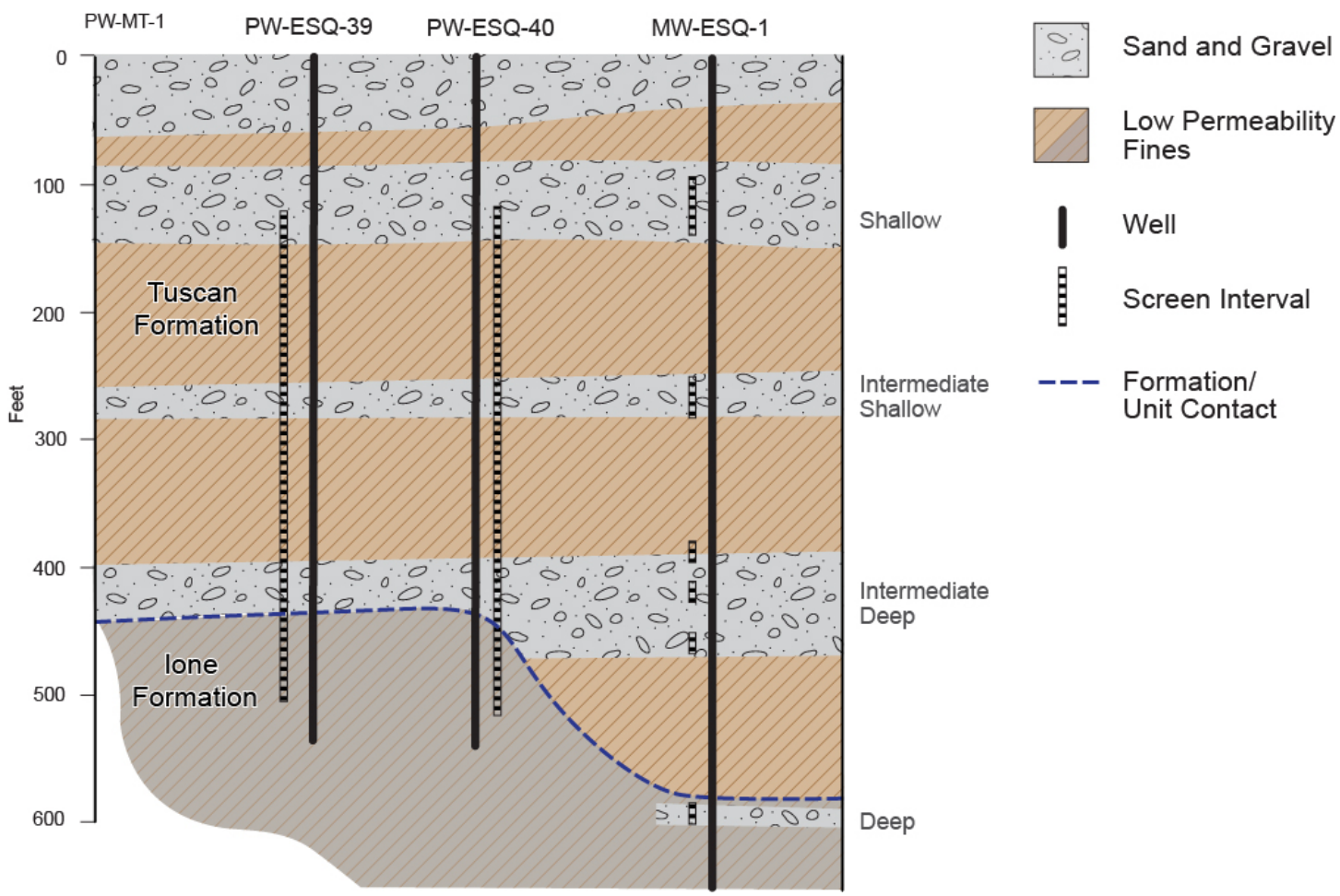


Final Report Excerpt: **Aquifer Test – Esquon Ranch**

The aquifer test completed at the Esquon Ranch was conducted in aquifers formed within the distal portions of the Lower Tuscan Aquifer (LTA) composed predominantly of unconsolidated fluvial material but with some hard cemented reworked lahar units. The Lower Tuscan Formation is present at the ground surface in the Esquon Ranch area. A generalized geologic cross section developed using the lithologic logs produced from the observation (MW-ESQ-1) and pumping wells (PW-ESQ-39 and PW-ESQ-40) for this test is presented in the following figure.



Four separate well screens were constructed within the observation well to monitor three zones within the LTA (shallow, intermediate shallow and intermediate deep wells) and the underlying Lone Formation (deep well). The pumping wells, as illustrated on Figure 4-17, are reported to be screened across the entire interval monitored by both the intermediate shallow and intermediate deep wells between 110 and 520 feet bgs. The shallow, intermediate shallow and intermediate deep wells

are placed within permeable sand units separated by low permeable fines and lahar units of the LTA. The deep well is placed within permeable sands of the Lone Formation that is overlain by low permeability fines and lahar units of the LTA. This design allowed assessment of the interaction between the aquifers of both the LTA and Lone Formation and an assessment of leakage responses through the low permeability units.

For this region, the aquifer test demonstrates that the primary LTA is hydraulically connected to the aquifer within the upper lone Formation through indirect pathways. The drawdown curve for the deep well showed a delayed response of approximately 16.5 hours and the shape of the curve suggests that although hydraulically connected, water from this zone has to follow an indirect path to the zone of pumping used for the test. This observation is consistent with the geologic cross section that shows this well completed within the lone Formation beneath fine grained units of the Tuscan Formation and suggests that the sands of the lone Formation in this area connect with the sands of the Tuscan Formation at a different location. The shallow zone drawdown curve indicates that the shallow zone aquifer is not hydraulically connected with the lower zones of the LTA.

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”, 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, 1980).

Summary of aquifer parameters calculated for Esquon Ranch Aquifer Test

	T (feet²/day)	S (unitless)	K (feet/day)
Esquon Ranch	12,230 to 23,650	0.00004 to 0.001	41 to 79