

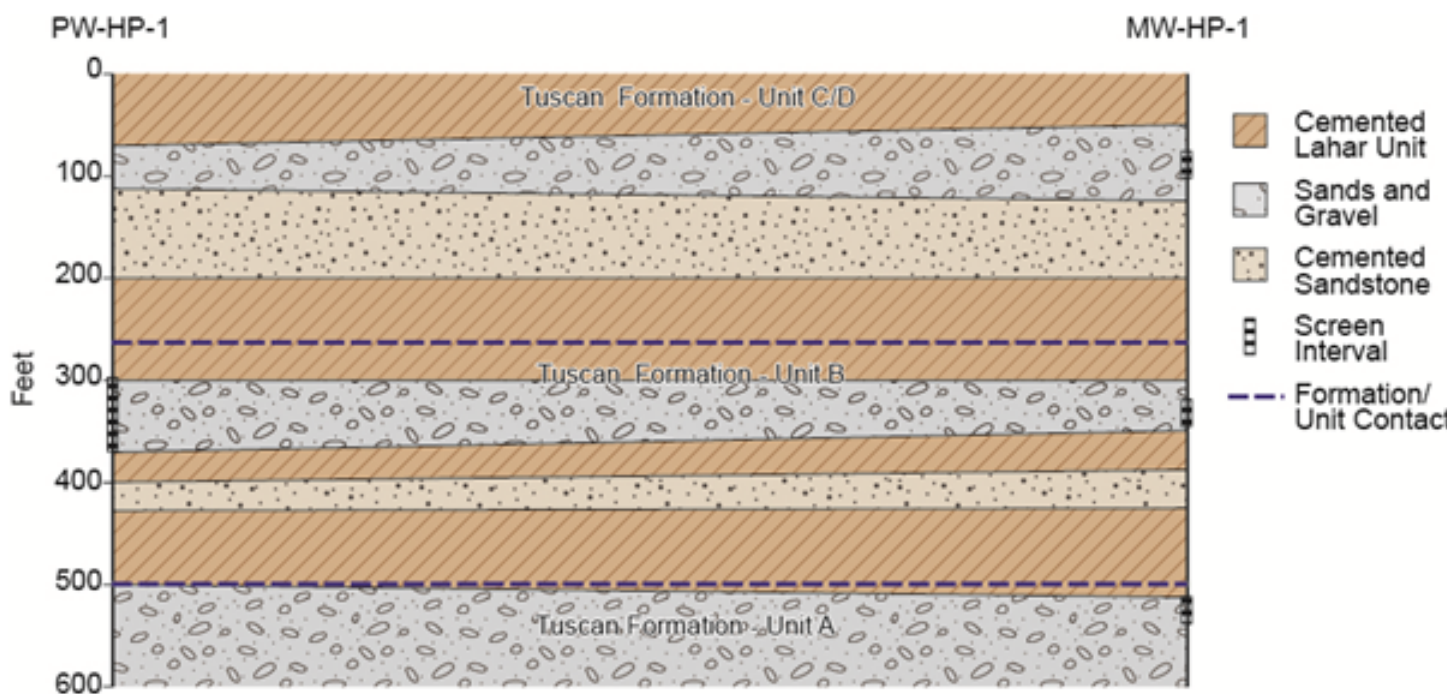
Final Report Excerpt: Aquifer Test Analysis – Hackett Property

Within the northern portion of the project area where the Hackett Property is located, outcrops of the Lower Tuscan Aquifer (LTA) consist of classic lahar deposits interbedded with tuff units and fluvial sand and gravels. A lahar is a type of mudflow or debris flow composed of a slurry of pyroclastic material, rocky debris, and water that flows down from a volcano, typically along existing natural drainages. The consistency, viscosity, approximate density and hardness of a lahar are that of concrete, but change with increased transport distances.

A generalized geologic cross section developed using the lithologic logs produced from the observation well (MW-HP-1) and pumping well (PW-HP-1) for this test is presented in the following figure. As seen on this figure, three separate well screens were constructed within the observation well to monitor zones within both the Upper and Lower Tuscan Aquifers. The pumping well is reported to be screened within the same sand zone of the intermediate screen for the observation well between 320 and 340 feet below ground surface (bgs). Based on field observations, the lahar units were expected to have low permeabilities and the three screen intervals were placed within

sand and gravel zones separated by significant thicknesses of these units. This design allowed assessment of the interaction between the aquifers and leakage responses through the low permeability lahar units

The pumping well used for the test was connected to an irrigation distribution system and the water extracted was used for normal irrigation (spray irrigation) practices of a walnut orchard. As part of this operation, during the test, several line changes were made to irrigate different portions of the orchard that resulted in changes in the pumping rate. The flow rates for the aquifer test ranged between 800 gallons per minute (gpm) to 1,200 gpm. No other wells operated within the orchard during the test. For the Hackett Property, the aquifer test demonstrates that there are at least two primary aquifers hydraulically disconnected (deep and intermediate zones). The test also shows that the intermediate aquifer interacts with a shallow aquifer through a leaky aquitard and that there is significant storage within the aquitard consistent with observations made during drilling of the observation well.



The conceptual model supports the response of observation well MW-HP-1 shallow screen well to pumping that suggests leakage from the overlying aquitard above PW-HP-1.

Transmissivity, represented by a “T”, is a measure of the ability of an aquifer to produce water and is equal to hydraulic conductivity (K) times the thickness of the aquifer (represented with a “b”), or **T = Kb**. As such, a T value for a 10 foot thick well-sorted sand with a K value of 100 would be the same as a 100 foot thick fine sand with a K value 10. Units of T are feet squared per day (ft²/day). Typically, T values of less than 100 ft²/day will supply only enough water for domestic wells or other low-yield purposes. In wells with T values greater than 1,300 ft²/day, the production yields are typically sufficient for industrial, municipal, or irrigation use.

Storativity, represented by an “S” in this report, is a physical property that characterizes the capacity of an aquifer to release groundwater. Specifically, it is defined as the volume of water an aquifer releases from or takes into storage, per unit surface area per change in head and is a unitless number. The storativity of a confined aquifer typically ranges from 0.00005 to 0.005, whereas for unconfined aquifers storativity ranges from 0.1 to 0.3 (Todd, 198).

Summary of aquifer parameters calculated for Hackett Property Aquifer Test

	T (feet²/day)	S (unitless)	K (feet/day)
Hackett Property	2,322 to 3,078	0.00004 to 0.00009	66 to 88