

## **Late Cretaceous and Early Tertiary Sequence Stratigraphy, Depositional Systems, Tectonic Framework, and Paleogeography of the Southern San Joaquin Basin, California**

Tor H. Nilsen<sup>1</sup>, S. A. Reid<sup>2</sup>, and David R. D. Boote<sup>3</sup>

<sup>1</sup>Consultant, San Carlos, CA

<sup>2</sup>Occidental Oil and Gas Corporation, Houston, TX

<sup>3</sup>Consultant, London, England

[tor\\_nilsen@msn.com](mailto:tor_nilsen@msn.com)

The Upper Cretaceous strata of the southern San Joaquin basin are generally poorly understood because of sparse outcrops and few well penetrations. South of the Bakersfield arch, the entire Jurassic to Paleocene Great Valley Group—which is thousands of meters thick and forms the principal gas reservoirs in the northern San Joaquin—is absent, having been stripped away as a result of early Eocene uplift. Upper Cretaceous strata increase in thickness northward of the Bakersfield arch and form a fairly complete section in the Orchard Peak and Coalinga areas. The Upper Cretaceous succession in outcrop along the west margin of the basin consists mostly of repetitive, thick, lowstand submarine-fan deposits, generally referred to loosely as the Panoche Formation, separated by highstand shales. The fans were deposited by westward- and southward-flowing sediment gravity flows from a Sierran provenance. Poorly preserved deltas and shelf deposits are present along the eastern flank of the basin. The uppermost fan deposit is overlain by shale and is in turn overlain by widespread deltas of Maastrichtian age that record filling of the forearc basin to sea level; these highstand deposits include from south to north the Redman sandstone, Garzas sandstone, and Mokelumne River Formation. Most of the basin was subsequently flooded by a major transgression that is recorded by the Moreno Formation, which extends into the early Paleocene. A second transgression (lower Lodo Formation) reached its maximum in the late Paleocene, when marine conditions may have reached across the ancestral southern Sierra into the southwestern Basin and Range. Eocene tectonic events reshaped the basin: in addition to early Eocene uplift and erosion of the southern basin and adjacent Sierran highlands, accretionary events along the western flank of the basin in the early middle Eocene emplaced new granitic provenance areas to the west that provided a western source of coarsegrained arkosic sediments into the basin. The basin remained partially enclosed throughout the remainder of the Tertiary.