

**STATE OF NEW MEXICO  
ENERGY, MINERALS, AND NATURAL RESOURCES DEPARTMENT  
OIL CONSERVATION DIVISION**

**IN THE MATTER OF THE HEARING  
CALLED BY THE OIL CONSERVATION  
DIVISION TO CONSIDER:**

**CASE NO. 15753  
ORDER NO. R-14737**

**APPLICATION OF THE NEW MEXICO OIL CONSERVATION DIVISION  
COMPLIANCE AND ENFORCEMENT BUREAU FOR A COMPLIANCE ORDER  
AGAINST OWL SWD OPERATING, LLC FOR THE MARALO SHOLES B WELL  
NO. 2 OPERATED IN LEA COUNTY, NEW MEXICO.**

**ORDER OF THE DIVISION**

**BY THE DIVISION:**

This case came on for hearing at 9:00 a.m. on September 15, 2017, at Santa Fe, New Mexico before Examiner William V. Jones.

NOW, on this 15<sup>th</sup> day of June 2018, the Division Director, having considered the testimony, the record, and the recommendations of the Examiner,

**FINDS THAT**

(1) Due public notice has been given, and the Division has jurisdiction of this case and its subject matter.

(2) The New Mexico Oil Conservation Division Compliance and Enforcement Bureau ("Applicant"), seeks a compliance order (1) determining operator OWL SWD Operating, LLC (OGRID 308339, "OWL" or "Operator") is out of compliance with 19.15.16.9 NMAC and 19.15.15.10 NMAC; (2) requiring Operator to return the Maralo Sholes B Well No. 2 (API No. 30-025-09806, "Subject Well") to compliance with 19.15.16.9 NMAC; (3) in the event of non-compliance, requiring Operator to suspend injection operations and to plug and abandon pursuant to 19.15.16.11 NMAC. Applicant specifically mentions rules regarding the proper construction of an injection well. For convenience, the primary rule in question is repeated below:

***19.15.16.9 SEALING OFF STRATA:***

***A. During the drilling of an oil well, injection well or other service well, the operator shall seal and separate the oil, gas and water strata above the producing or injection horizon to prevent their contents from passing into other strata.***

*B. The operator shall ensure that fresh waters and waters of present or probable value for domestic, commercial or stock purposes are confined to their respective strata and are adequately protected by division-approved methods. The operator shall take special precautions by methods satisfactory to the division in drilling and abandoning wells to guard against loss of artesian water from the strata in which it occurs, and the contamination of artesian water by objectionable water, oil or gas.*

*C. The operator shall ensure that water is shut off and excluded from the various oil- and gas-bearing strata that are penetrated. The operator shall ordinarily make water shut-offs by cementing casing.*

(3) Applicant maintains that the intermediate casing in the Subject Well allows for the potential communication of water to other strata, injected water is entering oil and gas bearing strata, and injection at the current (relatively higher) rates into the Subject Well endangers fresh water and the environment. Applicant asks the Director of the Division to enter an order finding Operator in violation of all three parts of 19.15.16.9 NMAC, require the Operator to provide a remedial cementing plan and schedule of repair, and in the event of non-compliance, find Operator in non-compliance with a Division Order and require plugging of the Subject Well under 19.15.16.11 NMAC.

(4) Rule 19.15.16.10 NMAC was also listed as being violated by the Applicant. Said rule concerns casing and cementing, pressure testing, and tubing requirements for wells drilled for oil or gas. The rule specifies that the operator shall equip a well drilled for oil or gas to isolate all water, oil, and gas bearing strata down to the casing point and effective isolation of the oil and gas producing interval. The rule requires circulation of cement behind surface casing if possible. The intermediate and production casings may be cemented with "oil-base casing packing material" in lieu of cement except across all oil and gas productive zones and at the bottom of the hole.

(5) OWL SWD Operating, Inc. entered an appearance as the respondent in the case. The State Land Office entered as an interested party. No other party entered appearance or otherwise opposed this application.

