JSAI

TECHNICAL MEMORANDUM

To: Andrea Felix, Enduring Resources

From: John Shomaker

Date: October 10, 2018

Subject: results of preliminary swab testing, Well SJ-4301 POD1, October 9, 2018

This memorandum will summarize the results of preliminary swabbing to develop and sample the producing interval in Enduring's Well SJ-4301 POD1, the North Escavada Unit 2207-16B Water Supply Well, in Sec. 16, T. 22 N., R. 7 W., on October 9, 2018. Daniel Apodaca of John Shomaker & Associates was at the well and collected the data. The Entrada Sandstone producing zone had been perforated, but no other work had taken place in the well. The perforated interval is 6,925 to 7,114 ft below ground level (bgl), significantly below the 2,500-ft criterion for a deep, non-potable supply as referred to in Sec. 72-12-25 et seq of the New Mexico Statutes (NMSA). Results include estimates of total dissolved solids (TDS) concentration and non-pumping depth to water.

Summary

Sampling and interpretation of preliminary swabbing data shows that the Entrada Sandstone water has a TDS concentration of about 11,530 mg/L, significantly in excess of the 1,000 mg/L criterion for wells drilled under Sec. 72-12-25 NMSA. The projected non-pumping depth to water is about 519 ft below ground level, or 6,399 ft elevation. It was not possible to determine aquifer transmissivity because the well continued to develop during swabbing. A value for transmissivity will be determined from recovery measurements after swabbing or pumping, once the frac has been completed and the well cleaned up and developed.

Swabbing

A packer was run on 3-1/2-in. OD tubing (2.99-in. ID) in the 7-in. casing to 6,849 bgl ft, above the uppermost perforations. Swabbing began at 08:30 and continued until 15:19 on October 9, a period of 409 minutes; a total of 152.3 bbls or 6,397 gal was produced into a frac tank, and measured by gauging the level in the tank. The average production rate was 15.6 gpm (gallons per minute). Depth to water was measured using the line counter on the swabbing unit, and, after swabbing was completed, with a wireline water-level sounder. Recovery measurements were taken for about 90 min, beginning about 90 min after swabbing was completed and the tubing became accessible for wireline measurements, until about 180 min after swabbing was completed.

Water Sampling

Water produced during swabbing was sampled during each swab run, and field measurements of temperature, pH, and specific conductance were made. Conductance was in the 1,200-1,300 µS/cm range for the first nine swab runs, representing the fluid in the well at the time the perforating took place. The conductance increased abruptly during the tenth swab run, and remained in the range 12,160 to 12,810 µS/cm for the duration of swabbing. It is concluded that the formation water in the Entrada Sandstone has a conductance of about 12,400 µS/cm, the average of the values.

The relation between specific conductance and total dissolved solids concentration (TDS) for Entrada waters in the central San Juan Basin may be estimated from the results of analyses of water from the Cherokee & Pittsburg No. 1 Gallo Wash water well in Sec. 16, T. 21 N., R. 9 W. (OSE File No. SJ-549-Explor-1). In that well, TDS concentration was 10,630 mg/L, and laboratory-determined conductance was 11,400 µS/cm, leading to a factor of 0.93 mg/L per µS/cm, which is higher than the typical range but not unexpected in high-concentration, sulfate-dominated waters. The water from the Cherokee & Pittsburg well, from a depth interval of 5,545 to 5,703 ft, is a sodium-calcium sulfate water, with 6,380 mg/L sulfate and little chloride or bicarbonate. Applying the same factor to the conductance of water from the SJ-4301 POD1 well would lead to a TDS concentration of 11,530 mg/L.

The pH of the formation water produced ranged from 7.82 to 7.94 during swabbing. The final value, 7.85, may be compared with the pH of 7.75 observed in water from the Cherokee & Pittsburg well. The temperature of the water produced increased from 16.6°C (62°F) to a maximum of 28.2°C (83°F) during swabbing, but all of the measurements presumably reflect significant cooling as the water passed through the tubing. The temperature during production is expected to exceed that of the water from the Cherokee & Pittsburg well, at 144°F, because of the somewhat greater depth.

A set of water samples was taken from the first swab run, to characterize the water in the well at the time of perforation to distinguish that water from Entrada Sandstone formation water. A set of samples of Entrada formation water was taken at about 11:50, and a second set at about 15:15, after approximately 3,300 gal and about 6,300 gal had been produced, respectively. These samples have been submitted today to Hall Environmental Analysis Laboratory in Albuquerque; the analytical suite will consist of pH, specific conductance, total dissolved solids concentration, and major-ion concentrations. "Rush" service is requested, and results will be reported as soon as they are received from Hall.

Aquifer Characteristics

The swabbing on October 9 represented the first production from the well after perforating. After the first 10 swab runs, at about 161 min, the water level in the tubing rose after each swab run, indicating that the well continued to develop throughout the swabbing period. Although recovery water-level measurements were taken as described above, it was not possible to determine transmissivity because of the continuing well development.

The final depth to water, measured 180 min after swabbing stopped, was 526.38 below measuring point (bmp), or 514.9 below ground level (bgl). Projection of the water level trend suggests a final non-pumping depth to water of about 530 ft bmp (518.5 ft bgl), or an elevation

of 6,399 ft. This elevation may be compared with the water-level elevation in the Cherokee & Pittsburg well of 6,395 ft.

District I
1625 N. French Dr., Hobbs, NM 88240
Phone:(575) 393-6161 Fax:(575) 393-0720
District II
811 S. First St., Artesia, NM 88210
Phone:(575) 748-1283 Fax:(575) 748-9720
District III
1000 Rio Brazos Rd., Aztec, NM 87410
Phone:(505) 334-6178 Fax:(505) 334-6170
District IV
1220 S. St Francis Dr., Santa Fe, NM 87505
Phone:(505) 476-3470 Fax:(505) 476-3462

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

CONDITIONS

Action 300689

CONDITIONS

Operator: NEW MEXICO ENERGY MINERALS & NATURAL RESOURCE 1220 S St Francis Dr Santa Fe , NM 87504	OGRID: 264235
	Action Number: 300689
	Action Type: [IM-SD] Well File Support Doc (ENG) (IM-AWF)

CONDITIONS

Created By	Condition	Condition Date
pgoetze	None	1/7/2024