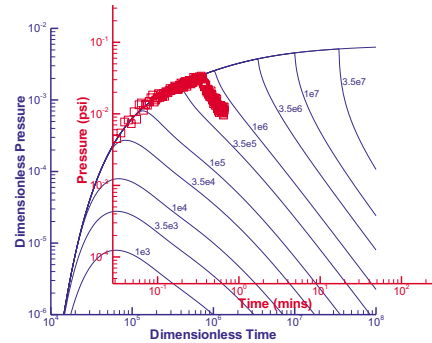


HydroGeologic Characterization

Hydraulic Pulse Interference Test

Hydraulic Pulse Interference Test

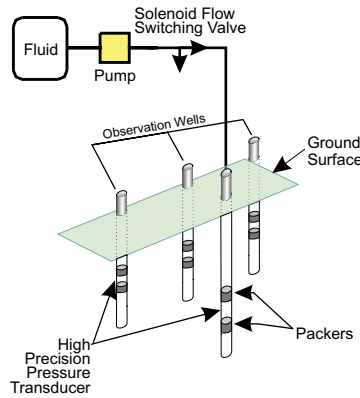
GeoSierra has developed specialized equipment and analytical interpretation procedures for site hydrogeologic characterization by the hydraulic pulse interference test. The equipment consists of high precision pressure transducers, constant flow rate pump and solenoid adjustable valves, packers and a high speed data acquisition system. Analytic and type curve analyses are available for the interpretation of the hydraulic pulse interference test in a variety of formations consisting of either porous media or fractured bedrock systems.



Type Curve Analysis of Confined Aquifer 35' to 110' bgs
Source Well and Receiver Well both at 100'-105'

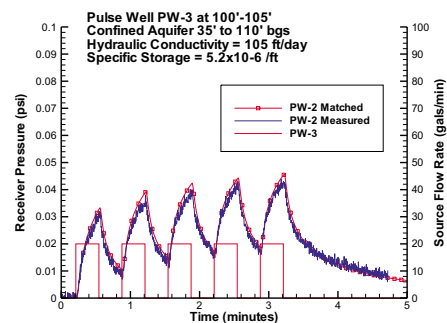
During the pulse interference test, the source well's flow rate and pressure are monitored along with all of the receiver pressure transducers. It is essential that the pressure transducers are of high precision and that the flow rates and pressures are all continuously monitored and recorded at high data acquisition rates. To ensure the tests are repeatable, the pulse switching mechanism needs to be automatically controlled and recorded on the data acquisition system. To optimize the resolution of the test, the injection/shut in time interval and/or injection flow rate will need to be varied depending on site conditions and the distances between source and receiver wells.

The hydraulic pulse interference test is an ideal test for the quantification of a site's hydrogeological properties. The pulse interference test is highly sensitive to hydrogeological properties between the pulse source and receiver wells. The transient nature of the test, involving the time delay and attenuation of the hydraulic pulse, enables the formation's complete hydraulic properties to be computed. The method is equally applicable to porous media and fractured bedrock systems. The advantages of the pulse interference test are the short duration of the test, the high resolution and directional characterization data obtained, and the lack of any generated contaminated groundwater during the test.



Typical Hydraulic Pulse Interference Test Setup

Hydraulic pulse interference tests involve a cyclic injection of fluid into the source well, and by high precision measurement of the pressure pulse in a neighboring well, detailed hydraulic characterization between wells can be made. The pulse interference test is highly sensitive to hydrogeological properties between the pulse source and receiver wells. To maximize the pulse test's resolution, a small section of the injector well is isolated by packers, the flow rate into the source injector well is rate controlled and set at a constant flow rate depending on the site hydraulic conditions. High precision pressure transducers are located in receiver wells. The injector well is pulsed for a set time, shut in for the same time period, and the cycle repeated. The pulse source and receivers can be located at differing depth locations in their respective wells and a detailed image of the site's hydraulic conditions can be determined.



Receiver Well Pressure Response
with Matched Analytical Model