

Back River Wastewater Treatment Plant (WWTP) Progress Report
October 14, 2022

Treatment Plant Overview

- One of the primary concerns at the WWTP is the processing and management of biosolids and the removal of solids from process equipment. The efficacious removal of biosolids is essential to maintaining total nitrogen and phosphorus effluent concentrations within permit limitations. In addition to the solids that are generated on a daily basis, any buildup of solids within the treatment system must be removed.
- The Maryland Environmental Service (MES) has helped accelerate the timeline of certain maintenance and repair projects at Back River to get process operations functioning to the desired levels.
 - During the August 2, 2022 weekly meeting MES' key recommendations to Baltimore City for operation of the plant included the development of a preventative maintenance schedule to ensure that recent repairs are maintained, establish Standard Operating Procedures, implement training programs, provide better workstations for staff, and develop a straightforward procurement process.
 - The city is in the process of receiving quotes to establish open-ended contracts to supplement preventative maintenance staff.
 - The city has selected American Contracting & Environmental Services, Inc. to supplement the WWTP's preventative maintenance staff and is waiting on approval of the contract.

Primary Treatment

- The primary settling tanks (PSTs) allow the solid material within the wastewater to be easily separated by settling to the bottom or floating to the surface for removal.
 - Currently, three PSTs (#1, #8, and #11) of the 11 are online and functioning.
 - PST #1 has been repaired and was back online on July 18, 2022.
 - MES has cleaned PST #7; completion has been extended until mid October 2022.
 - Repairs needed to replace drive and mechanism and repair sludge/scum pumps.
 - Baltimore City Department of Public Works (DPW) is focusing on the remaining PSTs.
 - Two PSTs (#2 and #9) are expected to be online by January 2023.
 - PST #2 cleaning is complete. The drive unit and mechanism were removed on August 2, 2022 for the completion of repairs.
 - PST #10 is expected to be online by April 2023.
 - Two PSTs (#3 and #4) are expected to be online by August 2023.
 - Completion dates for two PSTs (#5 and #6) are to be determined.
 - PST #5 is being cleaned by DPW contractors. Repairs are expedited to be completed in the fall 2023, and can be expedited once either PST #2 or #9 is returned to service.
 - PST #6 cleaning is being delayed until the odor masking system is received.
 - Odor complaints were received beginning on August 15, 2022 from Baltimore County residents downwind of the WWTP sludge lagoons where the sludge/wastewater is being stored.
 - As of August 19, 2022, the contractor is adding wood chips to the sludge as a bulking material to reduce/eliminate odors.
 - The city is conducting air monitoring in accordance with the requirements of its air permit
 - The city is required to submit to the Maryland Department of the Environment (MDA) an odor control plan.

Secondary Treatment

Biological Treatment Activated Sludge

- There are a total of three activated sludge plants that remove solids.
- Newly constructed Activated Sludge Plant #4 is online, however, a problem has developed with the waste pumps and associated equipment that is now being addressed by the manufacturer.

- The facility is sending 50-60% of the flow through Activator #4 due to better treatment performance and efficacy.
- DPW has plans in the near future to take the older activator plants offline - one at a time - to remove the accumulation of solids from the tanks and perform maintenance and equipment repairs. However, this cannot be done until all equipment at the Activated Sludge Plant #4 is online and functioning as designed.
 - Though flow rates are down, the wastewater flowing through the plant will help prevent stagnation of the water.
 - Once completed, this project will improve nitrogen removal and reduce solids concentrations in the biological reactors.

