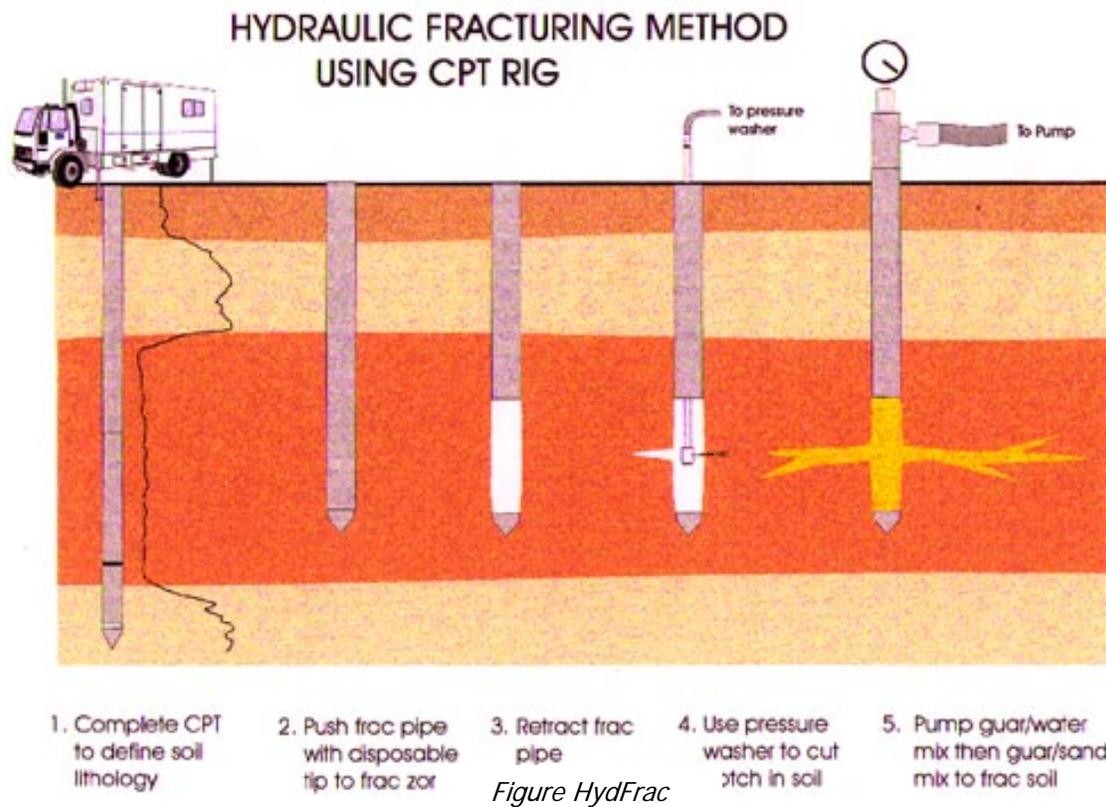


# Hydraulic Fracturing

Gregg Drilling and Testing, Inc. has refined a technique for improving flow rates in wells (groundwater and vapor extraction) in areas of low hydraulic conductivity by hydraulic fracturing. Hydraulic fracturing creates artificial sand lenses along zones of weakness in the soil, which can greatly increase the area of influence exhibited by an extraction well. The fractures are created by injecting a sand/guar gum mixture through a vertical pipe which has been installed at the desired fracture depth, *Figure HydFrac*.



Hydraulic fracturing can be performed using a hollow stem auger rig with a packer system. An even better method is to push the frac. pipe directly into the formation using a Cone Penetrometer Test (CPT) rig. The general procedure for hydraulic fracturing with a CPT rig is as follows:

1. Complete a CPT profile of the site. This is extremely important as it is imperative to have a clear understanding of the soil stratigraphy at the site in order to select the appropriate zones for fracturing.

2. Push the frac. rod to the deepest zone to be fractured. The rod should be tipped with an expendable point which is dimensionally smaller than the rod. It should not cut a larger hole than the rod as we are relying on the denser soil created as the rod is pushed to seal the rod to the surface. Pull the rod string up one foot to release the point.
3. Insert a small diameter rod equipped with a high pressure nozzle through the tremie pipe to the target zone. Pump water through the nozzle to cut a notch in the sidewall of the borehole. This will allow for the propagation of the new fissure.
4. Prepare a solution of guar gum and water. Guar gum is a plant-based cellulose material which greatly enhances viscosity. One pound of guar gum and 35 gallons of water will yield a substance with a viscosity high enough to carry sand grains in solution.
5. Pump the guar gum solution to a mixing tank (paddle type and mix with sand (20 40 mesh). Usually 35 gallons of properly mixed guar gum will suspend 100 pounds of sand.
6. Pump the sand/guar gum mixture through the tremie pipe into the fracture zone. It is necessary to have a solution pump that will pump the mixture at a high enough pressure to overcome the overburden pressure and to propagate the fracture.

