Technical Memorandum

To: Chuck Reid

Company: Mohonk Preserve

From: Matt Trueheart
Associate Water Resources Engineer

SLR Engineering, Landscape Architecture, and Land Surveying, P.C.

Date: September 27, 2024

Project No. 20261.00001

RE: Siphon Design for Drawdown of Duck Pond at Mohonk Preserve New Paltz, New York

Mohonk Preserve has requested assistance from SLR Engineering, Landscape Architecture, and Land Surveying, PC (SLR) with design of a siphon configuration for drawdown of Duck Pond in preparation for removal of the Duck Pond Dam. The proposed layout is shown on Sheet 1 (attached).

Consultation with the New York State Department of Environmental Conservation (NYSDEC) Dam Safety Section is highly recommended prior to installation or operation of the proposed siphons.

Given siphon pipe centerline elevations of 587.8 feet (ft) at the inlet (pond bottom), 599.1 ft through the dam spillway conduits, and 581.3 ft at the outlet, the proposed pair of 6-inch diameter, 152-foot long siphons have a combined discharge capacity of up to approximately 6 cubic feet per second (cfs) with a full pond, down to about 4 cfs with the pond drawn down by 10 feet. Computations account for pipe friction losses, but minor losses in couplings, fittings, and valves are not accounted for.

Siphon #1 is used for initial drawdown, and would then operate continuously to balance base flows from the upstream watershed and maintain a drawn down pool in the impoundment.

Siphon #2 is used for initial drawdown of the pond, and any subsequent drawdowns or to supplement the capacity of Siphon #1 as necessary.

Assuming a steady-state inflow into the pond from the upstream watershed of 2.2 cfs, which is the estimated 90^{th} percentile flow, (USGS SIR 2014-5220), drawdown to a stage of 588.0 feet NAVD88 will take approximately 57 hours with both siphons operating. At the estimated 50% (median) duration flow of 0.44 cfs, drawdown would be accomplished in about 38 hours.

All computations assume that the intermittently functional low-level outlet is not flowing during the drawdown. If the low-level outlet happens to be flowing at the time, drawdown may be more rapid. Note that NYSDEC may dictate that the drawdown occurs at a slower rate than the siphons are capable of.

Pond storage was estimated from bathymetry measurements by SLR in October 2021; an elevation-storage rating curve is shown in Figure 1. To facilitate unsteady computations, a power function was fit to the measured data and the drawdown was simulated numerically at a 1-second timestep. Storage volume, pool stage, and discharge over time are shown in Figure 2, Figure 3, and Figure 4, respectively.

Once the initial drawdown has been completed, Siphon #2 is proposed to be deactivated, while Siphon #1 is operated continuously to balance the incoming base flows from the upstream watershed. This base flow siphon should be configured with an outlet valve that allows for manipulation of flow rates so that a shallow pool can be maintained at quasi-equilibrium.

If possible and safe to do so, once the pond is drained, the inlet to the existing low level outlet should be cleared of any debris or blockages that interfere with its operation. This will help prevent the pond from refilling after significant rainfall.

A staff gauge should be installed near the deepest point of the pond, where the siphon inlets are located, which can be used by Mohonk staff to guide operation of the valving on Siphon #1 by indicating whether the pond is filling, draining, or maintaining a static stage. Six-inch or 1-foot graduations should be marked on the staff gauge.

Significant rainfall events will exceed the capacity of Siphon #1 to maintain a drawn down pool, which may refill partially or entirely; Siphon #2 may need to be reactivated to drain the pond again. Note that the possibility of the impoundment refilling may be unacceptable to NYSDEC Dam Safety Section, which may issue orders to breach the dam once the pool has been drawn down.