Secondary Clarifiers

- Each Activated Sludge Plant #2, #3 and #4 has 12 secondary clarifiers, with a total of 36 secondary clarifiers.
- A third-party engineering assessment determined that the Return Activated Sludge (RAS) pumps and wasting pumps require replacement. RAS pump failure would cause poor performance of the biological reactors and wasting pump failure would cause a buildup of solids in the treatment system.
- RAS and sludge pumps are being evaluated and repaired in the Activated Sludge Plant #3, and two pumps are on order.
- The secondary clarifiers #5B, #7A, #16A and #16B associated with Activated Sludge Plant #2 are not in service. Secondary clarifiers #11A and #12B associated with Activated Sludge Plant #3 are not in service and Activated Sludge Plant #4 has one secondary clarifier (#18) that is not functional due to a problem with the diffuser.
 - MES is assessing the secondary clarifiers and making repairs as necessary.
- A third-party contractor is cleaning out the scum pits on the secondary clarifiers #11, #12, #13, and #14.
 - The sludge blankets on the secondary clarifiers have gone from 10 to 2 feet, which signifies a reduction in the amount of solids within the secondary treatment phase.
- MES installed a scum arm scraper plate and placed clarifiers #13A and #16A back into service.
 - Clarifier #13A operates in manual mode.
- MES installed a scum pump motor and placed secondary clarifier #11A back into service.
 - Clarifier #11A operates in manual mode.

Tertiary Treatment

Denitrification Filters (DNFs)

- The facility has 52 DNFs designed to achieve effluent nitrogen concentrations at or below 3 milligrams per liter (mg/l) total nitrogen.
- The Back River WWTP was experiencing problems with the DNFs due to excess solids.
 - The solids concentration going into the filters have been reduced since March 2022.
- Control system problems due to electrical issues caused some of the filter quads to not function as designed.
 - ProStart, a private contractor hired by DPW to operate the DNF system, has temporarily corrected the problem by connecting a portable power supply that will be used until the electrical components are repaired and connected.
 - MES has performed an evaluation of malfunctioning level transducers and control units, and there are plans for more comprehensive evaluations of the DNF system once needs are confirmed.
 - Once completed, the filters can be backwashed frequently to remove solids.
- The issue of a permanent power supply to the DNF system has been resolved.
- DPW indicates that as of September 6, 2022, 51 of 52 filters are in, or available for, service.
 - The remaining filter will be placed into service when repairs are completed.

Sand Filters

- DPW's Sand Filter Operational Status report dated September 19, 2022, identifies 25 sand filters in service (#1-5, #8, #10, #11, #13, #15, #18, #20, #22, #23, #25-32, #38, #39, and #41,).
- The remaining 23 sand filters are scheduled to be returned into service in late 2024 with repairs to be

completed under a capital improvement rehabilitation project.

- DPW will submit a monthly report regarding the status of repairs to the remaining out-of-service sand filters.
- MES is evaluating the sand filters and their mechanics are replacing and repairing components.
 - Repairs to sand filters #17, #19, #42, #31, and #14 are underway.
 - There are 10 pumps and isolation valves for the sand filters on order.
 - Twenty carriage motors for sand filter repairs were received for installation.
 - Repairs to Sand Filter #7 are underway.
 - The city's monthly report submitted for Back River dated September 30, 2022 identifies 25 sand filters in service with the remaining 21 sand filters scheduled to be returned into service in late 2024 with repairs to be completed under a capital improvement rehabilitation project.

