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Geological Evaluation of the Cane Creek Shale, Pennsylvanian Paradox Formation, Paradox Basin, Southeastern Utah

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The Cane Creek shale of the Pennsylvanian Paradox Formation has been a target for exploration in the Paradox Basin of southeastern Utah since the 1960s. Horizontal drilling techniques in the 1990s sparked renewed interest and several new wells were drilled in the unit. Currently, six fields produce from the Cane Creek in the Paradox Basin fold-and-fault belt, with cumulative oil production over 3.8 million barrels. Though development and production has been moderately successful, the shale remains understudied. Total undiscovered recoverable oil reserves from the Cane Creek and other shales in the Paradox Basin are estimated at 471 million barrels.

The Utah Geological Survey is in the midst of a multi-year project examining the Cane Creek shale in order to gain insight into the geological, geochemical, and geomechanical rock properties of the reservoir. This study will help maximize production potential by identifying “sweet spots” across the Paradox Basin and by defining optimal completion strategies.

The Cane Creek records an early stage of a transgressive-regressive sequence (cycle 21) in the Paradox Formation and consists of organic-rich marine shale with interbedded dolomitic siltstone and anhydrite. The unit is up to 160 feet thick and areally extensive within the Paradox Basin. It is divided into the A, B, and C zones, with the shale and silty carbonates of the B zone considered both the source rock and reservoir. The A and C zones are anhydrite rich and provide an upper and lower seal to the B zone. The unit is highly overpressured, with measurements ranging between 5000 and 6200 psi, which is

probably the result of hydrocarbon generation between very impermeable upper and lower anhydrite seals. The B zone is naturally fractured, and oriented cores show that fractures trend northeast-southwest, matching the regional structural trend.

Overall, the unit has a porosity of 1 to 2% and matrix/fracture permeability between 39 and 400 mD. An average TOC of 15% has been reported in the literature, whereas initial analysis of a core from the Remington 21-1H well (a dry hole located 30 miles south of the nearest Cane Creek field) shows a range of TOC values from 1 to 20%, with an average of about 9%. In addition, X-ray diffraction and high-resolution X-ray fluorescence analyses, and a detailed core description have been performed on this core and compared to other available core data. Portions of the Remington core will be available for viewing.