LISTRIC NORMAL FAULTS IN THE MIOCENE-PLIOCENE SECTION AT NORTH AND SOUTH COLES LEVEE FIELDS: A RESPONSE TO PLEISTOCENE GROWTH OF THE ELK HILLS ANTICLINE

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ABSTRACT

Several northeast-trending listric normal faults affect the post-Miocene strata at North and South Coles Levee Oil Fields, Kern County, California (Fig. 1). These faults have been documented by subsurface mapping using geophysical logs and seismic data. The amount of displacement in these faults is as much as 105 m and decreases away from the crests of the two Coles Levee anticlines. The displacement on the faults decreases with depth and the faults sole into an east-dipping detachment surface near the Miocene-Pliocene boundary.

These faults were initiated and active during Plio-Pleistocene deposition. Although the geometry of these faults is similar to that of growth faults, the displacement appears to be due to increased rates of structural uplift of the adjacent Elk Hills anticline during and/or after deposition of the Pliocene section. The faults may be related to a series of normal faults mapped in the eastern part of the Elk Hills anticline by Woodring et al. (1932) and Maher et al. (1972). Maher et al. (1972) suggested that the faulting was the result of gravity sliding, but could not find similar faults in the Coles Levee area to support this hypothesis. Evidence that these faults are present at Coles Levee is provided in this paper.

Figure 1. Structure map (on the "N" Chert horizon) of the southern San Joaquin valley (modified from Webb, 1981). The map shows the Coles Levee area addressed by this paper. The inset map shows the location of the southern San Joaquin valley within California.

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