Biosolids Management

- Sludge dewatering is handled through a centrifuge.
- Two of four centrifuges (#1 and #2) are currently operational.
 - Centrifuge #3 has been refurbished; however, the installation has been delayed till mid-October. Once the installation is completed, there will be three active centrifuges for dewatering.
 - A minimum of two centrifuges are required to meet the current average conditions.
- Reliability and redundancy of centrifuges are necessary to perform dewatering operations. Equipment, such as the centrifuge feed pumps, flushing water booster system, and centrate pumps, have operational problems that need to be addressed.
 - The centrate for centrifuge #1 is very dark with significant solids accumulation.
 - Centrifuge #4 is on-site, but not installed. Parts needed for the installation are on order.
- Only two of the eight polymer pumps used for polymer addition are functional. The other six need to be replaced.
- Trucks are transporting sludge to the Veolia compost facility.
 - The Back River WWTP Plant Manager reported on September 29, 2022 that sludge is now being processed at volumes (Pelletech Facility is processing 55-58 dry tons/day using two dryers and 2 centrifuges and now processing 117 dry tons/day using two centrifuges) that have significantly reduced the on-site sludge inventory.
- Since July 31, 2022, Synagro's dryers have been shut down on three occasions (August 2, 3, and 5, 2022), due to low total solids feed to the centrifuges, issues maintaining flow over 100 gallons per minute, and a sludge tank leak at the gravity belt thickener (GBT).
 - MES investigated the problem and determined that no sludge had been pumped to the "loop" line or Tank 26/Tank 1 for 3 days. The operator reports that one of the thickened sludge pumps that feeds the hi-rate digesters is out of service (Pump 2B).
 - If no sludge is fed to the digesters, no sludge is being sent to the pelletizer and the centrifuges. The level in Tank 26 is very low (almost to the bottom) and is most likely the cause as to why the sludge feed solids are so low to the dryers.
 - The leak at the GBT has been repaired and the dryers have been restarted.
 - Synagro's sludge processing remains reduced through August 18, 2022.
 - Since August 19, 2022, a few issues were reported with the sludge processing, including trash in the liquid sludge and the loss of one of the centrifuges.
 - No major issues have been reported by Synagro during the period of August 30, 2022 through September 25, 2022 with two dryers and three centrifuges in operation.
 - Synagro continues to process sludge at normal levels during the week of September 16, 2022. Synagro processed 510 dry tons ending September 25, 2022.
 - Synagro continues to process sludge at normal levels during the period of September 26, 2022 through October 11, 2022 with two dryers and three centrifuges in operation.

Gravity Belt Thickeners

- There are a total of eight GBTs. At the current average daily flow conditions, six GBTs are required.
 - As of September 25, 2022, there are four GBT's online.
 - GBT #5 needs a new belt and #7 repairs are anticipated to be completed within the next two days.

Gravity Sludge Thickeners

- There are six Gravity Sludge Thickeners (GSTs). At the current design average flow of 130 million gallons per day (MGD), only one GST is required.
 - Two GSTs are fully operational.
 - The remaining GST's can feed flow and draw solids, but the gravity thickening mechanism is not functional.
 - DPW should achieve reliability and redundancy on GST operation in conjunction with the PSTs brought online.
- MES repaired the scum arm scraper on GST #3 and it has been placed into service.

