Quantified Facies Distribution and Sequence Geometry of the Yates Formation, Slaughter Canyon, New Mexico

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This study uses a new integrated outcrop data and airborne lidar from Slaughter Canyon, New Mexico, to quantitatively characterize the cycle-scale facies architecture within the G23-G26 high frequency sequences of the Yates Formation. High frequency cycle-scale mapping of these sequences shows sedimentological evidence for accommodation reduction associated with the highstand of the Permain composite sequence (CS) 13 highstand (G23-G25). Development of the G26 HFS additionally demonstrates the isochronous balance of mixed carbonate-siliciclastic deposition across the Yates-Capitan reef-rimmed shelf during the initial CS-scale transgression following significant exposure and bypass of sand across the shelf.

This sequence framework is quantitatively analyzed using progradation to aggradation (P/A) ratios, facies proportions, facies tract dip width, and facies tract bedding angles to evaluate the interplay of eustacy and syndepositional deformation as drivers of stratigraphic architecture. The sequences defined here developed in response to both eustacy and syndepositional deformation, but individual facies distributions and cycle stacking patterns were largely controlled by eustacy; while facies, cycle, and sequence thicknesses as well as facies bedding angles were locally influenced by syndepositional faulting. A reconstruction of each high frequency sequence and stepwise documentation of post-depositional fault displacement and HFS basinward rotation was generated using the lidar data. This analysis shows that the G23-G26 HFS developed basinward-dipping depositional topography from the shelf crest to the shelf margin reef. This geometry was largely unaltered by syndepositional faults during individual HFS deposition, but was rotated basinward shortly thereaf-

ter by younger fault movement.

The accommodation trends recorded in this largely shelf crest to shelf margin window can be additionally projected into the middle shelf producing zones of the prolific Yates-aged reservoirs on the Northwest Shelf and Central Basin Platform.