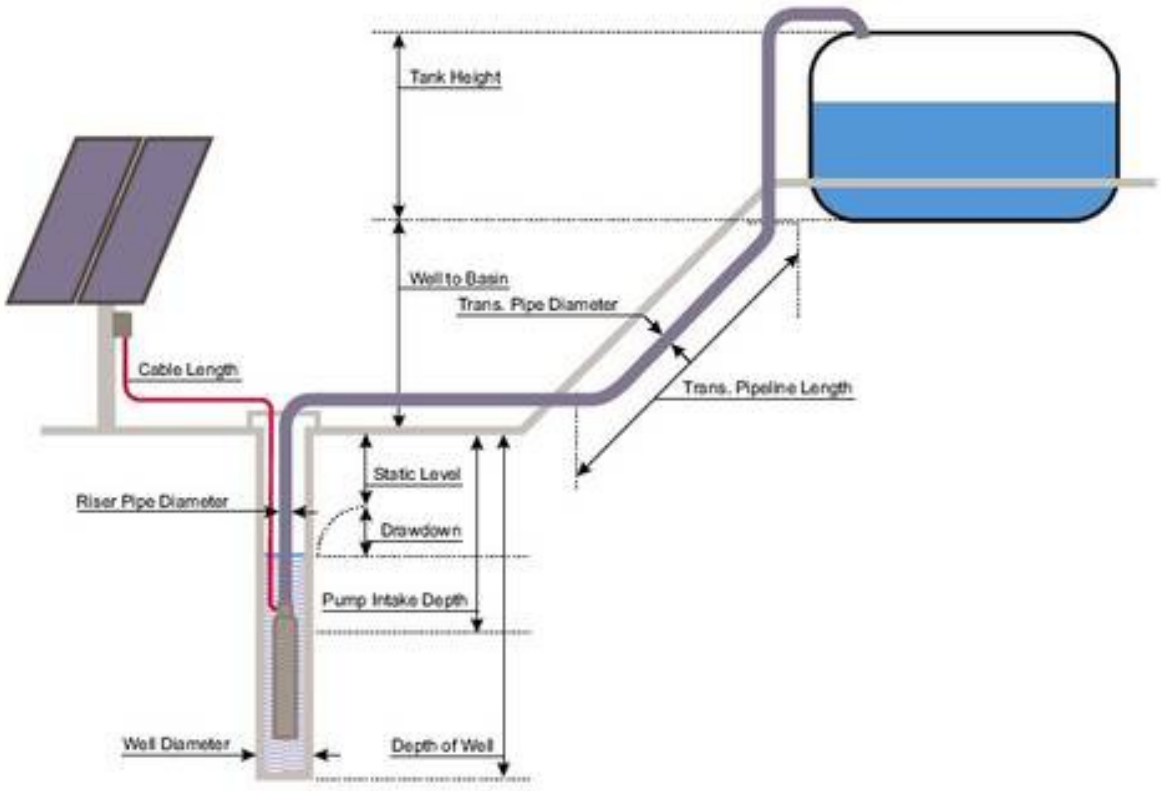
Solar Powered Water Pumping

http://www.backwoodssolar.com/learning-center/solar-powered-water-pumping

Water and water storage is on our minds currently as many of us face drought. As availability to solar energy becomes more affordable and much more efficient, the choice to change to DC solar powered water pumping in remote applications becomes clear. There are many remote situations where a solar powered water pump compared with a conventional grid-connected AC pump just makes more sense. Using solar to pump water can greatly relieve the work load and expense for many rural people. Depending on the application; irrigation, ponds, livestock, deep well water storage, or for an off grid water source, consider changing your existing AC pump and/ or installing a new DC solar powered pumping system closer to the water source. The age old argument is that AC pumps are faster and can last longer, however they use 4-8 times the amount of power per gallon than slower DC pumps. AC pumps can also be maintenance intensive and unpredictable at times, causing additional strain on inverters in off-grid systems when other loads are running. Most DC solar powered pumps use half the energy consumed by an AC jet pump, and can be more cost effective due to location and/or fuel dependence. A solar solution is cleaner and now cheaper than it has ever been. There are some basics you will need to know before you make the move to a solar direct water pump. We have also included a diagram that defines some of these terms further.



1. How deep is your well or other water source? “Water source” can refer to any well, spring, creek, or storage tank. Depth is a crucial measurement and is usually measured in feet; and is incredibly helpful when communicating with manufacturers or distributors. The depth of your well or water

source determines the type of pump you will need. When pumping from a storage tank, cistern, spring or creek you may need a shallow level submersible pump or surface pump.

2. What is the Static Water Level or Static Head in the well? This is the measurement from ground level of the well to the top the surface of the water, at rest within the well, from the natural production of the underground spring or stream.
3. If you have an existing well, do you know how many gallons per minute your well produces? Usually your well driller can provide you with this information, you might have it already, or you will have to estimate how much “draw-down” the well will have during pumping.
4. How many gallons per day will you need?
5. Are you planning on pumping to a non-pressurized holding tank or to a pressure tank?
6. And, how many feet above the well head is the tank located?
7. If you will be using a pressure tank is how many pounds of pressure will you need from the pumps performance?
8. If PV direct, without batteries, how many feet from the array to the well head (either of the surface pump or a submersible pump deep in the well? Some of the finer details that are often overlooked in the planning stage are the distances that the wire or conduit from the PV modules will need to be to get to the well head. If there is a battery bank, the distance from the well head to the battery system will have to be measured.

Adding a storage tank and increasing the size of the pumping system means that you can have excess water stored for continual use during the night or when it’s cloudy and the pump is off. The purpose of a storage tank or drinking trough is to allow a very consistent trickle flow of water constantly pumping throughout the day building up a large volume of water to supply brief periods of high water use.

DC powered submersible deep well pumps may be the best choice because they do not require large bursts of power or use the inverter at all. As touched on previously, DC submersible pumps only use 20% to 50% as much energy per gallon pumped as an AC centrifugal pump. Most of these pump very slowly and have less of a chance of depleting the water level in a slow recovery well. They can be powered direct by solar modules, without batteries. Or they can be powered by the same battery bank in an off-grid home like any DC appliance as long as the well is within about 200 feet from the house. These submersible pumps will not freeze or lose their prime. So, this leads to the next couple of questions to consider as you design your system.

1. Do you want to power the pump directly from a PV array, which implies that you will only get water when the sun is shining unless you have a storage tank?
2. Or are you considering that you would need to have your pump powered by a battery bank for additional pumping in times of little to no sun and into the evening? Batteries are also sometimes desirable to provide sufficient surge power for starting the pump.

At this point, drawing a rough diagram of your proposed system is a good idea so that you can indicate which measurements you will need and identify sources, storage, final discharge points, and required components to go solar. A solar powered water system is one of the easiest solar power systems to install and will ultimately save you time and money. As with any system, Backwoods Solar is here to answer any questions and help design the perfect system to meet your needs.