Using Applied Environmental Sequence Stratigraphy to Predict TCE Contaminant Migration Pathways: Air Force Plant 42, Palmdale, California

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Background/Objectives. The Antelope Valley (Los Angeles County, California) consists predominantly of unconsolidated alluvially-sourced gravels, sands, silts, and clays that contain an essential source of groundwater for hundreds of thousands of people. Because these sediments can be easily contaminated in the subsurface, they require a comprehensive understanding of stratigraphic constraints on contamination migration pathways in the region. In this study, we examine the regional and site-specific ("plume scale") extent and connectivity of late Pleistocene to Holocene alluvial fan deposits at Air Force Plant 42 (AFP 42), Palmdale, California, by using detailed facies analysis within an environmental sequence stratigraphic framework.

Approach/Activities. We correlate depositional sequences from continuous borehole data and geophysical logs to trace strike and dip cross sections throughout AFP 42. This information is then combined with detailed facies models, developed after examining modern analogs via Google Earth aerial imagery, to allow us to determine the continuity of confining beds/aquifer sands and to predict TCE contaminant migration pathways.

Results/Lessons Learned. Regionally, this study reveals that alluvial fan sediments are sourced from the uplifted San Gabriel Mountains to the south and dip to the north-northeast. Despite variable grain-sizes, all alluvial fan facies have at least some degree of vertical and horizontal transmissivity. On a plume scale, water preferentially flows through coarse-grained channel bar deposits while fine-grained floodplain and interfluve deposits act as flow barriers/baffles. Consequently, channel bar connectivity appears to be the predominant stratigraphic factor affecting the shape of the contaminant plume beneath AFP 42.