Quantifying Factors That Impact Riverbed Dynamic Permeability at a Riverbank Filtration Facility

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Previous modeling studies of the Wohler riverbank filtration system on the Russian River, California suggested that riverbed and aquifer permeability both influence the development of a pumping-induced unsaturated zone below the riverbed, which affects water produced through large radial water-supply collector wells that extend beneath and adjacent to the river. In particular, previous work suggests that riverbed permeability is influenced by interaction between pumping and river stage that is controlled by a downstream temporary inflatable dam during the summer low flow period. We hypothesize that raising the dam may instead lead to deposition of fine-grained sediment and/or accumulation of biota, both of which decrease riverbed permeability in the vicinity of the collector wells. To test this hypothesis, we are monitoring streambed permeability and seepage as a function of river stage and dam operation. We are using multiple methods to monitor the hydrological, sedimentological and geomorphic dynamics, including: seepage meters, sediment traps, cryogenic coring, ground penetrating radar, electrical resistance tomography, riverbed topography, piezometers, and thermistors. Here we discuss the use of this novel suite of methods to quantify dynamic riverbed permeability, how it relates to dam operation, and determine the key controls on permeability (i.e., biotic or abiotic). These results are expected to improve the overall understanding of riverbed permeability dynamics associated with Riverbank filtration. The results are also expected to be transferable to the project sponsors, the Sonoma County Water Agency, toward the development of an optimal pumping and dam operation schedule.