

**OPTION 2: Electric Pump with Diesel Powered Generator (20 GPM at 225 ft TDH)**

Reducing the flow to 20 GPM reduces the power required to operate the pump. It also reduces the frictional losses in the piping to 15 ft, for a TDH of 225 ft. Another pump, (Goulds Model 2SVB1H4G0) is a 7-stage, 3 HP pump that closely matches the desired flow. This pump has flanged connections and a 240 V single-phase TEFC motor suitable for outdoor use. The pump lists for \$1952.

A 3 HP (2237 W) motor could use a 3000 W generator. Bowers Power Systems can supply a Baldor Model DG3E portable diesel generator rated for 3000 continuous watts. It lists for \$2215. Fuel capacity on this model is 2.75 Gallons for a run time of 9 hours. At 20 GPM, it would take 6.25 hours to pump 7500 Gallons per day. This configuration would then consume 1.875 Gallons/Day of diesel fuel. Again, a 120 gallon fuel storage tank is advisable to store approximately 64 days worth of fuel.

**OPTION 3: Solar Powered Pump (12.5 GPM at 215 ft TDH)**

If we assume that there are 10 hours per day of sunlight available, then the water may be pumped using solar power at a rate of 12.5 GPM. This reduces the TDH to 215 ft.

Southwest PV Systems Inc (800-899-7978) can supply a pumping system complete with submersible Grundfos pump, 900 W solar panels, and controller for \$6011. Since this is a submersible pump, the configuration details need to be worked out in the design phase of the project.

The obvious advantage of using solar power is that fuel consumption is eliminated. If you chose to switch later to solar power, with the diesel as a backup source of power, you would need either (34) 110 W panels for option 1 above, at a cost of \$549 each, or (21) 110 W panels for option 2. The added costs, including controller, would be \$18,785 and \$11,648 respectively.

**ITEM 3 – PIPING**

The Baucells report recommends the use of galvanized pipe. Galvanized piping contains up to 0.5% lead. While it is an acceptable material for Potable Water, it is not the best material. A newer (and possibly less expensive) alternative is High Density Polyethylene (HDPE) piping as manufactured by Performance Pipe, for example. It is practically indestructible, it won't corrode, and it is easy to install below-ground. An above ground installation could actually be rolled out directly on the ground. Best of all, it is available in 500 foot rolls and the cost for 2" diameter SDR11 (0.216" wall thickness good for 160 PSI) is \$0.60/linear foot. This might make a better choice for the cross-country piping. It is joined using a fusion machine, but fittings are also available that perform the fusion when connected to an electrical current. The suction piping, and the piping immediately after the pump could be something more traditional, due to the number of fittings that will be involved.

The total cost of 1500 ft of HDPE pipe is XXXXXXXXXXXX. The weight of one spool of it is CCCCCC

**ITEM 4 – DISTRIBUTION TANK**

This could be essentially identical to the tanks used for the cistern. A distribution manifold should be piped at the discharge to facilitate filling of water bottles and buckets.

Please contact me if you have any questions regarding this list of recommendations.