(6) Case No. 15723, "Application of OWL SWD Operating, LLC for Authorization to Inject, Lea County, New Mexico" was heard August 2, 3, and 4, 2017. Case No. 15723 could be considered a companion case because the disposal well permit being proposed in Case No. 15723 would replace the permit for disposal into the Subject Well. The parties considered whether to combine the two cases for purposes of testimony but agreed to present the cases separately. A separate order will be issued in Case No. 15723.

(7) Applicant's counsel asked that the previously heard record in Case No. 15723 be considered as part of the record in this Case No. 15753 to the extent that the examiner considers it applicable. The other two parties in this case did not initially object. However, OWL later objected to State Land Office testimony concerning possible wasteful migration of commercial disposal into the injection formation as out of the scope of redirect and out of the scope of this application.

(8) In letters to the Division and to the Department of Energy, Minerals, and Natural Resources, the City of Jal expressed a concern for whether this well is adequate to protect upper fresh waters while being used for high rate commercial water disposal. And by letter to the Division dated April 28, 2016, the City of Jal expressed concerns that the high disposal rates into this well would endanger its potential to exploit its proposed water rights in this Section 25.

(9) The City of Jal entered an appearance in Case No. 15723 and appeared at the hearing through counsel, who questioned witnesses and presented briefs. Despite its earlier expressed concerns, the City of Jal did not appear in this compliance case.

(10) In Case No. 15723, the hearing examiner required the area of review for notice purposes to be extended from one half mile to a one-mile radius from the proposed disposal well. The Division subsequently received a letter from Special Energy Corporation dated August 30, 2017 as one of the noticed (affected) parties stating there was no objection to the application, so long as only one of the wells is allowed by the Division to be used for disposal.

(11) Applicant appeared at the hearing through counsel and presented the following.

- (a) Applicant presented the history of the Subject Well, the well name and relative location, the existing injection permit, and the progression of ownership culminating in OWL as operator of record for the Division.
- (b) OWL SWD Operating, LLC (OGRID 308339) is the current operator of the Maralo Sholes B Well No. 2 (API No. 30-025-09806) located in Unit P of Section 25, Township 25 South, Range 36 East, NMPM, Lea County, New Mexico.
- (c) The shallow, prolific Ogallala fresh water aquifer does not extend this far south, but other water sands may exist. The State Engineer has permitted a water well intending to test the potential of Santa Rosa water sands near this location. The drillers log or operators well record submitted to the OCD in June of 1947 for the Subject Well shows a water sand located at depths of 1050 feet to 1060 feet with a 60-foot anhydrite zone above (990 to 1050 feet) and a 60-foot anhydrite zone below (1060 to 1120 feet).
- (d) Concerns have arisen over the ability of the intermediate 8-5/8" casing, which was installed to 1225 feet in June of 1947 and only circulated with mud, to adequately protect identified water sands, while this well is under large rate commercial disposal. For wells drilled for use as disposal or injection, all protectable waters that could be considered as Underground Sources of Drinking Water (or "USDW") should be protected with casing circulated with adequate cement.
- (e) In addition, the 7-inch production casing set at 2935 feet was cemented with only 150 sacks of cement in 1947. The top of cement was not measured and

can only be estimated based on annulus size, cement yield, and formation loss. Estimates of this cement top range from 2000 feet to 515 feet from surface. Applicant considers that the hole was drilled with cable tool and the salt may not therefore be washed out as if the well were drilled with a rotary drilling system. Based on data from surrounding wells, Applicant estimates the cement top at 1650 feet from surface.

