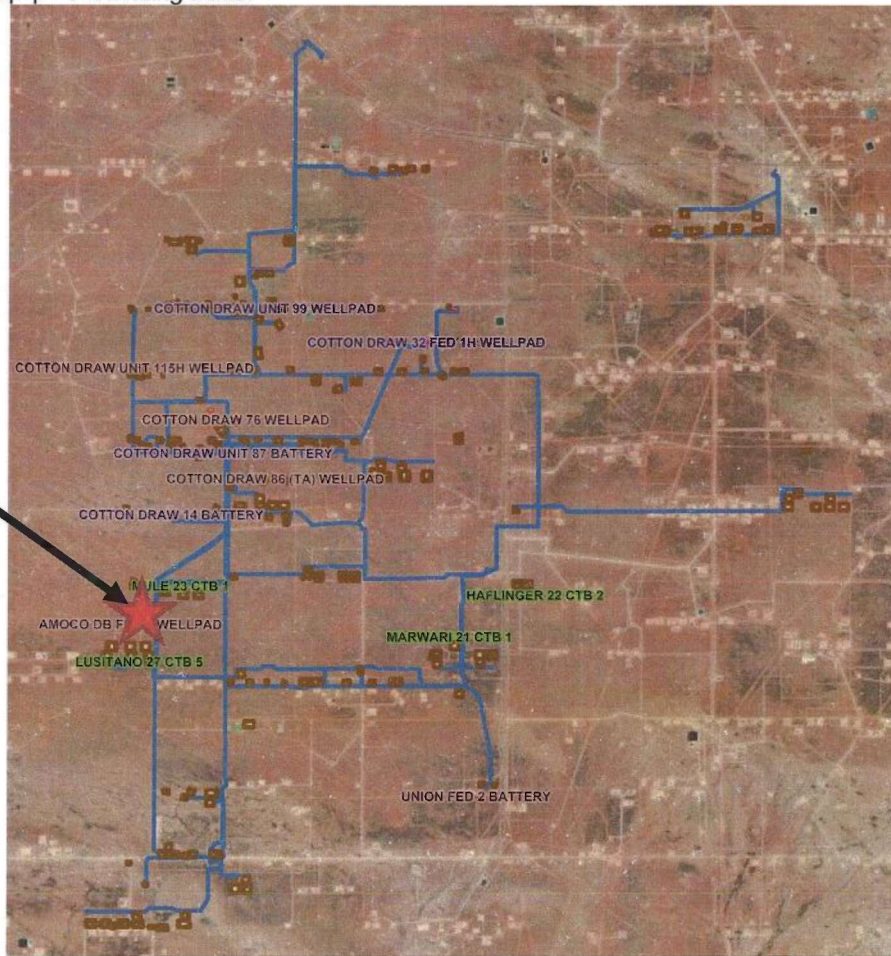
Attachment 3 - Question 12.

List the source(s) of the produced water including basin of origin. Describe how the produced water will be transported to and from the site including origin and disposal locations and onsite storage safety precautionary methods. Provide as an attachment.

The water will be transported to the Cotton Draw 22 ("CD 22") treatment facility through Devon's produced water gathering system in Devon's Cotton Draw field (see map of system). The produced water will be stored in above ground storage tanks or in Devon's produced water pond after it has been pretreated with chemicals and gone through a dissolved air flotation unit.

Before the water is processed in the proposed desalination unit, incoming water may be stored in a frac tank. Frac tanks will also be used to store the effluent streams for testing purpose before being combined again and discharged into the produced water pit to be used in completion operations. Industry standard containment for produced water will be used on all equipment holding fluids.

CD 22 Treatment Facility





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### Attachment 4 – Question 13

Provide the disposal and decommissioning plan for the expected byproducts, waste products and other potentially contaminated materials. Plan should include disposition of equipment, soils, plants and piping requiring disposal and the expected disposal locations for each. Provide as an attachment.

Disposal of by products will be handled in the same manner as current waste is handled at the approved OCD facility. If there is any soil contamination, it will be disposed of at R360 Environmental Solutions.



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**Attachment 5 - Question 14**

Describe the expected contaminants in the untreated produced water and the treated produced water (e.g. contaminants being studied, known contaminants, known additives). Include estimated concentrations if known, and copies of laboratory analyses of untreated and treated produced water. Provide as an attachment.

