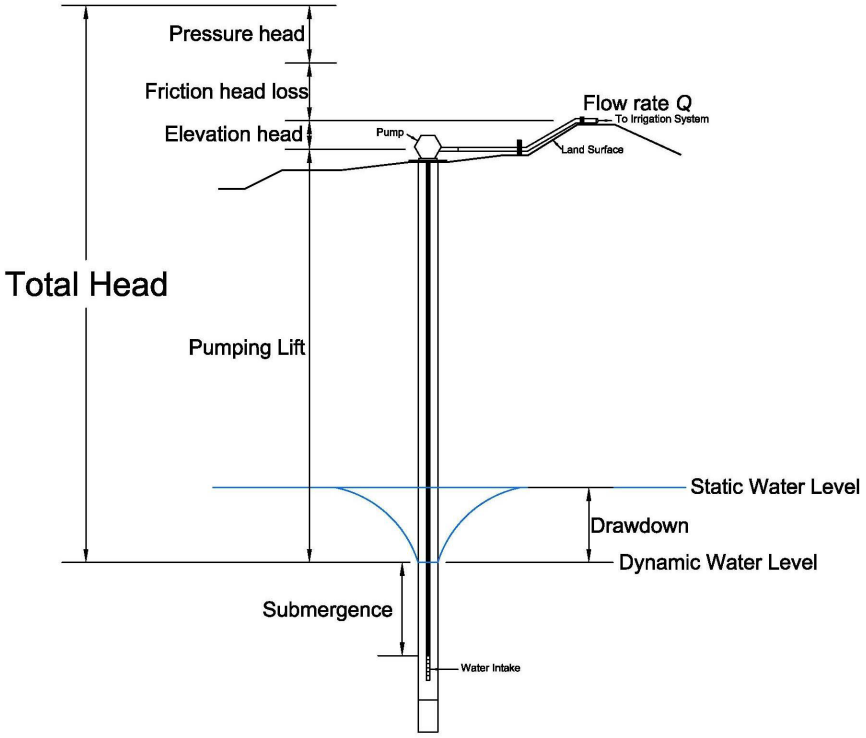
Coping with Declining Groundwater Levels

In Drought conditions, groundwater recharge is greatly reduced due to two main factors: (1) the decrease in rain and/or (2) the probable increase in use of groundwater because surface water allocations may be curtailed. Eventually, this situation cause groundwater levels to decline. Declining groundwater levels, in turn, cause changes in pump performance. The pump performance depends on the *Total Head* and the desired flow rate at the end of the pumping system.



Usually, the total head increases during drought conditions because groundwater levels decline. This can cause two potential situations: (a) there is an energy increases due to the total head increases, thus the electric utility bills will also increase or (b) the flow rate and/or the pressure at the irrigation system decrease because the pump use the energy to lift the water and there is not enough energy left to provide the desired flow rate or pressured at the end of the pumping system, this can be overcome with longer irrigation periods to prevent deficit irrigation. The later situation will increase the electric utility bills.

As mentioned before, declining groundwater levels will also reduce the pressure of pressurized irrigation systems. The following are measures for coping with declining groundwater levels:

1. Install a booster pump to increase the discharge pressure of the pumping plant. The pressure provided by the booster pump should equal the difference between the existing pressure and the normal operating pressure. A booster pump can also provide some suction lift in addition to the discharge pressure, which will increase the capacity of the pumping plant. The suction lift imposed on the booster pump should not exceed 20 to 25 feet.

2. If pumping levels decline to such an extent that suction no longer occurs in the intake pipe of the deep-well turbine, air will enter the pump and the capacity will decrease. This in turn will cause the water level in the well to rise. When the water level in the well rises, water will again be pumped until the level is lowered and air enters the intake. This behavior causes surging, which can be corrected by:
    a) Lowering the pump intake pipe, or
    b) Reducing the drawdown (the difference between static water level and pumping water level) in the well by decreasing the pumping discharge using one of the following options:
        - Installing a Throttle valve (butterfly or gate valve) in the pump discharge or reducing the number of lateral operating per set in a sprinkler or drip system.
        - (For semi-open impellers only) raising the impeller.
        - (For an Engine-driven pump), decreasing the engine RPM.
3. Install a new pump capable of providing the desired discharge pressure and capacity at the greater pumping lifts. Usually, this will increase the horsepower demand and require a larger electric motor or engine
4. Add an additional stage to the existing pumping plant. This will require a larger motor or engine

Note: If surging in the well does not occur, lowering the pump will not increase the pump discharge. The pump discharge depends on the elevation difference between the discharge pipe and the pumping water level, not on the depth of the pump. Lowering the pump under these conditions may slightly decrease the discharge because of increased friction losses in the column pipe.

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