

**BEFORE THE STATE CORPORATION COMMISSION
OF THE STATE OF KANSAS**

Before Commissioners: Dwight D. Keen, Chair
 Shari Feist Albrecht
 Jay Scott Emler

In the Matter of the Application of ORCA	)	Docket No. 19-CONS-3266-CUIC
OPERATING COMPANY, LLC for a Permit to	)	
Authorize the Disposal of Produced Water into	)	CONSERVATION DIVISION
the Shoffner SWD 12-1 Well located in Reno	)	
County, Kansas	)	KCC License No. 34358
_____	)	
	)	

PRE-FILED DIRECT TESTIMONY

OF

JASON ANDREWS

ON BEHALF OF APPLICANT,

ORCA OPERATING COMPANY, LLC

1 Q. Please state your name and business address.

2 A. My name is Jason Andrews, and my business address is 427 S. Boston Ave, Ste. 400,
3 Tulsa, OK 74103

4 Q. By whom are you employed and in what capacity?

5 A. I am the Manager and a geologist for Orca Operating Company, LLC.

6 Q. Please summarize your educational background.

7 A. I received a Bachelor of Science and a Master of Science, both in Geology, from
8 Oklahoma State University in Stillwater, Oklahoma.

9 Q. Please summarize your professional experience.

10 A. I began my career as a self-employed wellsite geologist, supervising wells drilled in
11 central Oklahoma. I sat numerous wells before going to work as a geologist in 2001
12 for a company that would later become Orca Resources, LLC, an affiliate company of
13 Orca Operating Company, LLC. I have been working for both of those companies
14 since 2001 as both a geologist and general manager.

15 Q. Have you previously testified before the Kansas Corporation Commission or any other
16 state's oil and gas regulatory commission or board?

17 A. I have testified several times before the Oklahoma Corporation Commission, but I do
18 not recall testifying before the KCC.

19 Q. Were your credentials to testify as an expert in the field of Petroleum Geology
20 accepted by the oil and gas regulatory commission or board in those proceedings?

21 A. Yes, they were accepted by the OCC.

22 Q. Are you familiar with the Application for Injection Well (KCC Form U-1) for the
23 Shoffner SWD 12-1 well that was filed by Orca Operating Company, LLC ("Orca
24 Operating") in this docket (the "Application")?

1 A. Yes, I am familiar with that Application and the subject matter of that Application.

2 Q. Are you also familiar with the area where that well is located and why Orca Operating
3 seeks permission to inject water into that well?

4 A. Yes.

5 Q. Is the subject of the Application within your responsibilities as a Geologist for Orca
6 Operating?

7 A. Yes, it is.

8 Q. Have you reviewed the Application filed by Orca Operating that is the subject of this
9 docket?

10 A. Yes, I have reviewed it and the information contained in that Application is true and
11 correct.

12 Q. Would you generally describe the nature of the Application?

13 A. Yes. Orca Operating seeks permission to inject produced water into the Arbuckle
14 formation in an open hole completion from an anticipated casing depth of 4,270 feet to
15 a total depth estimated to be approximately 4,750 feet. The water that will be injected
16 in that well will come from a planned horizontal well, known as the Kelly #12-1-1H
17 well, which will also be drilled by Orca Operating that is intended to produce oil and
18 gas from the Mississippian Osage formation. Orca will drill the Kelly #12-1-1H well
19 from the same well pad on which the Shoffner SWD #12-1 is located. Depending on
20 results of the Kelly producing well, additional producing wells may be drilled.

21 Q. Without this disposal well, would Orca Operating be able to drill and produce oil
22 and/or gas from this new horizontal well?

23 A. No, it would not be able to economically drill those wells, so no.

24

1 Q. In your opinion will the water that will be injected into the Arbuckle formation in this
2 well be confined to the Arbuckle formation?

3 A. Yes, I believe that the water that will be injected in the Shoffner SWD 12-1 well will
4 be confined to the Arbuckle formation.

5 Q. What is the basis for that opinion?

6 A. That opinion is based on two things: the construction design of Shoffner wellbore and
7 the existence of several confining formations in the more than 4,000 feet of rock
8 separating the Arbuckle formation and the deepest fresh usable water.

9 Q. Please review the document that is attached hereto as Andrews Exhibit A and explain
10 that document to the Commission?

11 A. Andrews Exhibit A is a diagram of the Shoffner SWD 12-1 wellbore that demonstrates
12 the nature of the wellbore construction as it pertains to the geological environment.
13 Included on the diagram are depth references to various common marker beds taken
14 from my study of various well logs in the area.

15 Q. In your opinion, is the wellbore of the Shoffner SWD 12-1 adequate to prevent the
16 possible contamination of fresh usable water?

17 A. Yes, the design of the wellbore of the Shoffner SWD 12-1 well is adequate to prevent
18 the upward migration of water in that wellbore. The design starts with 16 inch
19 conductor casing which will extend from the surface to 125 feet, which is well below
20 the base of the deepest known horizon of fresh water. In addition, we will install
21 surface casing inside of the conductor casing which will extend from the surface to
22 below the salt section ending at a depth of approximately 1,650 feet. The salt section
23 itself is a naturally impermeable barrier to fluid. Both the conductor and the surface
24 casing will be cemented from their setting depths all the way to surface, thoroughly

1 isolating the wellbore environment from any useable water source. In addition, we will
2 set production casing from the disposal zone at approximately 4,250 feet all the way to
3 the surface. The production casing will be cemented from the top of the Arbuckle, up
4 1,000 feet to approximately 3,550 feet. From the surface to a depth of 1,650 feet, the
5 production casing will be inside the surface casing and from surface to a depth of 125
6 feet, the production casing will be inside both the surface casing and the conductor
7 casing. Finally, a tubing string will be inside the production casing to deliver disposed
8 fluids to the open hole portion of the Arbuckle. Thus, during disposal operations the
9 injected water will be separated from the useable water horizon by three sets of pipe set
10 concentrically one inside of the other, and the outer two horizons will be cemented. A
11 fourth set of pipe, the lined tubing, will be located inside the other three sets of pipe.

