Lidar Survey of Bone Spring-Brushy Canyon Outcrop Lithology and Fractures, Bone Canyon, Texas: Insight into Updip Deepwater Lithofacies

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The Leonardian Bone Springs formation is one of the dominant oil and gas producing formations in the Northern Delaware Basin today. It is Leonardian in age and lies just below the Guadelupian Brushy Canyon formation. Traditional production from these units comes from upslope carbonates on the slope and shelf margins of the Delaware Basin and the Northwest Shelf equivalents of the Bone Spring, the Abo and Yeso Formations, along with up dip clastic pinch-outs. The majority of the production came from diagenetic, secondary porosity developed in carbonate debris flows and slump deposits derived from the shelf margin. New developments in drilling, production, and development technologies have allowed for a shift in primary target focus down dip into the basin. The Bone Spring Formation provides at present one of the most active unconventional plays in the Permian Basin today. Therefore, optimizing the sweet spots where extractable oil occurs by preservation in anoxic environments and where it is most brittle is critical to its economic exploitation. Understanding the reason for its heterogeneity of lithology and oil occurrence owing to changes in paleoceanography would also greatly impact the unconventional exploration in similar basins elsewhere. Nonetheless, understanding the stratigraphy and lithologic variation of the Bone Springs and how it relates to changes in sea level are best viewed at the updip portion of the slope facies.

It is for this reason that the preliminary data presented were acquired in the classic exposure which crops out in Bone Canyon of the Guadalupe Mountains. The canyon contains the stratigraphically highest units of the Bone

Springs formation including the Avalon representing the updip portion of these basin fed systems. These formations were imaged using a total of eleven Light Detection and Ranging (LiDAR) scans, three of which being high-resolution scans of each measured section where auxiliary data was collected. This scan data yields reflectance which can be constrained by XRF confirmed lithologic differences (e.g., chert, dolomite, limestone, shale, etc.). In addition, fracture set rose diagrams have been generated from application of automated plane delineation (SPLIT-FX) of the LiDAR data which are useful in identifying regional stresses and directions of highest fluid connectivity.