

Back River Wastewater Treatment Plant (WWTP) Progress Report December 19, 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 (TN) and phosphorus (P) 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 (PM) 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 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.
 - MES has cleaned PST #7; yet, completion has been extended due to a delay in the shipment of the replacement skimmer arm.
 - Repairs to the drive and mechanism and repair sludge/scum pumps, skimmer blades, and electrical work have been completed. However, the flushing water is still being added to the PST in order to go online. Prior to going online, the accumulated solids from flushing water will need to be cleaned from the PST and adjustments to the scum trough and center stilling well are needed before PST can be placed in service.
 - PSTs #5, #7, and #9 were used for flow through during the storm event on December 15, 2022. PST # 5, #7, and #9 are to be drained.
 - Baltimore City Department of Public Works (DPW) is focusing on the remaining PSTs.
 - The removal of sludge from PST #2 is complete and mechanical repairs are underway. The drive unit and mechanism were removed on August 2, 2022. The contractor is sand blasting the rakes, plows, and scum baffles.
 - PST #2 is expected to be online by January 2023.
 - The repairs to PST #9 have been delayed as PST #7 is still out of service. Once PST #7 goes online, PST #9 can begin its repairs.
 - The city anticipates returning PST #9 into service by February 2023.
 - PST #10 is expected to be online by April 2023, and 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 still has a scum layer and is being cleaned by DPW contractors.
 - MES reported a strong odor at the PST on November 21, 2022, which was attributed to the buildup of sludge in the PST. Prior to pumping down the solids, during the interim, the city used bleach and added water to the PST. As of December 15, 2022, only a residual layer of sludge remains to be removed. Odors have been significantly reduced.
 - 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 (MDE) 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.
 - Problems that developed with the waste pumps and associated equipment have been addressed by the manufacturer and corrected. The activator system was taken offline and the repairs were made and then put back online on November 9, 2022.
 - 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) TN.
- Back River was experiencing problems with the DNFs due to excess solids.

- The solids concentration going into the filters have been reduced since March 2022.
- Previously, there were control system problems due to electrical issues, which caused some of the filter quads to not function as designed.
 - ProStart, a private contractor hired by DPW to operate the DNF system, has corrected the problem and the electrical components have been 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, Filter #11 in Quad 3, will be placed into service when repairs are completed.

Sand Filters

- DPW's Sand Filter Operational Status report dated November 18, 2022, identifies 32 sand filters in service (#1-5, #7-17, #19-22, #23, #25-32, #38, #39, #41, and #43,).
 - The remaining out of service sand filters (#24, #37, #42, #46, and #47) are scheduled to be returned into service in late 2024 with repairs to be completed under a capital improvement rehabilitation project.
 - Sand filters #6, #18, and #48 are scheduled to be in service by February 2023.
 - Sand filter #36 is scheduled to be in service by March 2023, and sand filters #33-35, #40, and #44 are scheduled to be in service by April 2023.
 - Out of service sand filter #45 was expected to be in service in December 2022. Electrical repairs are still underway.
 - There are three sand filter backwash return pumps on order with an expected shipping date of January 2023.
 - Ten pumps and 20 isolation valves were received for sand filter repairs and installation.

Biosolids Management

- Sludge dewatering is handled through a centrifuge.
- Two of four centrifuges (#1 and #2) are currently operational.
 - Centrifuge #3 has been refurbished, but it needs a probe to be fully functional. 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 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 two centrifuges and now processing 117 dry tons/day using two centrifuges) that have significantly reduced the on-site sludge inventory.
 - Synagro continues to process sludge at normal levels with no major issues cited during the week of October 23, 2022. Synagro processed 523 dry tons ending November 1, 2022.
 - Synagro processed 1,903 dry tons during the period November 2 - December 7, 2022.
 - No sludge was processed on November 22, 2022 due to mechanical issues and on December 1, 2022 due to a broken sludge line that occurred on November 30, 2022. Normal processing resumed on December 2, 2022.

Gravity Belt Thickeners

- There are a total of eight GBTs. At the current average daily flow conditions, six GBTs

are required.

- As of November 21, 2022, there are five GBT's online.
- GBT #1 needs new rollers, which are on order, GBT #2 needs full refurbishment, and GBT #7 is on standby if needed.

