Newsletter Article:

BELOW THE SURFACE

Filtration, innovation, and collaboration

For most of us, our biggest concern when we see a storm pop up on the radar is getting caught outside without an umbrella.

But for those who manage water resources, there is much more at stake. They have many concerns, the largest being where all the water will go and the sediment that will move with it. For staff at the Rice Creek Watershed District (RCWD) in Blaine, MN, addressing this concern is a big part of their day-to-day work.

THE NEED FOR STORMWATER FILTRATION

When you think of treating water, what comes to mind? It might be a water treatment plant that returns water to our home taps. Or you might even imagine the water filter you use to ensure your drinking water is safe and tastes its best. What might be lesser known is our need to treat stormwater, even when there may not be an obvious connection to our daily use. The stormwater that falls during a rainshower will find its way to the nearest lakes, streams, and rivers before ultimately making its way to the oceans. We need to ensure that water is as clean as possible when it reaches these broader waters.

As the RCWD explored a solution to this water quality challenge, they found an innovative large-scale filtration system for stormwater as an ideal tool: iron-enhanced sand filters (IESF).

CHALLENGES FACED

The RCWD faced multiple challenges that required them to forego a traditional IESF system and dig deeper for an improved approach.

Phosphorus in Lakes
Excess phosphorus in stormwater causes algae growth in lakes. It can be removed by infiltrating water into the ground naturally or through a practice like an IESF system.

Fully Developed Area
With limited public land to construct effective practices to treat stormwater, the RCWD must often explore unique methods to get the most phosphorus removal.

Passive Practice Issues
Other management practices can be difficult to take offline for maintenance, and they typically treat stormwater only during rainfall events.

TAKING IESF TO THE NEXT LEVEL

The RCWD was interested in using an IESF system, a new and natural method to treat stormwater. However, they wanted to improve the concept to meet the unique needs of the watershed as stated above.

Hansen Park in New Brighton, MN, was identified as a public site to test this concept with flood storage and to capture stormwater that was moving phosphorus—a mineral that can be found in stormwater that has harmful effects in concentration—along to other waterbodies.

Before the Hansen Park project, IESF systems in Minnesota were primarily passive, meaning the treatment only occurred during rainfall events as stormwater was routed over the filter system. The RCWD was interested in an automated pumping solution that would maximize stormwater treatment through the ability to pump stormwater continuously.

A pump would give the RCWD more control during a rainfall event, greatly improving the stormwater treatment's effectiveness. However, a pump generally requires human operation, and the RCWD couldn't station someone at the project to provide this hands-on approach. That's where Houston Engineering, Inc. (HEI) and EPG Companies came in!

The design the RCWD envisioned wasn't available off-the-shelf. HEI-EPG had created other pump systems from previous landfill projects and teamed up again to marry technology used in waste management and irrigation industries.

HEI has been a go-to for providing the RCWD's stormwater engineering for many years. EPG is also based in Maple Grove, MN, providing engineering, design, and fabrication of pumps and controls for a variety of environmental challenges. The two firms were excited to partner with RCWD on this unique IESF approach, challenging each other to find an answer where there wasn't one already.

PUMPED-UP IESF

To address all of these challenges, HEI-EPG started brainstorming a new system to reduce the most phosphorus with the most automation. The RCWD wanted to manage the pumping and dosing across multiple filter beds to maximize the treatment given the changing water levels in the adjacent pond. To work effectively, the sand has to be dry twice as long as it is wet.

The group amplified the concept through many calls, emails, and in-person sessions. Pumping components that had never been used in the stormwater realm became part of the new IESF blueprint.

The project's partners collectively drove the overall creativity, bringing their ingenuity to the solution. As shown in the diagram below, the new IESF is far from simple beneath the surface. "Through our collaboration with the RCWD and EPG, we really programmed the heck out of this thing!" recalls HEI's Project Manager Dennis McAlpine, PE.

EPG helped design the system with a keen focus on the programming, including how it would be controlled and what the interface would look like. **In the end, the automated system can be operated and controlled from a cell phone!**