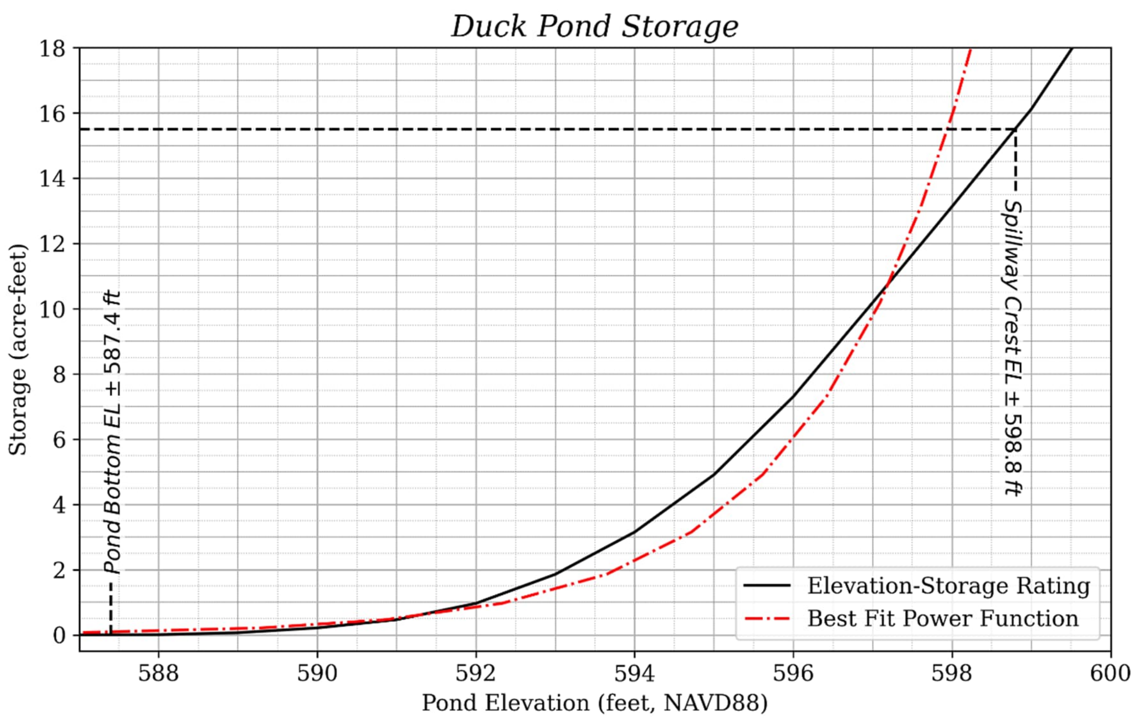

Figure 1 Elevation-Storage rating for Duck Pond.

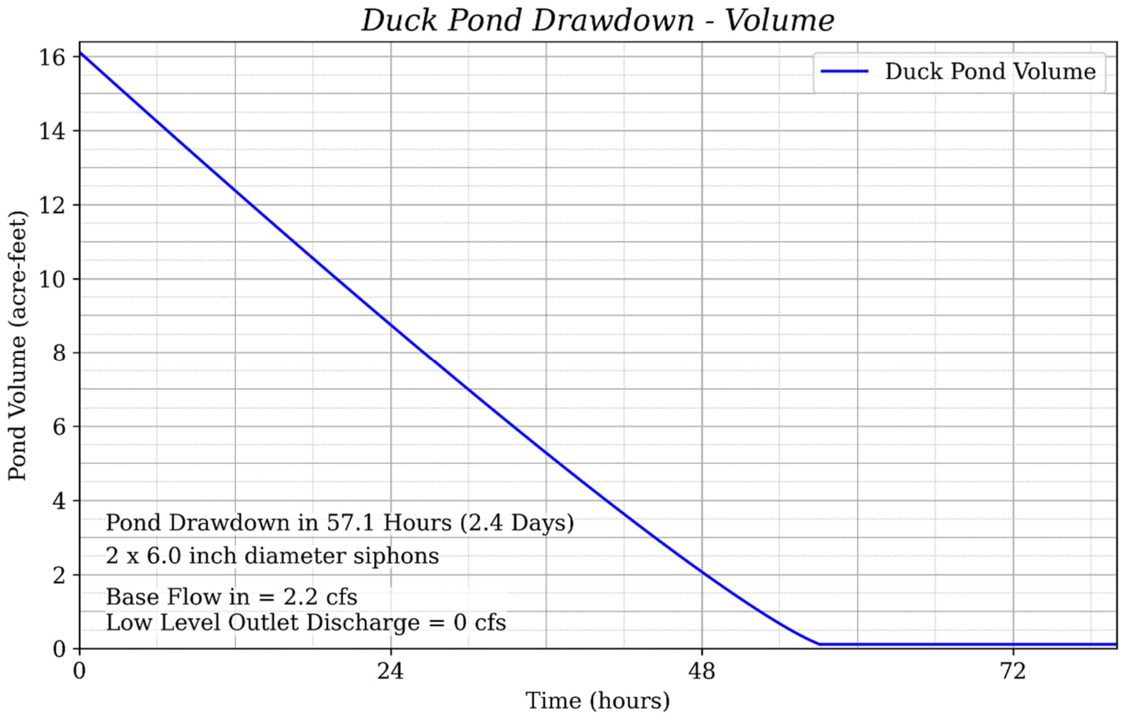

Figure 2 Simulated drawdown of storage volume in Duck Pond with two 6” diameter siphons, 2.2 cfs inflow, and inoperable low-level outlet.

