Rainwater Catchment System for New England Home

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In December 2003 we moved into our new home in Southbury, Connecticut, to one of the worst New England winters, and within days we discovered problems with our deepwater well. At 650 feet, a low hydrostatic level of 500–600 feet, and extremely low yield, it was not recharging to supply water sufficiently for our family of three. None of this was discovered during inspection as the seller had filled the well with pool water for inspection and masked the problem with other methods such as “pretending” to use the water softener.

After consulting attorneys, local and state Health Departments, a geo-physicist and hydrologist from the U.S. Geological Survey, a personal friend who was also a former physicist from Yale University, various well drillers and other well consultants-none of whom could offer us a guaranteed solution-we were left to our own devices. The prospect of being stuck with a property with no adequate supply of potable water was as devastating as a prognosis of terminal cancer. The state of Connecticut had no laws, regulations, nor offered any assistance with well problems. It’s a “buyer beware” state with very little disclosure enforcement and no statutes whatsoever regulating the sales of existing homes. The town said it had no plans for city water and, if we did not get water, the property could be condemned and we could at that point neither sell it or live in it.

Our immediate remedy, as recommended by a well company, was to re-hydro-fracture the well using a more intensive method, which was to no avail. We were back to the drawing board and $8,000 in the (dry) hole. After more extensive research into the history of the property, we

discovered there had been two other wells on the property that had gone dry and been abandoned. It was becoming apparently more clear that there is very little groundwater in our property or the entire surrounding area. Builders were simply being allowed to drill too many wells in the small area.

The next recommendation from the well company was to install a reserve tank and abandon the traditional bladder tank. The reserve tank would draw water at regular intervals throughout the day and allow water to be stored for usage at other times. As it turns out, we only had one standard 36” entrance to the basement where we could store the tank. Most tanks were larger than this in diameter, and the well company did not offer any tanks that size. At this point, we were resorting to filling 5 gallon buckets of water from a distant spring for potable water needs and used the well water only for showers on a rotating basis as we waited to find an alternate solution.

Fortunately, through the internet we located a 400 gallon doorway tank designed to fit through narrow passages. With this, along with a booster pump and a float switch, we now had 400 gallons of reserve water available for use. But this still did not solve our water shortage completely, as even with the reserve storage, the well was not recharging sufficiently to keep the reserve tank full at all times. It was like poor cash flow - more water being used on a daily basis than the well could produce and put into the reserve tank, so that at intervals of time we would run into a deficit. This seemed to occur when we had overnight guests and the hot water heater would refill from the storage due to showers. We had to use the laundromat from time to time to overcome the deficit. So, while we could cope with living conservatively with 3 people, it was a

strain whenever we had company. However, it was always a good excuse to refuse unwanted company.

For the next two years we lived in cycles of deficit and, when our daughter went away to college, we had enough water for two. We had also by this time retrofitted our household with water saving appliances and fixtures. We installed water-saving showerheads, bought an ASKO washing machine that used the least amount of water, and changed from the old fashioned toilets to low flush toilets, and later changed those to dual-flush toilets. This gave us some breathing time to find a long term solution.

Among the solutions offered were to deepen the well at a cost of over $15,000, or drill a new well at $30,000 with absolutely no guarantee of obtaining water. Neither of those solutions were viable for us, especially after having sunk the initial $8,000 to hydro-fracture for nothing. Based on all of our research, we concluded that the topography and geology of the surrounding property left the chances of hitting a new aquifer or vein unlikely. Granite and mica, being soft rocks, did not produce a lot of fractures needed to create an abundance of water veins besides. The last solution we came across during our research was rainwater catchment, and so as a last resort this became the only viable solution.

Hence, we began to design our system. The components we needed for our system consisted of a clean roof, clean gutters, a cistern for water storage, piping, some light filtration and another booster pump.

The first concern was a clean roof before anything else could be considered – we needed a new roof. Our roof was worn out and had moss from the overhanging trees. A year earlier, as part of

our other home improvement projects we had most of the overhanging trees removed. Then with a bad rainstorm our roof began to leak in several key places. When it started leaking through the electrical fan, we had no choice but to re-roof. So with a new clean roof we were now able to proceed with our rainwater catchment system. Next was cleaning out the roof gutters and installing gutter guards. This also had been done as part of another home improvement project we had previously completed. We opted for the solid gutter guards-versus mesh, since these only let water in-not even small particles. These were easy to install, kept out most of the debris and only allowed very, very tiny particles to occasionally enter the gutters.