FORWARD-THINKING SOLUTION

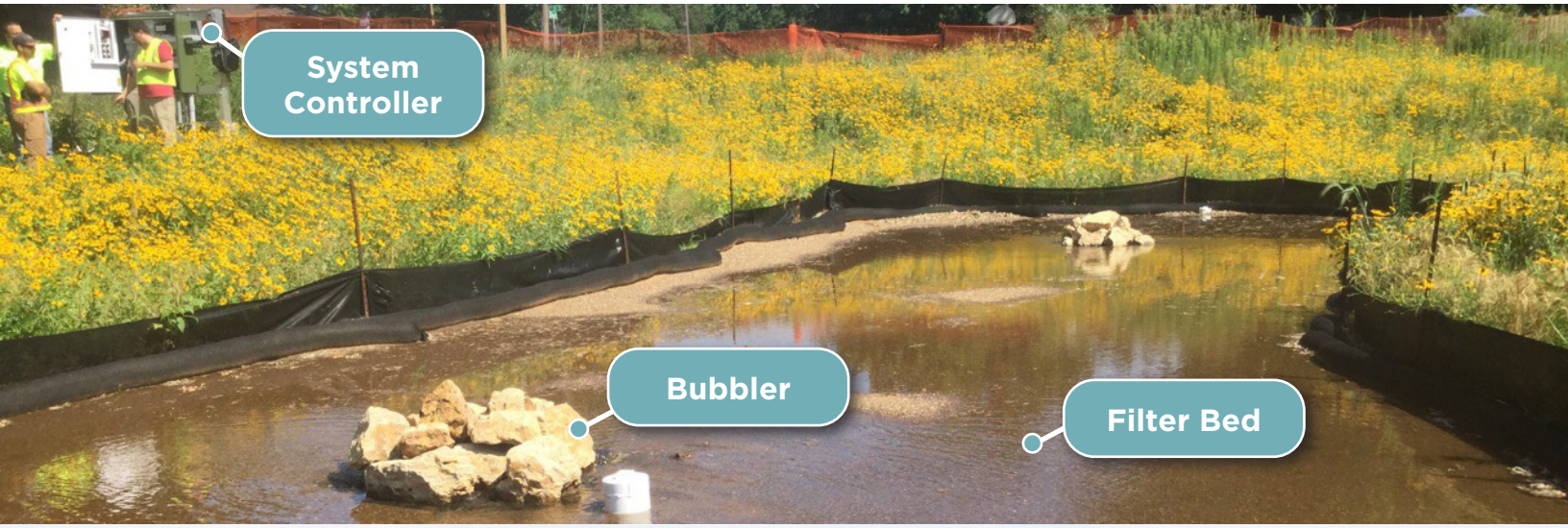
As our region sees increases in both storm frequency and intensity alongside continued urbanization, solutions like the Hansen Park IESF system will be more necessary than ever to treat stormwater. New issues will challenge engineers, manufacturers, watershed districts and other local government organizations, and the public in new ways.

To date, the RCWD has installed successful IESF systems designed by HEI-EPG at Hansen Park and Oasis Pond in Roseville, MN, with another install scheduled soon at Bald Eagle Lake. Total phosphorus reductions have ranged from 50-90%, with huge reductions seen in total suspended solids (particles that cannot be dissolved) at a rate of 80-95%!

YOUR WATERSHED OR CITY COULD BE NEXT! HERE ARE A FEW TIPS TO KEEP IN MIND.

IESFs have proven to be a great system for removing phosphorus and particles. In fact, with lessons learned to date, the RCWD is moving forward with new installations. If you're considering a project of your own, Kyle Axtell of the RCWD gives a few tips on what you should consider:

- ✓ Don't underestimate maintenance! The filter beds require regular tilling, some algae removal, and weeding.
- ✓ Staff will need to learn how to troubleshoot and monitor operation of the system.
- ✓ Total phosphorus reductions may fluctuate depending on weather patterns and the concentration level within the water that's entering the filtration system.



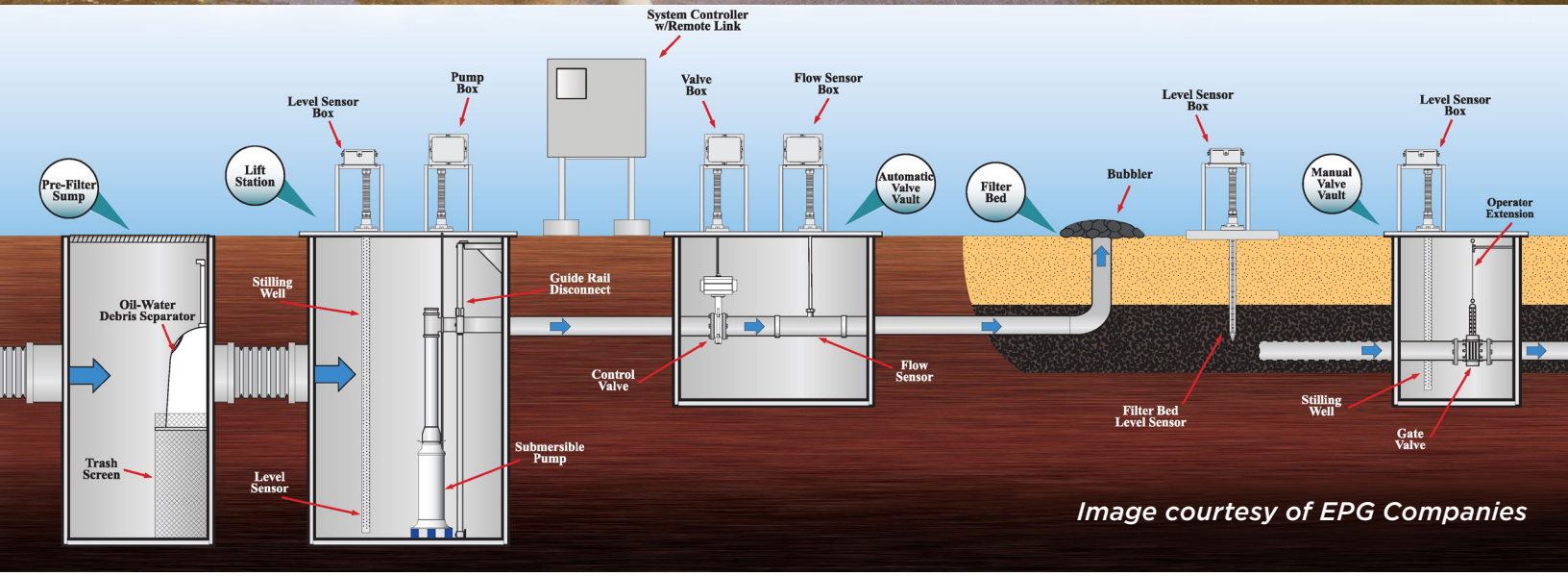


Image courtesy of EPG Companies