- (f) With the intermediate casing set only with mud at 1225 feet and the production casing cement top at 1650 feet, that leaves significant portions of the wellbore unprotected and the upper portion of the Salt interval in communication with the surface through a bradenhead (casing to casing) annulus. Applicant concludes the well is not cased adequately to isolate formations and isolate waters up-hole. Applicant asks that the Division require OWL to remediate the well to adequately isolate the Rustler sands and Santa Rosa sands behind casing and cement.
- (g) After formal requests by the Division in 2016, OWL conducted an injection survey and installed risers to enable bradenhead surveys on the Subject Well.
- (h) The Division had previously issued a letter signed by the Director requiring OWL to submit within 30 days a Notice of Intention ("NOI") stating how the remedial cementing would be done. OWL responded with a proposal to replace the Subject Well with another well drilled and completed and permitted for disposal in the same disposal interval as is being used in the Subject Well – *See* Case No. 15723.
- (12) OWL appeared at the hearing through counsel and presented the following.
  - (a) The injection operation into the Subject Well can be conducted in a safe and responsible manner without causing waste, impairing correlative rights or endangering fresh water, public health or the environment.
  - (b) The mud behind the 8-5/8-inch casing is adequate. The cement top behind the 7-inch casing could be as high as 515 feet from surface which is inside the intermediate casing and therefore isolates the lower formations.
  - (c) The Mechanical Integrity Testing of this well shows there are not any issues with the isolation of disposal waters from the up-hole strata.
  - (d) The Injection Survey shows no waters moving up-hole around the packer and injection water staying in the permitted disposal interval.
  - (e) The injection interval is an old oil and gas reservoir that has produced since the 1920's and is severely depleted and under low pressure.
  - (f) Due to the low pressures, there is no impetus to cause injected fluids to go out of the interval and endanger strata up-hole. The disposal interval could accommodate years of disposal without over pressuring the formation.

- (g) The well is now adequately plumbed to enable bradenhead surveys.
- (h) The flowline installed to this location reduces truck traffic and evens out the injection surges into the well. The surface facilities for the Subject Well are new and designed to Division requirements. The well is equipped with a SCADA system which monitors rates and pressures and can be used to remotely control the well.

(13) The State Land Office appeared at the hearing through counsel and presented the following from an engineer with experience in drilling, hydrology, and environmental remediation.

- (a) The State Land Office maintains the Subject Well is inadequate for use as a high rate commercial disposal well.
- (b) The mud behind the 8-5/8-inch casing is initially adequate for water shutoff, but over the long term, is less than adequate because of segregation of particulates.
- (c) The corrosion on the exposed casings will occur on the outside and likely near the top of the well due to introduction of oxygen with temperature fluctuations.
- (d) The well as-drilled in the 1940's may be tricky to adequately plug.

(14) The following technical details are important to consider and were either presented in testimony or are available from Division records.

- (a) The Subject Well was permitted for drilling by the Oil Conservation Division and spud May 25, 1947. Surface casing of 10-3/4 inch, 36 pounds per foot ("ppf") was set at 410 feet and cemented with 150 sacks of cement. Intermediate casing of 8-5/8 inch, 22-ppf, was set at 1225 feet and "mudded in". Production casing of 7 inch, 20-ppf, was set at 2918 (or 2935) feet and cemented with 150 sacks of cement by the "Halliburton Method".
- (b) The well was drilled with cable tools and has a detailed drillers log. The only water sand reported on the log was bounded top and bottom by anhydrite and located 1050 feet to 1060 feet. The last depth reported for salt was at 2552 feet and the oil pay interval (Yates or Seven Rivers formation dolomite) was reported to extend from 2945 feet to 2950 feet.
- (c) The 24-hour initial potential test on the well was reported at 240 barrels of oil and no water. Another report from July 2, 1947 showed a test of 626 barrels of oil per day.