Below is a complete water analysis from the CD 22 pond after water has been pretreated to remove iron and total suspended solids. These are the known contaminants in the water. In addition to testing for the contaminants below, there are likely other contaminants such as ammonia, organics (benzene, toluene, xylene, etc.), naturally occurring radioactive materials (NORM), and others that are not tested for in Devon's current operations and therefore the data is not readily available. Devon and CCR will gather samples for frequent testing of these materials and coordinate with the New Mexico Produced Water Research Consortium to have third party evaluations done on the water streams.

**WATER CHEMISTRY**

<b>CATIONS</b>		<b>ANIONS</b>	
Calcium(as Ca)	3968	Chloride(as Cl)	64700
Magnesium(as Mg)	515.65	Sulfate(as SO <sub>4</sub> )	534.06
Barium(as Ba)	6.02	Dissolved CO <sub>2</sub> (as CO <sub>2</sub> )	38.40
Strontium(as Sr)	701.25	Bicarbonate(as HCO <sub>3</sub> )	294.00
Sodium(as Na)	37039	Carbonate(as CO <sub>3</sub> )	0.00
Potassium(as K)	730.93	Silica(as SiO <sub>2</sub> )	16.31
Lithium(as Li)	20.73	Phosphate(as PO <sub>4</sub> )	0.440
Iron(as Fe)	0.530	Boron(as B)	84.61
Aluminum(as Al)	0.0200		
Manganese(as Mn)	0.690		
Zinc(as Zn)	0.220		
<b>PARAMETERS</b>			
Temperature(°F)	77.00	Sample pH	7.00
Conductivity	163813	Sp.Gr.(g/mL)	1.08
Resistivity	6.10	T.D.S.	115499



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**Attachment 6 – Question 15**

**Describe all components of the produced water processing, treatment, storage, secondary containment, and produced water system (e.g., pre-treatment units, above ground storage tanks, etc.). Include sizes, site layout map, closed loop processing plans, and specifications.**

**Pretreatment**

1. Raw produced water enters a newly installed above ground storage tank (AST) or is processed through a gun barrel to remove oil and solids.
2. Raw produced water is then moved from the AST or gun barrel to the treatment plant where it is treated with chemicals such as hydrogen peroxide, a coagulant, and a flocculant.
3. The water is agitated via a serpentine system of pipes.
4. Water is then put into a dissolved air flotation (DAF) unit for removal of the solids.
5. The discharge of the DAF units has the same TDS as the water going in, but the solids and iron has been removed. Water is then stored in the pond for use in drilling and completions operations.

**Desalination**

The desalination process will be tested with water that has gone through the pretreatment step above and raw water directly from the AST tank.

Spontaneous Evaporation and Condensation Technology (SPEC) employs the process of evaporation/condensation which has two main advantages. First, it allows the replacement of large, complex equipment made from exotic metallurgy. Second, the tendency for fouling/mineral scaling is drastically reduced, along with associated downtime/maintenance costs required by most thermal technologies. An overview of the treatment process is as follows:

6. Pretreated or untreated influent is transferred enters the evaporator loop from the feed tank.
7. The brine stream is heated using heat recovered from the condensate loop through a heat exchanger. A majority of the thermal energy required for this process is recovered through this operation.
8. The heated brine stream is heated to the desired process temperature through a second heat exchanger which pulls new heat from any heat source (e.g., boiler, waste heat recovery, solar thermal) through a liquid media (e.g., Ethylene glycol).
9. The fully heated brine stream cascades through the entire series of evaporators.
10. The brine temperature drops in each stage as water evaporates.
11. The concentrated brine at the bottom of the evaporator loop is recirculated until the salinity reaches the desired level. It is possible to concentrate the evaporator loop up to the point of saturation.
12. Similarly, the temperature of the distillate increases as water cascades through each stage.
13. The heat accumulated in the condenser stream is recovered internally by the heat exchanger to drive further evaporation.
14. The concentrated effluent that is produced from this process will be ~240,000 TDS and will be blended into Devon's produced water pond to be used in drilling and completions operations. The clean effluent will be blended into the produced water pond as well or may go through a post treatment process for further polishing.

**Post Treatment – Devon is still evaluating which post treatment will be used.**

15. The clean effluent will be polished through activated carbon to remove co-distilled compounds and Devon is still evaluating technologies to address ammonia removal. These technologies could be:
  1. Electrolysis and oxidation
  2. Moving bed biofilm reactor (MBBR)
  3. Others
16. Post treated clean effluent will be discharged into the produced water pit to be used in drilling and completion operations.