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

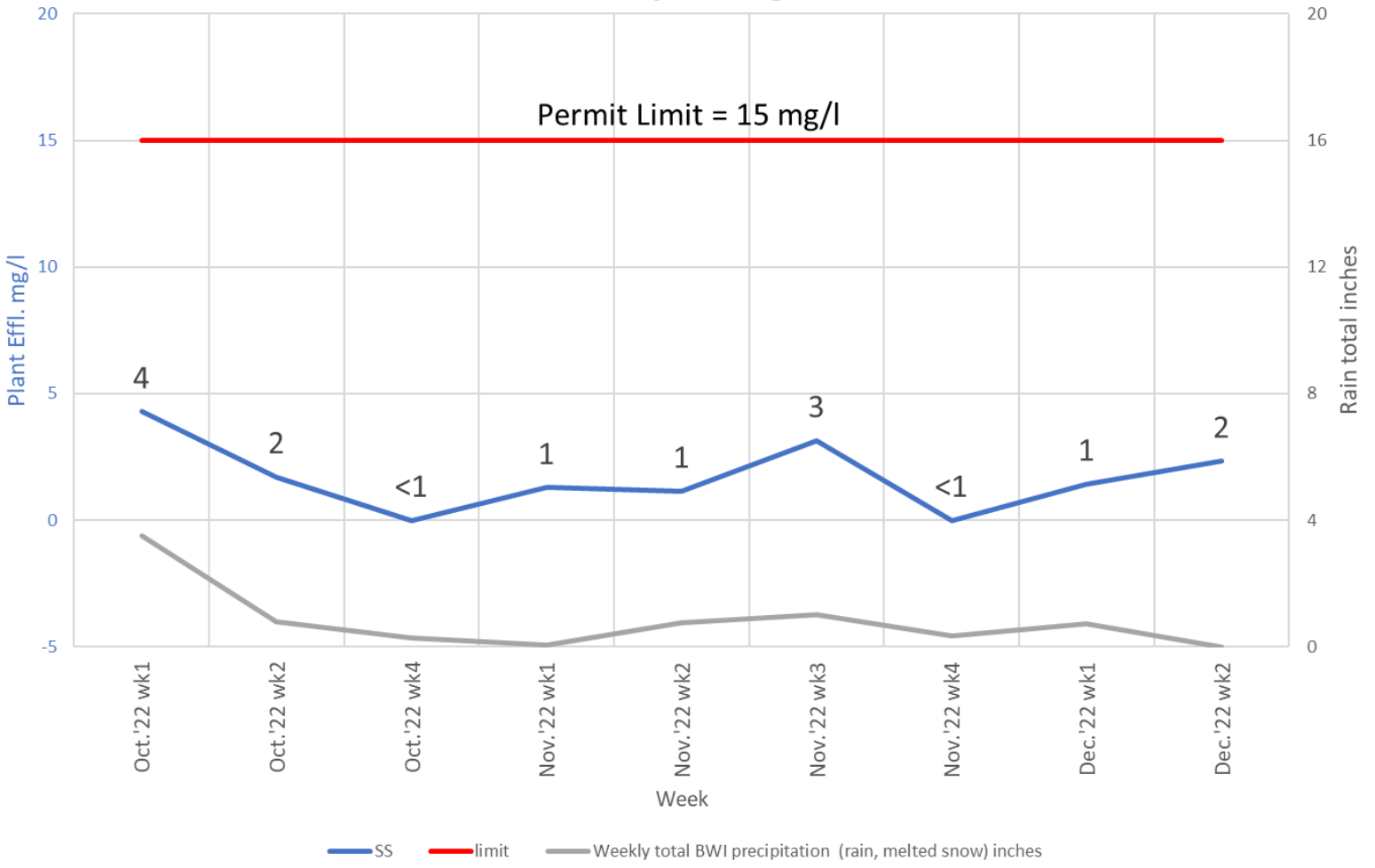
- DPW reviewed staff roles and stressed the necessity for communication, teamwork, and cooperation between MES and DPW.
 - DPW is in the process of hiring additional maintenance technicians.
 - The city's monthly report for Back River indicates a total of 81 open positions, including various functional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