- (d) The total depth of the open hole was reported at 2950 or 2955 feet. The well has since been deepened and a recent wireline run in December of 2016, measured a total depth of 3072 feet.
- (e) The operator at the time reported in Division records that the oil interval had "watered out" and applied to recomplete the well up hole as a gas well in the Yates formation. On October 6, 1961 the well tested at 780 thousand cubic feet ("Mcf") per day from upper Yates formation sands at 2871 feet to 2910 feet. These perforations were squeezed and a thicker pay interval from 2824 feet to 2933 feet was perforated and fractured on October 21, 1981.
- (f) By 1986, the well had reached its economic limit and was deepened at least 50 feet and used as a water supply well for the Jalmat Waterflood. The well continued to produce some gas.
- (g) Fulfer Oil and Cattle, LLC took over as operator of record on November 1, 2007.
- (h) After administrative application, on June 1, 2008, the Maralo Sholes B Well No. 2 was permitted by the Division with administrative order SWD-1127 for use as a disposal well into an open hole from 2938 to 3055 in the Lower Yates and Upper Seven Rivers formations. The application for disposal stated the operator's intention to dispose of a maximum of 5,000 barrels of water per day from the same formation and from the operator's own production in the area.
- (i) OWL took over as operator of record on July 16, 2014, cleaned out the disposal well, and changed the injection tubing from 3-1/2 inch to 4-1/2 inch in diameter, and connected a produced water flowline to the well. The well has since been used for commercial disposal at rates approximately 25,000 barrels of water per day ("bwpd"), sometimes peaking at much higher rates.

(15) The injection surveys were run at injection rates up to 6500 barrels of water per day ("bwpd") which was thought to be the highest rate that radioactive tracer surveys could be used accurately. The surveys showed injected waters were leaving the permitted open hole interval in a lateral direction and not dropping out the bottom of the open hole into unpermitted intervals. The surveys also showed injected waters were not exiting the well higher up hole than permitted. These surveys were run by necessity at the lower rates and do not necessarily show what happens under disposal rates of 25,000 to 35,000 bwpd.

(16) The injection surveys and the periodic mechanical integrity tests have confirmed the well's wellhead, casing, packer, and tubing are not leaking injected water into fresh water intervals or unpermitted strata.

(17) The bradenhead surveys which consist of opening the riser valves and measuring pressure and flow between casing strings, have not shown obvious fluid communication between strata in this well.

(18) Behind the outside casing or between the casings, communication between strata or into fresh water intervals is difficult to confirm but is likely not happening. The well was drilled and cased in 1947, so if communication did occur, it would have happened decades ago.

(19) The fresh water sand interval in between Rustler Anhydrites is located near the bottom of the 8-5/8-inch casing. The mud circulated between the hole and the 8-5/8-inch casing likely separated out years ago, leaving the heavier portions of the fluid covering the fresh water sand interval and providing a seal. The seal would not be as competent as cement but should be adequate. This mud seal near the shoe of the casing would also prevent fluids moving up from the salt interval from moving around the shoe and into the annulus between the hole and the 8-5/8-inch casing.

(20) The well, the casing, and cementing design was permitted by the Division in 1947 with the standards existing at the time. However, the well was permitted for drilling and use only as an oil and gas producer from the Yates formation, Cooper Jal (subsequently Jalmat) Pool, and not as a high-pressure disposal well designed to withstand pressures exposed from surface to the disposal interval. Disposal wells and injection wells in waterfloods should be more robustly designed than production wells which are best kept pumped off and are therefore less of a danger to shallow fresh water intervals.

(21) OWL has shown that the interval being used for disposal is of such high permeability and remains at such low pressure that shallower depths in the Subject Well are not being exposed to additional pressures. This low pressure in the open hole was confirmed during the wellbore cleanout done in 2016, when OWL had to use light weight CO2 foam to circulate the well. These shallower depths are also protected by the dense Tansill formation, located below the Salado ("Salt") formation and with 7-inch casing cemented from the casing shoe up to (most likely) the base of the Salado formation.

(22) Rule 19.15.16.9 NMAC allows specifically one alternate material ("oil-based casing packing") to be used between hole and casing of intermediate and production casings. The practice of installing intermediate casing and using mud as the packing fluid as a water shutoff was at one time widespread and was routinely approved by the Division. Rules 19.15.16.9 NMAC and 19.15.16.10 NMAC seem targeted at the design and initial installation of the well and not as remedial practices to be enforced years after the well is in place.