Staffing

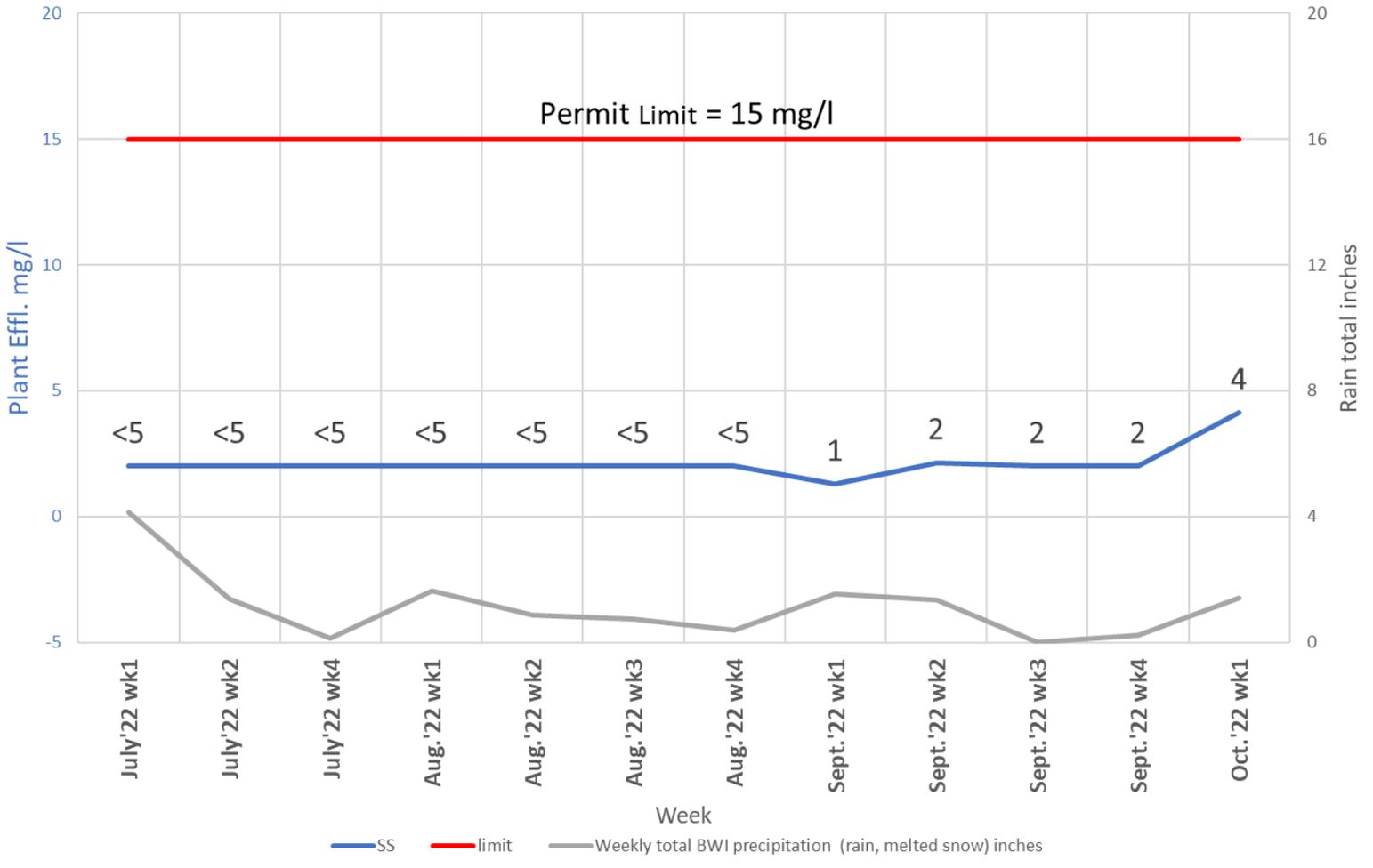
- DPW reviewed staff roles and stressed the necessity for communication, teamwork, and cooperation between MES and DPW.
 - DPW is in the process of hiring additional maintenance technicians.
 - The city's monthly report for Back River indicates a total of 81 open positions, including various functional levels of electrical maintenance technicians, instrumentation technicians, and mechanical maintenance technicians.