Next, finding a place for the cistern was a challenge. Our house is built on a slope so there was very limited flat ground to place a cistern. In addition, being in the northeast, an above ground tank will likely freeze each winter. After considering the cost of an underground system, we decided to try the above ground tank as a start, to maximize gravity and lessen the need for pumps. We found the perfect spot-between the gutters and the plumbing, so that gravity was all that was needed to get it into the tank and to the plumbing. We had located a spot flat enough and shady enough to hold a 350 gallon black polyurethane tank and prevent growth of algae from light. To overcome the cold, a heater of some sort was necessary. While most of the heaters we had looked into for large tanks were many hundreds of dollars, we came across a floating, thermostatically-controlled trough heater for only twenty five dollars at a local farm supply store. Although the winter cold has hit (it is January as I write this), in speaking to people who own livestock, they have informed us that these devices work well. So far we have had water and no ice, even with single digit weather and high winds.

The hardest part was the plumbing of threaded large pipe connections, which repeatedly leaked at the beginning. This was a material issue, and frustrating, but not impossible to solve. Using large threaded connections by oneself in cramped places means it is often hard to tighten them enough. What we thought would be the hardest part, drilling through the cement block wall to get the plumbing to the interior, turned out to be one of the easier parts. It was simply a matter of drilling several holes with my high powered drill and connecting them with a cold chisel and sledge hammer to breach the wall. Had this been the part of the foundation (like the rest) been made of field stone, it would have meant calling a coring company or renting heavy, expensive machinery and doing it by myself.

Next was the pump. The Davey™ Booster pump was familiar to us, as it is what we used for the reserve storage tank we had installed for the well system. It has a HydroScan™ on it, which is a device that senses a drop in water pressure and kicks on the pump to deliver the water to the house. The filter system currently consists simply of an inline GE Waterwise™ sediment filter. Later this will be supplemented with an inline carbon filter and an ozonizer to kill any potential pathogens, to be placed with the storage cistern.

The system was now complete and consisted of:

- clean catchment surface – the roof
    - solid, 4’ gutter guards
    - simple downspout
    - 350 gallon, black, opaque HDPE cistern
    - pipe freeze prevention heat cable

- tank heater (made for animal watering troughs)
- GE Waterwise™ sediment filter
- Davey™ Booster pump
- appropriate plumbing pipes and fixtures

The plumbing pipes consist of

- two inch white PVC (OK because it is shaded and wrapped),
- one half inch black flexible plastic tubing to connect the pump to the existing plumbing
- appropriate plumbing fittings

Once everything was installed, it was amazing how well it worked. In fact, we had severely underestimated the ability of it to supply water and found out that there was more rain than storage, meaning every rainfall there is spillage once the tank is refilled. And this is only from a very small fraction of our roof. The tank is 350 gallons and now runs the laundry and master bathroom-basically, half of the entire house. It is separated from the well water system by a ballcock valve, which can be opened to allow well water usage. The well and roof catchment waters do not mix (against local codes) and it is an either/or type of setup.

Eventually with one more tank or a larger one, we can be completely free of the well, although we will still use the well for some small tasks just to keep it healthy, “worked” and flowing. We are now considering making a Ferro-cement tank into some shape incorporated into the landscape, to make it as inconspicuous as possible. We also discovered since this time how prevalent this system is worldwide, and how really only the U.S. is not up to speed on doing this.

Now that we know how to do the system, repeating it will be much easier. Since then we have decided to form a company to do this for others who are not aware that there is an alternative to digging deeper both into the ground and into their pockets for water solution. Our state has many areas where low yield is prevalent. Being a contractor who has worked in remodeling and handyman repairs for two decades, I know it should be fairly simple to do, with the occasional headaches of materials, space, topography and budget. The company is called Frugal Water, is located on the web at http://www.frugalwater.com and our company is committed to help find solutions to water problems. We know that in Connecticut and elsewhere, wells can simply be or become unreliable.