(23) If there were a need for remedial action, there was no testimony as to what it would be or how it could be best accomplished. The OCD application leaves the specification of that up to the examiner; therefore, the examiner concludes as follows: Any attempt to perforate and squeeze cement up-hole in this 70+ year old well would compromise the mechanical integrity of one or both casing strings. The attempted squeeze(s) may not be possible behind the mudded in 8-5/8-inch casing and could easily collapse the casing. Attempting to pull the free portion of the 7-inch casing and replace it with new casing would only be possible if the existing cement is above the salt interval. Simply squeezing the 7-inch casing to surface would still leave the oft debated issue of the mudded 8-5/8-inch casing annulus.

The Division concluded as follows.

(24) The extremely low pressure and high permeability of the permitted disposal interval, the injection surveys, the mechanical integrity tests, and the bradenhead surveys, if all viewed together, present a compelling argument that this well is adequately equipped to be used for disposal and to isolate up-hole strata and protect fresh water intervals.

(25) For so long as the reservoir pressure remains low, disposal into this well should not pose a danger to strata up-hole. However, the poor well design, the age of the well, the high rate of disposal and the presence of fresh water sands up-hole all point to a need for caution in operation of this well.

(26) The operator of this well should be required to conduct annual mechanical integrity tests and to annually report reservoir pressure of the permitted disposal interval.

(27) Static reservoir pressures in this well should be limited to less than 1000 psi or the shut-in pressure at which reservoir fluids, without the protection of casing, would be exposed to fresh water sands.

(28) If this well fails a mechanical integrity test and it is determined there is a hole or possible parting in the casing, the well should be immediately plugged and abandoned while such action can be done properly.

(29) The Division must confine its findings and actions to the application in this case. If there is a concern over the use of this well for commercial disposal, then that issue should be addressed in another case. If the target disposal interval is found to contain protectable waters and waters of higher salinity are being disposed, then that issue should be addressed in another case.

**IT IS THEREFORE ORDERED THAT**

(1) The application of the New Mexico Oil Conservation Division Compliance and Enforcement Bureau in this case for a compliance order against OWL SWD Operating, LLC as operator of the Maralo Sholes B Well No. 2 ("disposal well") is hereby denied. However, operator is subject to the following additional requirements for continued operation of this well.

- (a) The frequency of mechanical integrity testing on the Subject Well is increased to a minimum of one test per year.
- (b) Operator shall run a casing integrity log and supply that log to the Division. The operator shall run the log at the time the tubing is pulled from the well for other reasons, but no later than one year from the date of this order.
- (c) Operator shall report annually the reservoir pressure of the permitted disposal interval to the Division's Engineering Bureau and to the Hobbs district office. The reservoir pressure may be obtained by measurement of static fluid levels in the Subject Well or other Division approved methods.



(2) The operator shall immediately shut-in and plug and abandon this well if any of the following occur:

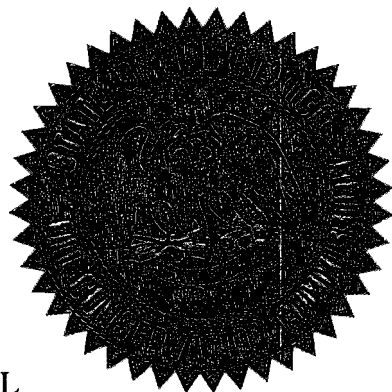
- (a) The static bottom hole reservoir pressure exceeds 1000 psi; or
- (b) the well fails a bradenhead survey; or
- (c) the well fails a mechanical integrity test run according to the requirements in 19.15.25.14 NMAC by failure of the casing to hold pressure.

(3) All other provisions of Administrative Order No. SWD-1127 remain in full force and effect.

(4) In the event of non-compliance with these additional requirements or any other requirements pertaining to the operation and injection into this well, Operator shall suspend injection operations and plug and abandon the Subject Well pursuant to 19.15.16.11 NMAC.

(5) Jurisdiction is hereby retained for the entry of such further orders as the Division may deem necessary.

DONE at Santa Fe, New Mexico, on the day and year hereinabove designated.



SEAL

STATE OF NEW MEXICO  
OIL CONSERVATION DIVISION

A handwritten signature in black ink, appearing to read "Heather Riley".

HEATHER RILEY  
Director