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## **CHARGING OF ELK HILLS RESERVOIRS AS DETERMINED BY OIL GEOCHEMISTRY**

The different Elk Hills oil families, generated from stratigraphic/geographic variations in the 'Monterey' organic-rich facies, correspond to reservoir horizon. This suggests minimal up section, cross stratigraphic migration from the basin depocenters to Elk Hills; specific inter-Monterey source-reservoir packages are extended down dip into the basin with good seals intervening. The older Monterey source horizons can charge pre-Monterey reservoir units (Family B1) as up dip, but down section migration occurs, while the youngest Monterey source facies have supplied oil to the Pliocene SOZ reservoirs.

The aerial distribution of Elk Hills oil families is also the result of charging Elk Hills from different depocenters. Low maturity Family C oils, concentrated in the NW Stevens anticline, may have originated in the Buttonwillow subbasin to the NNE while other oil families migrated from the Maricopa subbasin to the SE of Elk Hills.

The results of the carbon isotopic analyses suggest that both the heavy and light end components of Elk Hills reservoirs were derived from the Monterey (no Eocene Kreyenhagen component detected). Oil was generated at different thermal maturity stages (at different times and different depths into the sub-basins) and mixed in the reservoir. In fact, Family A oils from Stevens turbidites, by far the main oil producers at Elk Hills, contain the greatest proportion of more mature light hydrocarbons from the subbasin depocenters by a factor of at least ten.

The Pliocene SOZ oils have suffered biodegradation to different degrees, with the most biodegraded oils occurring on the flanks of the 31S Anticline. These are the lowest API gravity oils. Although slightly more positive (not caused by biodegradation), the carbon isotopic composition of SOZ oils suggests yet another Monterey source facies (perhaps the youngest) with charging of Pliocene reservoirs. The SOZ oils are not simply the result of vertical "leakage" within the Elk Hills area from any of the older Miocene reservoirs.