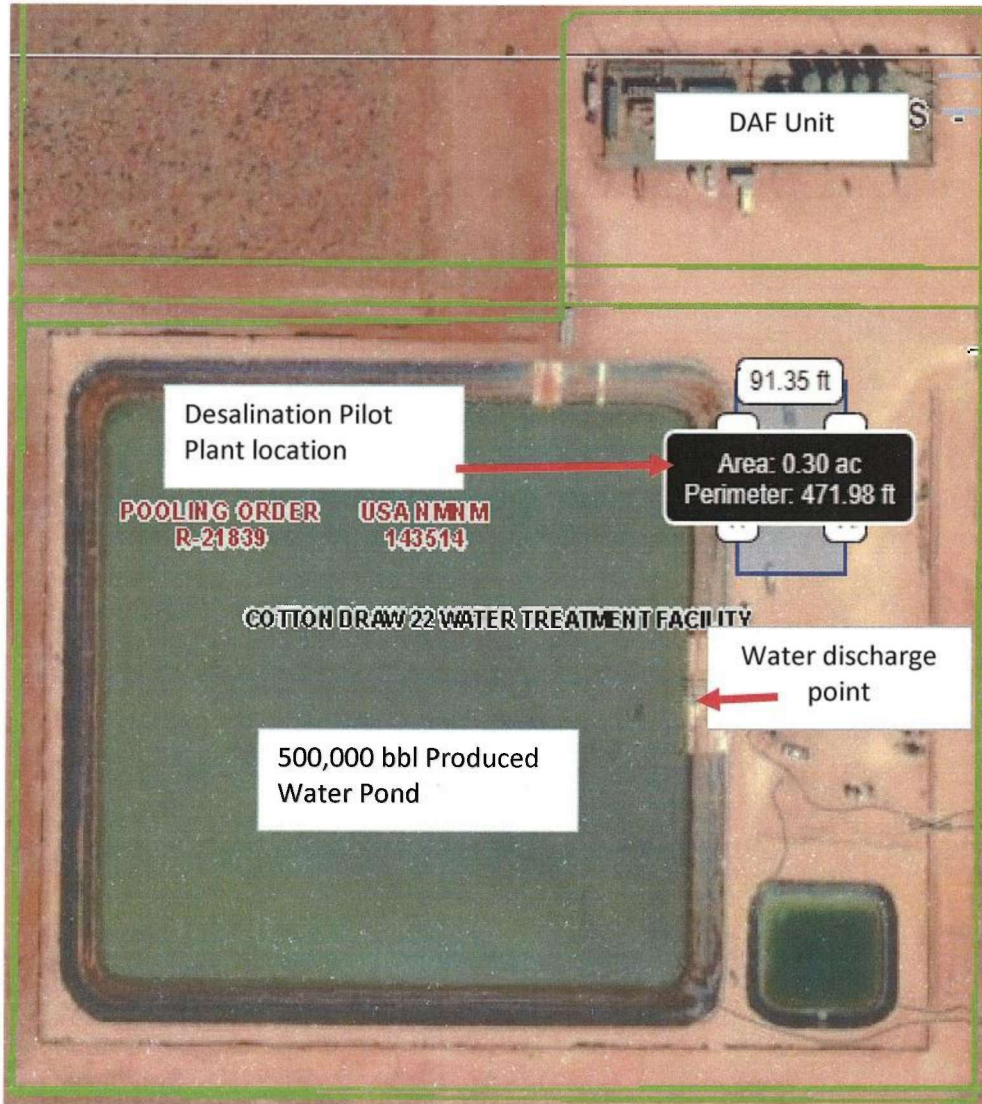
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**Attachment 7 – Question 16**

**Describe your disposal plan for all produced water, treated produced water, permeate or brine concentrate into a SWD.**

The produced water, treated produced water, and permeate/brine concentrate will not be disposed of in an SWD. Devon plans to discharge all streams into the existing, OCD approved, produced water pit for use in drilling and completions operations.





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### Attachment 8 – Question 17

**Describe your final closure plan after completion of the pilot project.**

After completing a produced water desalination pilot project, a final closure plan is necessary to ensure that all equipment is properly decommissioned and transported to its next location. In this case, all of the equipment used in the pilot project is mobile and will be transported by Crystal Clearwater Resources to their yard or next customer. The closure plan will include procedures for removing and cleaning all equipment, disposing of any waste materials, and restoring the site to its original condition. Any contaminated soil will be disposed at R360 Environmental Solutions at 4507 W. Carlsbad HWY, Hobbs, NM 88241.