



Scientists staying at a streamside biological station rely on a shallow, hand-dug water well to support their water needs during extended field visits. Recently, a large-scale horticulture center (greenhouse complex) was built nearby, requiring the extraction of large amounts of groundwater from the unconfined aquifer as the ecologically important stream is protected from any water abstractions. It is known that the stream and aquifer are well connected.

Should the scientists be concerned about the resulting drawdown from the new water well? To help answer this question, quantify the drawdown at the location of the shallow hand well after 3 months, 6 months, and a very long time of pumping of the new water well. First, use an analytical approach. Then, check your analytical solution by creating a simple numerical model using MAGNET. Further apply your numerical model to evaluate the impact of aquifer heterogeneity.

Given information: pumping rate of irrigation well: $10,000 \text{ m}^3/\text{day}$; location of pumping well, $x_2=200 \text{ m}$ from the stream; location of shallow hand well, $x_1=85\text{m}$ from the stream; aquifer; specific yield of aquifer: 0.1; initial saturated thickness: 20 m; average hydraulic conductivity: 100 m/d ; variance of hydraulic conductivity: 0.2 m^2 ; correlation scale (x-direction): 8m; correlation scale(y-direction): 8m.

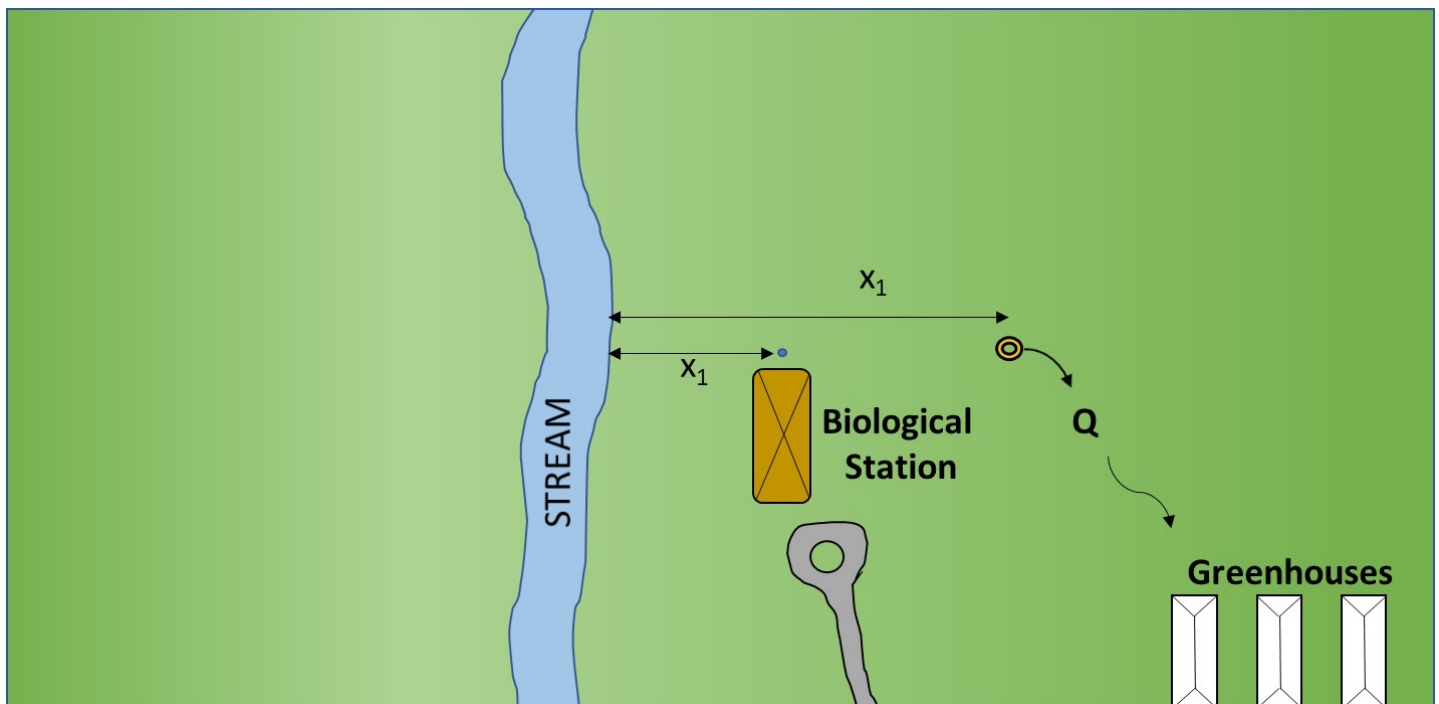


Figure 1: Location of the wells, stream, biological station and greenhouses.