12 Q. In your opinion, do you believe that the water that will be injected could migrate
13 upward from the Arbuckle formation and contaminate the fresh usable water in the
14 area? If not, why not?

15 A. No, I do not believe that is possible. As stated previously, there are numerous
16 precautions that will be taken in the design of the wellbore to separate the delivery of
17 injected fluid from all other formations, especially those formations near the useable
18 water table. With respect to the geologic setting, there are several permeability barriers
19 that exist above the proposed injection interval and below the deepest fresh usable
20 water. As shown in Andrews Exhibit A, there is approximately 4,170 feet between the
21 open hole injection zone in the Arbuckle and the base of useable water. Most of that
22 distance is composed of rock that is impermeable to the vertical migration of fluid. The
23 most notable barrier is the roughly 550 feet of salt section as shown on Andrews
24 Exhibit A from approximately 900 feet to 1,450 feet. This salt section is well known in

1 the Reno County area because it has historically been used to construct caverns for the
2 purpose of storing valuable documents, film and records from across the country
3 because it acts as a natural barrier against the intrusion of water and moisture. The salt
4 section is about as good of a barrier against fluid migration as nature has to offer. The
5 Arbuckle formation itself has relatively high permeability and porosity readings, which
6 indicates that it will readily take the injected water. The nature of the rock in the
7 Arbuckle formation itself is the proverbial path of least resistance, particularly given
8 the numerous confining layers above that offer little to no effective permeability. All
9 of that supports my opinion that the injected water will remain in the Arbuckle
10 formation and could not migrate upward and contaminate the usable water.

11 Q: Have you reviewed the construction of all the oil and gas wells, including all
12 abandoned, plugged, producing and injection wells, within a one quarter (1/4) mile
13 radius of the Shoffner SWD 12-1 well?

14 A, Based on the records that I reviewed, I did not find any oil and gas wells, either
15 producing, abandoned, plugged or injection wells, within ¼-mile of the Shoffner well.

16 Q. What is the base of the deepest fresh usable water in the vicinity of the Shoffner SWD
17 12-1 well?

18 A: We have found it reported as being between 80 to 100 feet.

19 Q. Have you reviewed the plugging records of the two abandoned wells located on the
20 Picketts' property to the south of the Shoffner SWD 12-1 well?

21 A. Yes, both of those wells are more than ¼-mile from the Shoffner well. One of those
22 wells, the Griggs Oil No. 1-13 Brooks Johnson well, reached TD in the Kinderhook
23 shale which is an impermeable shale beneath the Mississippian reservoir and well
24 above the Arbuckle zone in which we intend to dispose. Since the wellbore failed to

1 penetrate the same horizon as the proposed disposal zone in the Shoffner well, and is
2 separated from the disposal zone by confining layers, there is no means for
3 communication regardless of the quality of the plugging operation. That being said,
4 KCC approved the plugging of that well in 1995. The other well is the No. 1 Hayes
5 well that was originally drilled in 1964, but was re-entered by Sterling Drilling Co. in
6 1993. That well did penetrate the Arbuckle formation but was subsequently abandoned
7 and plugged. I understand that the plugging of that well was also approved by the
8 KCC.

9 Q. Do those records show that both of those wells were properly plugged?

10 A. The plugging of both wells was approved by the KCC who monitors such procedures
11 for correct practices. The available records and the fact that the pluggings were
12 accepted give us confidence that they were plugged properly.

13 Q. Have you calculated the fracture gradient for the Arbuckle formation?

14 A. I have not calculated the exact fracture gradient for the Arbuckle in the area of the
15 Shoffner well. In our correspondence with the KCC, we understand that the maximum
16 injection pressure of 250 psi that we requested in the application, when calculated with
17 the natural pressure gradient of the Arbuckle in this area, is comfortably below an
18 injection pressure that might induce fracturing of the Arbuckle formation.

19 Q. What is the proposed injection pressure for the Shoffner SWD 12-1 well?

20 A. The Application requests that the well be permitted with a maximum injection pressure
21 of 250 psig.

22 Q. At that maximum pressure, will the injection of water in the Shoffner SWD 12-1 well
23 initiate fractures in the Arbuckle formation?

24 A. No, it should not. At that depth, and utilizing the low maximum pressure, the change in

1 gradient from the formations natural pressure gradient is relatively small. The
2 maximum requested surface injection pressure of 250 pounds is within the acceptable
3 limits utilized by the KCC. It is a reasonable assumption that the KCC who regulates
4 these matters, sets limits that prevent such fracturing.

5 Q. In your opinion, is the construction and design of the Shoffner SWD 12-1 well
6 adequate to properly protect the fresh and usable water resources in the area of that
7 well?

8 A. Yes, it is and I see no evidence that would indicate that the water injected into that well
9 could migrate to the deepest fresh usable water in the area.

10 Q. In your opinion, will granting the Application prevent waste?

11 A. Yes, it will.

12 Q. How will it prevent waste?

13 A. The disposal of produced water in the Shoffner well is necessary to support the drilling
14 of the Kelly #12-1-1H well and potentially other producing wells in that area. If the
15 Shoffner well is not available, those producing wells will not be drilled and any oil and
16 gas reserves attributable to those wells will not be recovered.

17 Q. Does this conclude your testimony?

18 A. Yes, but I reserve the right to supplement my testimony.
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Orca Operating Company, No. 12-1 Shoffner SWD
Conceptual Well Schematic: Not to Scale