Monitoring Results

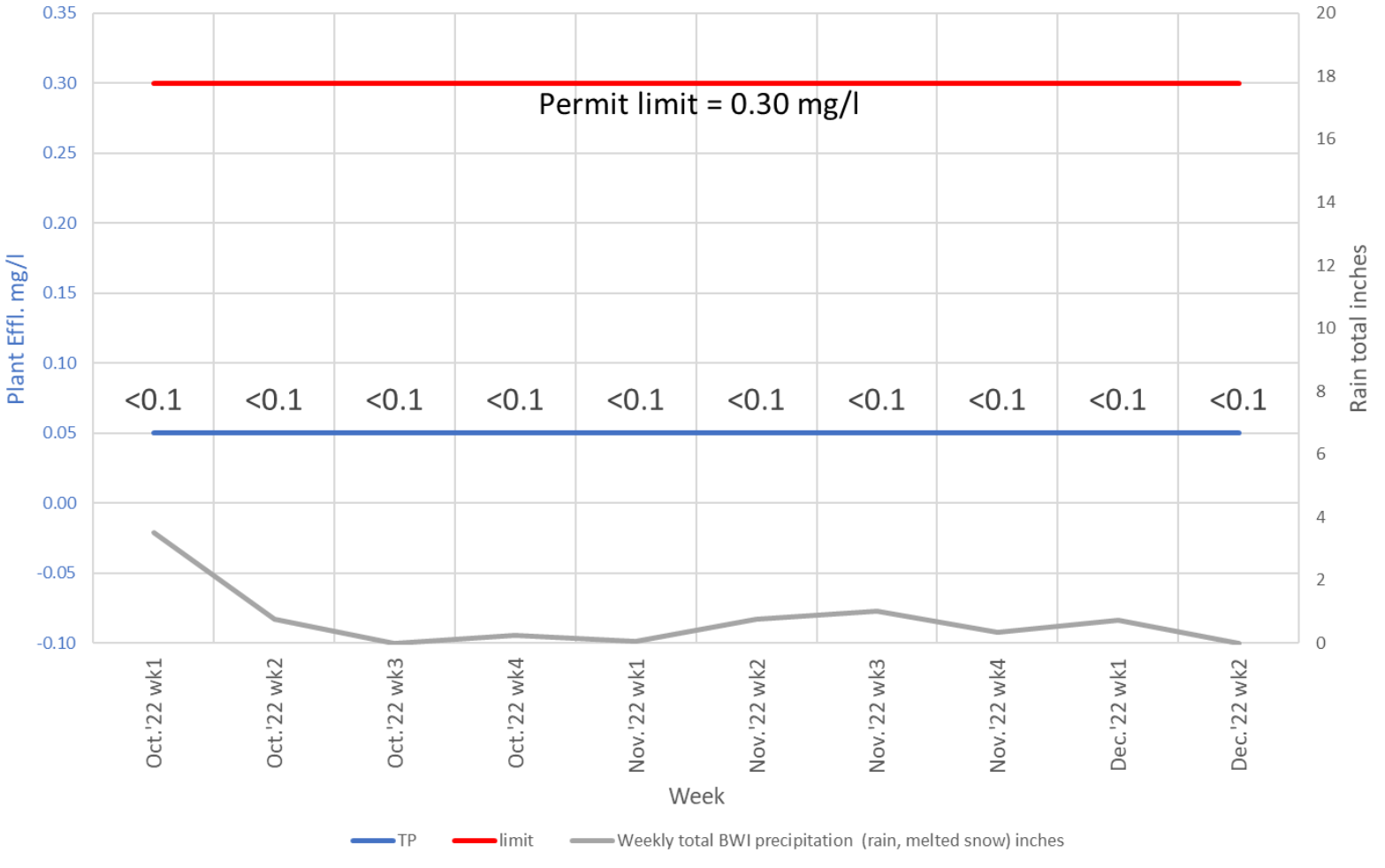
- The analytical data demonstrates that there has been some measured progress made toward getting Back River into compliance with its discharge effluent permit limits.
- The Total Suspended Solids (TSS) concentration has been a factor in creating high nutrient concentrations.
 - Data from November 2022 show that the monthly average TSS concentration at discharge point Outfall 001 is 2.0 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 for June 2022, 2 mg/L for July 2022, 2 mg/L for August 2022, 1.75 mg/L for September 2022 and 3.0 mg/L for October.
 - 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

