Title: Bottom withdrawal pipe alterations at Devil's Lake (Sauk Co.) – Final Project Report

Project applicant: Friends of Devil's Lake State Park

Project Contact: Richard Lathrop, DNR-SS (retired)

Project Description: This project funded the reconstruction of the siphon pipe system at Devil's Lake by lowering the land portion of the pipe so that it fully flows as a gravity feed system whenever the lake level is at or above the Ordinary High Water Mark (OHWM) – a condition that causes flooding in the park. The project entailed digging up approximately 900 feet of the 1,350-ft long land section of the siphon pipe (total length 5,500 ft, HDPE pipe OD 20-in.) and lowering (retrenching and regrading) the highest point by about 4.4 feet from its original elevation (Fig. 1). Thus, the top of the pipe at its highest elevation is now at the OHWM elevation so that the pipe fully self-primes when lake levels reach the OHWM. The pipe reconstruction also included adding an additional butterfly flow valve "upstream" of the pipe's high point to provide dual flow control of the pipe for safety and operational purposes. (The primary flow value was installed near the pipe's discharge manhole when the pipe was first constructed in 2002.)

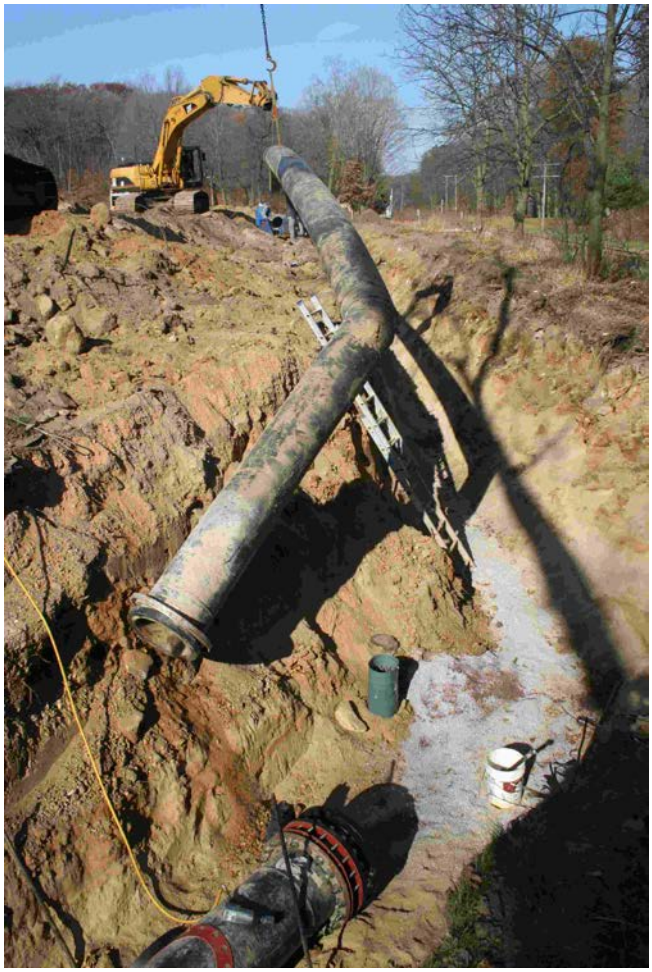

Fig. 1. The bottom water withdrawal pipe at Devil's Lake was retrenched 4.4 feet deeper at its highest elevation so that the pipe would self-prime and run as a gravity feed system whenever lake levels reached the "Ordinary High Water Mark" (OHWM). The lowered pipe also has improved flow rates during late summer/early fall when phosphorus is being removed from the lake.

The total cost for the reconstruction was originally estimated to be $48,000, which included contractor costs for retrenching the pipe, and costs for purchasing the flow valve, associated hardware and manhole extensions. Costs also included post-construction landscaping and blacktopping two park road sections, repair of the channel walls near the upstream intake to the water pipe system used to divert clean bluff water into the lake, and miscellaneous costs including electrical work at the high point manhole.

The pipe reconstruction work was done during October 2009 when lake levels were relatively low immediately following a period of withdrawing lake water.

Landscaping of the retrenched area was done in November 2009. Road repaving and curb replacement work was completed by the end of summer 2010 except for replanting the rain garden (disturbed during retrenching), which was completed in September 2011. Repairs on the inflow diversion pipe system were not completed until late summer 2011.

Project Outcome: The pipe reconstruction and associated work was all completed successfully and within budget. Since reconstruction, the pipe has worked well. For 2-3 month periods in the spring of both 2010 and 2011 when the lake had exceeded the OHWM, the pipe was operated to prevent flooding in the park. A minimal amount of gas that had accumulated in the pipe was quickly removed by venting at the high point manhole as self-priming was instantaneous. Lowering the siphon pipe has also simplified the filling of the pipe each spring as the pipe is emptied in late fall for winterization purposes. In the past, filling the pipe required running a vacuum pump for 5-6 hours plus set-up time; now the pipe almost completely fills without the use of the pump even at levels below the OHWM.

Lowering the pipe's high point also has allowed the pipe to operate more efficiently as a siphon for the removal of phosphorus (P) during the fall withdrawal period when lake levels are typically lower. This is a time when gasses tend to accumulate in the high point of the pipe, so even though the pipe is only partially below lake level, the removal of the gasses and repriming of the pipe is much more efficient. Without these pipe alterations, the long-term use of the pipe to remove P from the lake would be difficult to sustain.

Respectfully submitted,

Richard C. Lathrop, Ph.D.
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