Monitoring Results

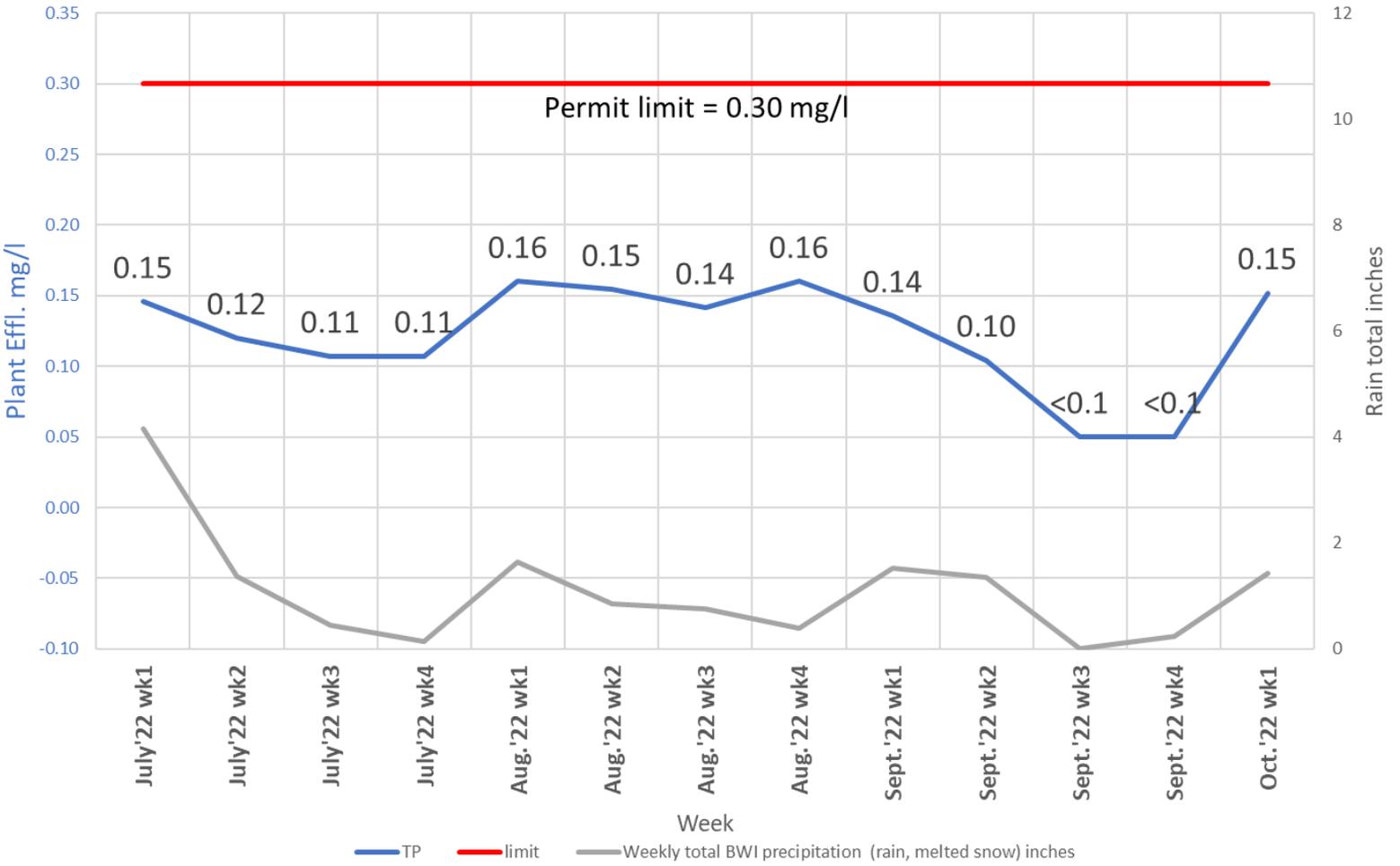
- The analytical data demonstrates that there has been some measured progress made toward getting the Back River WWTP into compliance with its discharge effluent permit limits.
- The Total Suspended Solids (TSS) concentration has been a factor in creating high nutrient concentrations.
 - Data from September 2022 show that the monthly average TSS concentration at discharge point Outfall 001 is 1.75 mg/L compared to 21 mg/L for January 2022, 17.5 mg/L for February 2022, 14.2 mg/L for March 2022, 7.5 mg/L for April, 2022, 8.75 mg/L for May 2022, 4.0 for June, 2022, 2.0 for July, 2022 and 2.0 mg/L for August.
 - Data indicates progress toward the goal of removing the accumulation of solids from the treatment system.
- *Due to the continued improvements being seen at the Back River WWTP, MDE will be posting the Back River WWTP Progress Reports monthly, instead of bi-weekly.*

Graphs Showing Reported Final Effluent Concentrations and Loading Performance for 2022

City of Baltimore, Back River W.W.T.P.
TSS Concentration Outfall 001
Weekly Average

