Comparative Analysis of CONTECH StormFilters on OSU Campus

Sam Albert, Maceo Gutierrez-Higgins, Jessalyn Imdieke*

Conclusions & Observations

- Initial results show that filters are not consistently meeting desired TSS removal specifications.
- Filter location/use may affect filter performance more than age.
- Fairbanks and Johnson locations are difficult to sample due to submerged outlet pipe during normal flow conditions.
- Fairbanks location appears to be plugged, there is sludge buildup and bypass during storms smaller than design storm.
- Kelley location operating below design flow rate of 15 gpm.

Recommendations

- Clean, maintain, and replace filter cartridges as needed.
- Test filters throughout the Oregon wet season.

Future work

- Improve collection technique to reduce sludge disruption in outlet pipe or invest in automated sampler.
- Determine method to estimate flow rates at the Johnson and Fairbanks locations.
- Troubleshoot nitrates and total phosphates tests.
- Determine if Fairbanks location is performing adequately during peak wet season.

Acknowledgments

- Project Sponsor
  - Dave Elliott, Corvallis Sustainability Coalition
  - OSU Capital Planning and Development
  - Dr. Phil Harding, CBEE

- TAPE Technical Advisors
  - Dr. Doug hollow, Washington State Department of Ecology
  - Carla Milesi, University of Washington Tacoma Center for Urban Waters

Technical Assistance
- Nathan Patterson, OSU Capital Planning and Development
- Dr. Tyler Budnick, CBEE
- Dr. Megha Babbar-Sebens, CCE
- Andy Brickman, CBEE
- John Cochran, CBEE
- Gary Hickman, CH2M
- Dr. Jeff Nolte, CBEE
- Sarah Burch, CBEE Graduate student

Disclaimer: Results are preliminary. We have analyzed all storms, including those that do not meet the minimum storm intensity defined by TAPE. Do not draw final conclusions from our data.

Figure 1. Schematic of a CONTECH StormFilter. Water enters under the filter head, passes through the Filter media for purification, and exits through the under-drain manifold. Design flow rate for an 18 inch tall cartridge is 7.5 gpm/Filter.

Figure 2. Total suspended solids for storms on A) April 11th, B) April 23rd, C) April 27th, D) May 11th, E) May 12th, F) May 16th. Error bars represent the standard error of the mean for N=3 replicates per site; storm A has N=1 replicates for all samples except Fairbanks influent (N=5). A green check mark ✓ represents that TSS TAPE requirements have been met for that site location. A red X or “x” represents an event that did not pass the required removal of TSS by TAPE.

Figure 3. ICP-OES analysis for dissolved and total metals for A) copper and B) zinc in the influent and effluent for the April 11th, April 23rd, and April 27th storms. Error bars represent the standard deviation of N=3 storm samples for Kelley and N=2 storm samples for Fairbanks and Johnson. Milli-Q water was processed as a control after passing through a 0.45 µm filter used for all samples, using the total metals digestion protocol.

Figure 4. Team Photo by the Kelley Engineering Center storm filter. Picture by Dr. Harding.

Testing Methods

- CONTECH StormFilters are located around campus to remove contaminants from storm water. They use a ZPG™ media blend of zeolite, perlite, and granular activated carbon to remove total suspended solids, and to a lesser extent some soluble metals and organics.

- We are testing three filter locations of various ages on campus: Kelley Engineering Center, Fairbanks Hall, and Johnson Hall. To our knowledge the filters have not undergone maintenance since installation. Suggested maintenance includes removing sludge from vault, replacing cartridges yearly or as needed, and performing monthly inspections during the wet season.

- Our goal is to determine if OSU-installed CONTECH StormFilters meet local stormwater regulatory requirements as the system ages, and to propose any necessary mitigation.

Efficiency goals

- Total suspended solids (TSS) < 20 ppm (50% removal)
- Dissolved Copper: < 10 ppb (90% removal)
- Dissolved Zinc: < 50 ppb (20% removal)

- EPA Industrial Stormwater Benchmark

- Total Phosphorous < 0.1 ppm (90% removal)
- Nutrients: < 0.68 ppm

- TAPE testing requirements are from Washington State Department of Ecology.