

BARE HILL POND DRAWDOWN PUMPING SYSTEM – Interesting “factoids”

- Pump system specs
 - Capable of pumping 10,500 gal/min
 - Intake pipe:
 - Construction and installation led by Jim Clark, a town resident and marine construction expert
 - 800ft of 28" diameter HDPE pipe sunk at its far end in about 13 feet of water
 - 48,000 lbs. of pipe with an additional 53,000 lbs of concrete weights attached along 15 foot intervals -- 50 tons in total!
 - Built by volunteers with DPW assistance at town beach, and then towed and sunk in place
 - At maximum flow rate, water is moving at 5-6 ft/sec in the pipe
 - Discharge pipe
 - 65ft of 24" diameter HDPE pipe
 - At maximum flow rate, water is moving at 8-9 ft/sec
 - Pump and motor system
 - Designed by Chris Ashley
 - 125HP pump run by a variable speed motor to vary pumping rate under programmed control
 - Motor and pump assembly weighs over 17,000 lbs.; was custom designed, fabricated, and preassembled in Hudson, trucked to site, and lowered into building by crane
 - Control system
 - Designed by Ron Ricci
 - Fully automated system driven by microprocessor-controlled logic
 - Monitors changes to pond level to determine optimal pumping rate to achieve desired drawdown in fall and maintain water level during winter
 - Monitors instrumentation to detect problems and automatically shut down
 - Capable of unattended restart in event of power failure
 - Connected to town monitoring system by radio link
 - Has its own self-modulated air conditioner to keep it cool during operation
 - Electrical system
 - Designed by Ron Ricci
 - We generate our own 3-phase 440V power from 1-phase 220V
 - We convinced Mass Electric to extend the grid down Willow Road for free
 - Building
 - Designed by Mark Cooper, a town resident and building architect
 - Has detachable roof that can be removed by crane to give overhead access to pump and motor for removal for extraordinary service
 - Assembled in one weekend by a volunteer crew using wall panels that were prebuilt by volunteers in Mark's basement
 - Landscape restoration
 - Designed by Kim Ahern, a town part-time resident and professional landscape architect
 - All plantings provided at cost and installed for free by GardenSmith as a contribution to the town
- Pump system schedule
 - Grant submission: 6/2003
 - Final contract closure with DEP: 3/2004
 - Design completed: 6/2005
 - Built and installed piping: 9/2005

- Built foundation: 1/2006
- Installed pump platform and control cabinet; built house: 3/2006
- Finished pump hookup: 5/2006
- Tested pump: 6/2006
- Pump system financials
 - Pump system value: estimated between \$.75M-\$1M
 - Actual pump system expenditures: \$359K
 - Federal funds (through s.319 grant administered by DEP): \$184K
 - State funds (matching CPA funds): \$87.5K
 - Town funds: \$87.5K

This project is unique in several dimensions. First of all, we are pushing the envelope of technology with this system. Pumps are normally designed to push, not pull, liquids over long distances and up high elevations. It took a lot of engineering on our part (this was outside the experience base of any civil engineering firm we could find) to optimize the piping and find the right pump to achieve the flow rates we needed over the range of lift and distances we had to "suck" the water. There are only 3 firms in the entire Northeast that were willing to even consider the marine installation of the intake piping -- and all of them were prohibitively expensive (over \$.25M for any of them to do it). So we chose to do it ourselves with the help of DPW manning the heavy equipment. The control system design is also quite unique and optimized for our particular application. And of course we had to generate our own unique power needs. Even the foundation of the building is unique -- a custom designed and fabricated stainless steel box with 50 cubic yards of concrete poured in and around it to keep the 6 feet of groundwater that it sits in from floating the foundation and/or leaking into the pump pit. What blew me away was that we had in town experts in each of these fields -- Chris Ashley in pumping technology; Jim Clark in marine pipe design and construction; and Ron Ricci in control system design and programming. And that each of them was willing to devote over 500 hours each over the past 2.5 years to make this project successful. Each of them also used the buying leverage of their respective companies to get preferred pricing and pass these savings directly onto the town (we got a \$77,000 pump for \$53,000; a \$8500 motor for \$4500; etc.) And of course, the contribution of 50+ volunteers in town who put in anywhere from 10 hours to over 1200 hours each to make this whole thing come together, with much of the work being done in the dead of winter, in the pouring rain, or working for hours in <60 degree pond water. It was this huge investment of over 5000 hours of volunteer expertise and labor, coupled with the significant matching funds that we were able to secure, that made it possible to give the Town a 10:1 return on its investment of \$88K. And amazingly, we also delivered this system within a budget and schedule set over two years ago!

/Bill Johnson – Project Leader
 Bare Hill Pond Watershed Management Committee
 Harvard, MA