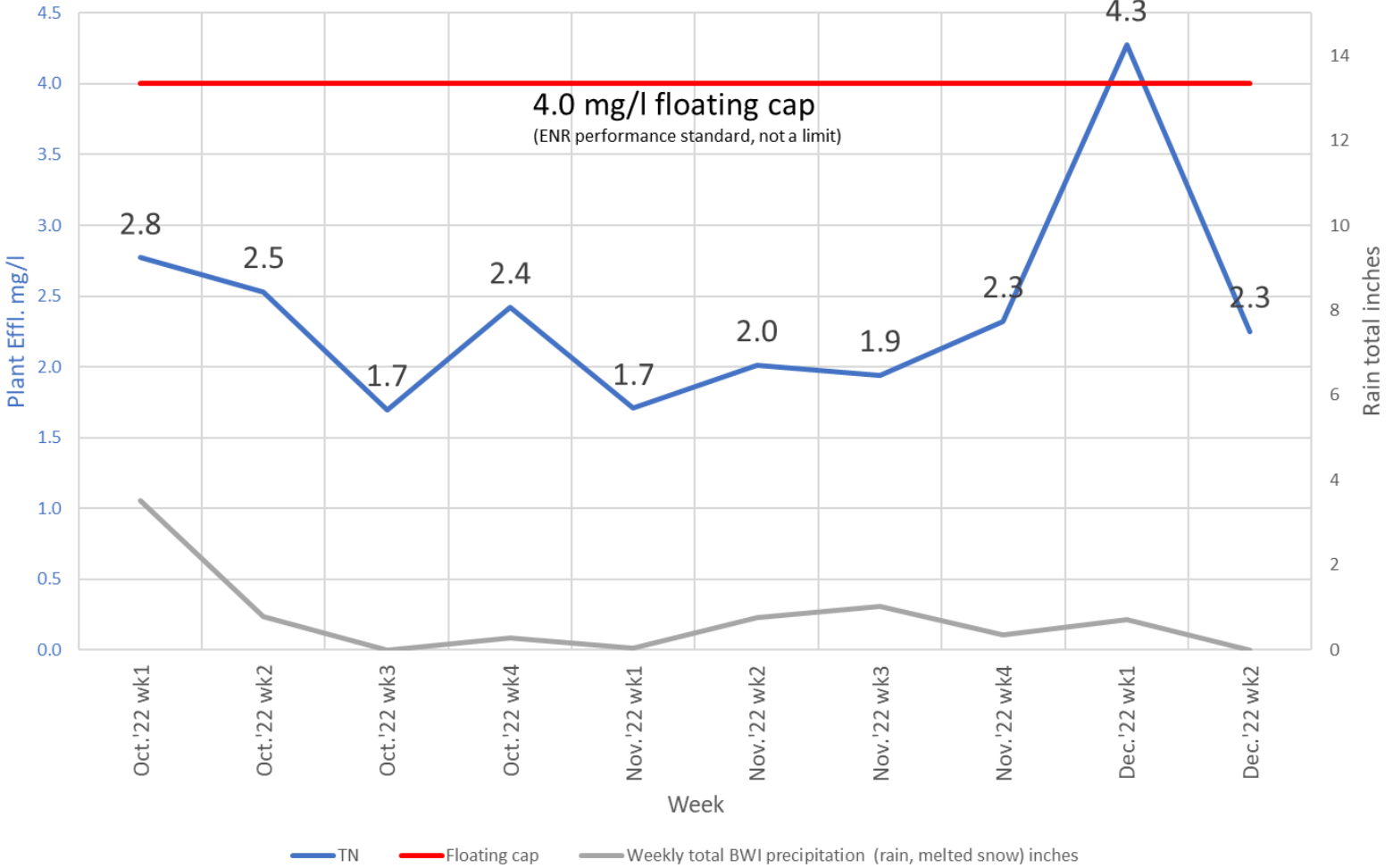
City of Baltimore, Back River W.W.T.P. TSS Concentration Outfall 001 Weekly Average



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



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



**Back River WWTP has informed MDE that the high TN results are due to issues with methanol addition and internal recycling pumps. MDE is working with Back River WWTP and MES to ensure these issues do not occur in the future.*