MACKWORTH-ENVIRO
Aquatic Barrier & Screening Solutions

Lake Attitash

Amesbury, MA

Project Background

Lake Attitash is a 373-acre enlarged great pond located approximately 1.5 miles northeast of Merrimac center. The maximum depth is 34 feet with an average depth of 10 feet. The bottom is predominantly sand and gravel, and aquatic vegetation is scant except in the inlet and outlet coves. The shoreline is nearly completely developed with homes. The lake has issues with both internal and external phosphorus loading. A significant portion of external phosphorus loading comes from the Back River, the single major inlet to the lake. The river drains farmlands adjacent to and higher in the watershed (Attitash Lake Association, 1995).

In 2003, Mackworth personnel designed, fabricated, and installed a particulate control system barrier in the Back River in an effort to reduce phosphorus inputs from the tributary.

Design

The final design was a floating boom; approximately 140 feet long with a filter curtain that averages 6 feet deep along its perimeter. The system was constructed in one piece consisting of flotation hood assembly, double sided filtration curtain, ballast chain pocket w/chain and mooring attachment points.

It was positioned well up in the Back River and spans the full length across from bank to bank. The curtain was anchored to the contour of the waterbed floor. Its ends were secured on the shore and mushroom anchors were deployed upstream and downstream to help hold its configuration across a wide range of flow conditions. The system also had a 10- foot section specially designed for passage of kayaks, canoes, or small watercraft. The system was designed to allow river flow over the top of the flotation during high flow events.

Figure 1. Aerial view of barrier placement (circled in yellow) for Lake Attitash project

Figure 2. Aerial view of upstream barrier vs downstream barrier

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Performance Results

Sampling data for the 2004 field season reported an average reduction of 53% for total phosphorus downstream from the barrier between September and October. Sampling data for the 2005 field season (May to October) reported an average reduction of 43% for total phosphorus downstream of the barrier. Analysis from the 2020 data set reported a statistical difference in total phosphorus levels above and below the boom with an average reduction of 52% of total phosphorus downstream of the barrier.

Sampling data for the 2022 field season reported an average reduction of 60% for total phosphorus downstream from the barrier between May and October. Analysis from the 2022 data set reported a statistical difference in total phosphorus levels above and below the boom with an average reduction of 60% of total phosphorus from Bear Hill Bridge to the downstream side of the barrier (p=0.001)

Discussion

After 2005 there was a reduction in the amount of sampling for phosphorus data, and there was no available record of sampling upstream of the barrier until 2020. Instead, sampling focused on the lake's inlets and outlets as well as the deep station. Anecdotal evidence from the town engineer reported initial observations of overall phosphorus being notably reduced below the barrier from levels upstream. There were further reports that bloom conditions during the wet years of 2005 and 2006 did not occur, except during fall lake turnover most likely due to internal loading.

The most recent google earth images available for the barrier location further support evidence of noticeable phosphorus removal below the barrier. Overall, while phosphorus data on lake Attitash is variable with large gaps in years and sites, available data indicate a minimum average reduction of 43% for total phosphorus downstream of the barrier per season.

Figure 3. Boom installed across the Back River

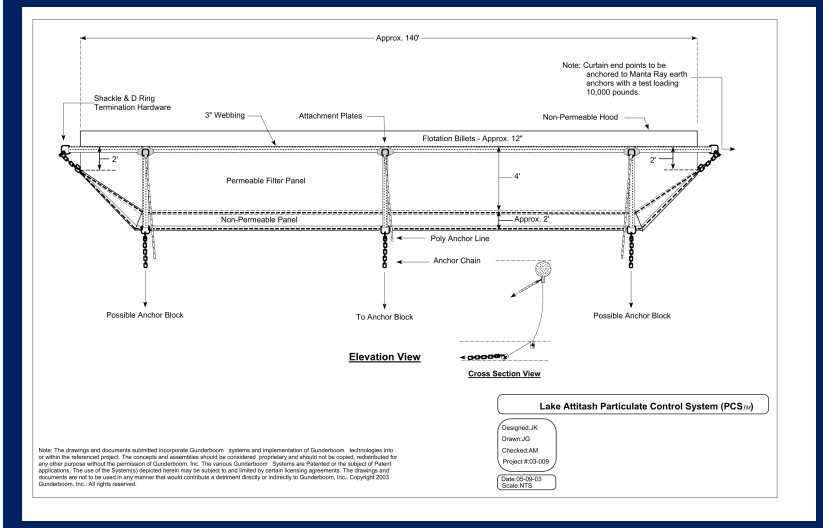

Figure 4. Drawing for the PCS filter barrier

Contact Mackworth-Enviro for more information

info@mackworth-enviro.com

cguelke@mackworth-enviro.com

www.mackworth-enviro.com