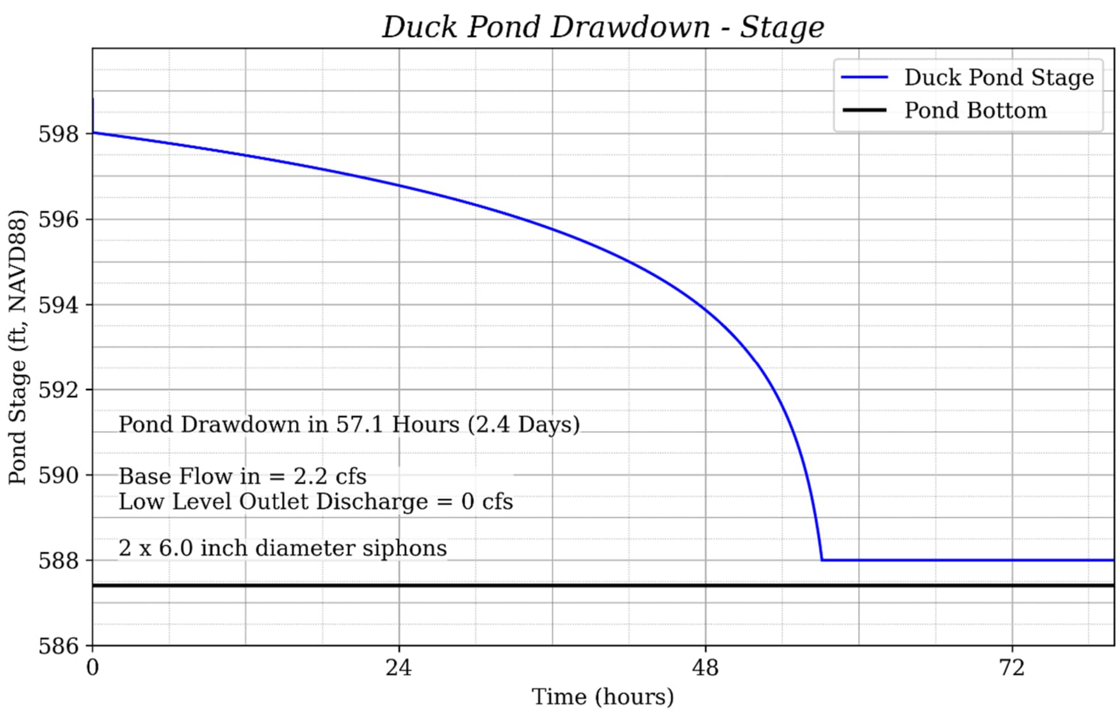

Figure 3 Simulated drawdown of pool stage in Duck Pond with two 6” diameter siphons, 2.2 cfs inflow, and inoperable low-level outlet.