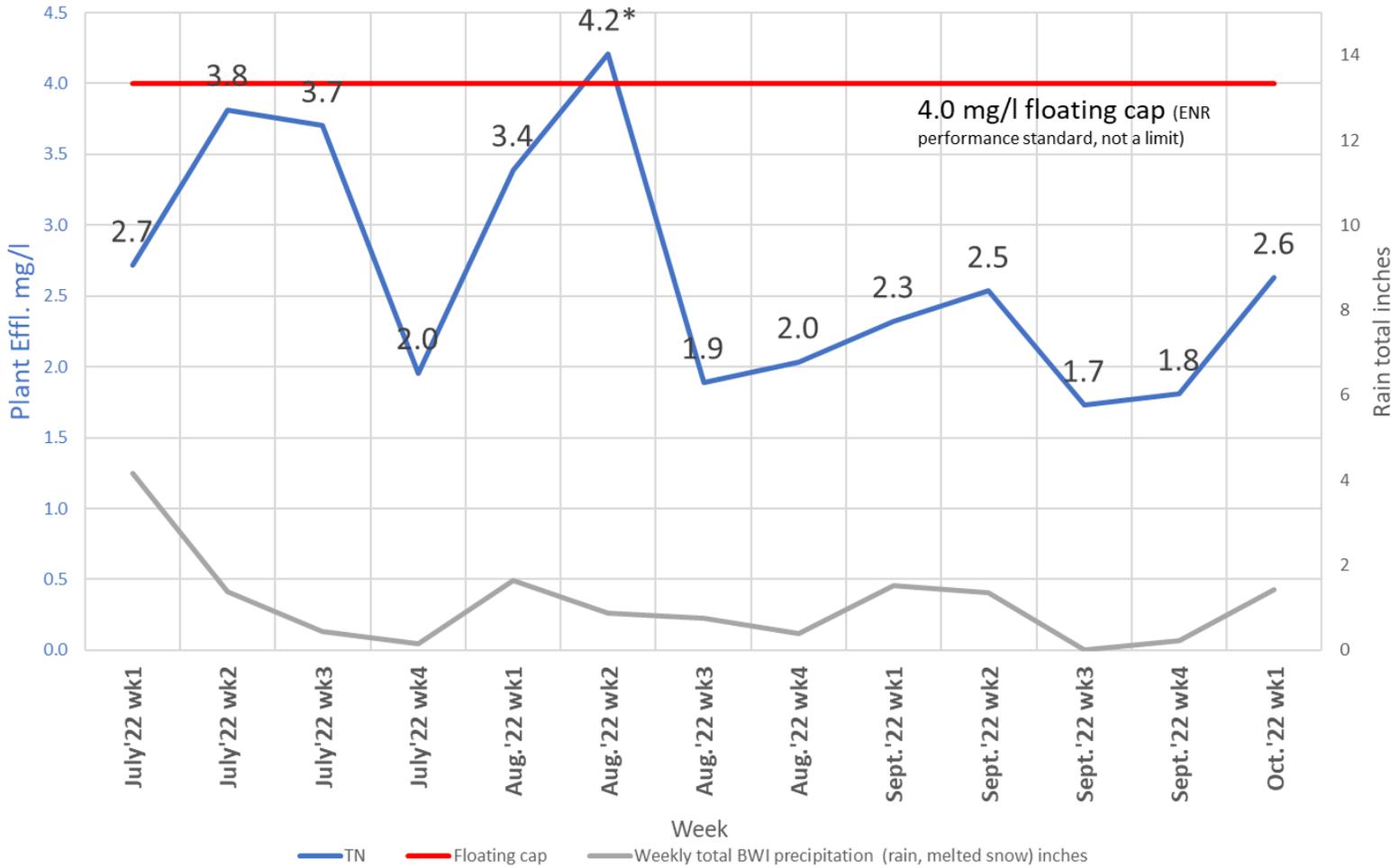


**City of Baltimore, Back River W.W.T.P.
T.P. Concentration Outfall 001
Weekly Average**



*Following Hurricane Ian, the Back River WWTP faced a hydraulic overload, causing flows and solid concentrations to be elevated due to infiltration and inflow. MDE and MES are currently monitoring the situation to ensure levels decline.

**City of Baltimore, Back River W.W.T.P.
T.N. Concentration Outfall 001
Weekly Average**



* Back River WWTP staff indicated that in July there were three significant storms, a power outage, and a failure of the blower switches causing a significant impact on treatment causing a rise in nitrogen levels. See the August 16, 2022 Compliance Evaluation Report for more information on the spike. In early October, following Hurricane Ian, the Back River WWTP faced a hydraulic overload, causing flows and solid concentrations to be elevated due to infiltration and inflow. MDE and MES are currently monitoring the situation to ensure levels decline.