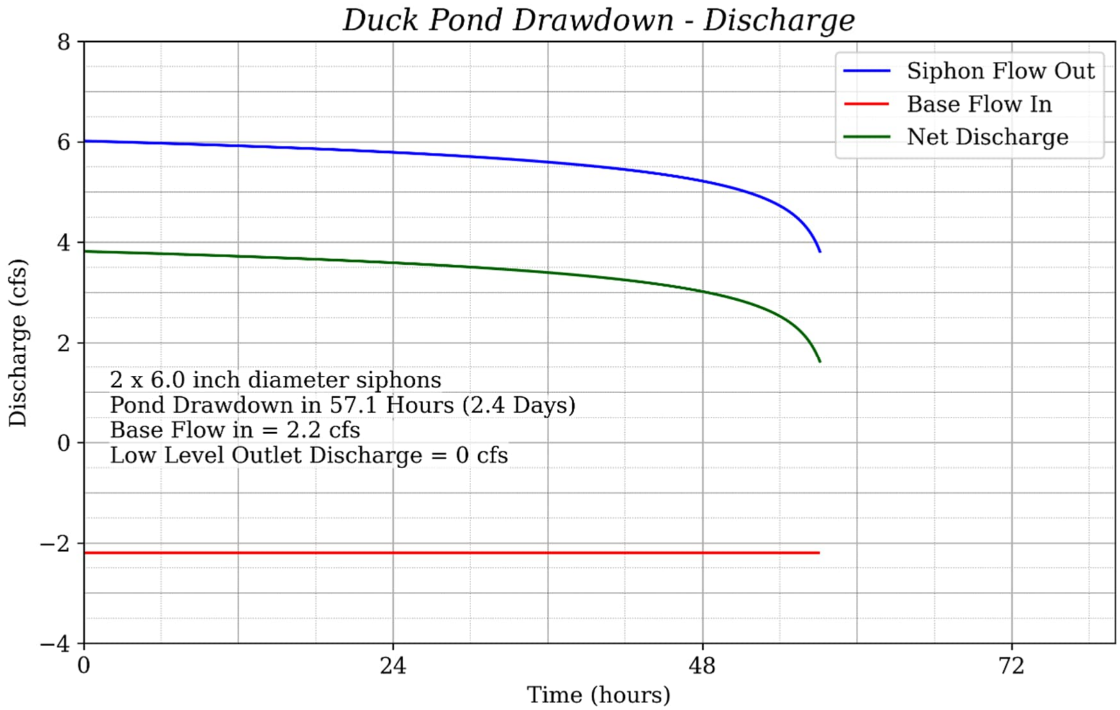

Figure 4 Simulated net discharge from Duck Pond with two 6” diameter siphons, 2.2 cfs inflow, and inoperable low-level outlet.

<u>Materials</u>

- Approximately 320 linear feet (LF) of 6” diameter schedule 40 PVC pipe.
  - Each siphon requires ±152 LF of pipe.
  - Recommend extra lengths of pipe to account for waste or unforeseen circumstances.
  - Downstream ±40’ of siphons can be flexible 6” pipe.
- Each siphon requires:
  - 2x 45-degree elbow fittings (4 total)
  - 2x 22.5-degree elbow fittings (4 total)
  - Angles are not perfect, assumes some deflection of PVC pipes.
- Female-Female PVC couplings for joining sections of pipe:
  - Assume 6 per siphon (12 total) for 20’ pipe lengths
  - Assume 12 per siphon (24 total) for 10’ pipe lengths
  - Flexible fittings (e.g. Fernco) are not recommended for this application
- For priming at the top of dam, each siphon needs:
  - 1x 6” Tee fitting with short riser pipe (2 total)

    - Riser is for filling the siphon to prime it and can be a smaller diameter than 6”.
  - 1x female threaded cleanout adapter, same diameter as riser (2 total)
  - 1x male threaded cleanout cap, same diameter as riser/cleanout (2 total)
  - PTFE tape (“teflon tape” / “plumber’s tape”) to seal cap threads
- PVC primer
- PVC cement
- Siphon #1:
  - 1x 6” full port PVC ball valve (for outlet – used for priming siphon and to control discharge for maintaining drawdown)
  - 1x 6” full port PVC ball valve (at inlet, necessary for priming once pond is drawn down)
- Siphon #2:
  - 1x 6” diameter female threaded cleanout adapter and 1x 6” male threaded cleanout cap (for outlet – used for priming siphon)
  - 1x 6” full port PVC ball valve (at inlet – optional, would be necessary for priming once pond is drawn down)
- Sandbags/pipe strapping:
  - Siphon pipes must be secured at the spillway, at the toe of the dam, and at the outlet. Steel pipe strapping can be used to affix the siphons to the concrete spillway with masonry fasteners, and sandbags can be used elsewhere. Sandbags may be used at the spillway provided that they do not obstruct the spillway.
- Anti-vortex devices:
  - When the pool gets shallow, vortices (“whirlpools”) may develop at the siphon inlets. This can allow air to be drawn into the siphon, which may result in loss of vacuum and deactivation of the siphon. Anti-vortex devices may be fit to the inlets, or the pool may be maintained at a slightly higher stage to mitigate vortex development.
- Outlet erosion control:
  - A splash pad of large stone (or similar) should be placed at the siphon outlets to prevent soil erosion.

Please feel free to contact me at 845-394-8609 if you have any questions.

Attachment

142.20261.00001.s2624.memo.docx

JOB DUCK POND DAM

SHEET NO. 1 OF 1 SCALE 1" = 20'

CALCULATED BY MET DATE 9/24/2024

CHECKED BY DATE

PROPOSED DRAWDOWN CONFIGURATION WITH TWO 6" DIAMETER SIPHONS