

Back River Wastewater Treatment Plant (WWTP) Progress Report:
February and March
March 31, 2023

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.

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, 2 PSTs (#8, and #11) of the 11 PSTs are functioning as designed.
 - After a series of repairs to the scraper arm on PST #1, it has still failed to operate and further evaluations are necessary to determine next steps.
 - PST #7 was taken off line after refurbishing to correct two major issues. After refurbishing, the stilling well was not level, and the scraper arm required adjustments to function properly. According to representatives of Baltimore City DPW, the final repairs to PST# 7 are complete and the unit should be back online in a few days.
 - PST#1 and #5 are being used as flow through tanks to prevent a bottleneck at this part of the process.
 - As of 3/22/23, the cleaning of PST #2 is complete. The MES contractor is working on mechanical repairs, however some of the parts required to complete the repairs will not arrive until April - early May. Concrete floor repairs will be done after MES has completed all mechanical work. Repairs were delayed due to additional time required in completing PST #7 by the MES contractor. To extend the lifespan of the tank, the contractor will be adding a topper coating. The completion date has been extended until 6/2023.
 - The concrete repairs are scheduled to be completed for PST #3 in September 2023 and the parts and equipment for the repairs are onsite. The estimated date to complete the project is November of 2023.
 - With regards to PST #4 , concrete repairs, including effluent channel repairs and coating to be completed in September of 2023. The parts and equipment necessary to complete the repairs are scheduled to be delivered in July 2023. PST #4 is estimated to be operational by January 2024.
 - PST #5 has been cleaned and the necessary parts to get the unit back online have been ordered. Once the parts have been received, a timeline for getting this PST back online can be determined. However, the estimated time frame is the Fall of 2023.
 - PST #9 has been drained and an assessment has determined that the skimmer arm is bent, and the rake arm is not oriented properly. Repairs to PST #9 were delayed due to additional work required to get PST #7 back on line. Concrete repairs and mechanical repairs, including the installation of a Westech drive are now being scheduled for PST #9. PST #9 is now scheduled to be in service sometime in June 2023.
 - PST #10 is expected to be online by September 2023, and two PSTs (#3 and #4) are expected to be online by November 2023 and January 2024.
 - Completion dates for PST #6 is to be determined.
 - 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 3 activated sludge plants to reduce organic material and solids.
- Newly constructed Activated Sludge Plant #4 is online and all reactors and clarifiers are online.
 - 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.
 - 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
- A third-party contractor is cleaning and removing the vegetation from the secondary clarifiers and affected reactors.
 - 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.
- At this time 51 of 52 filters are in, or available for, service. Filter #11 on Quad 3 was not functioning due to a control issue with the air valves for the filter. Parts have been ordered for the repairs and Filter #11 in Quad 3, will be placed into service when repairs are completed.

Sand Filters

- DPW's Sand Filter Operational Status report dated March 20, 2023, identifies 32 sand filters in service (#1-5,

#7-17, #19-21, #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 and #18 have wash water pump issues that have delayed repairs. These filters are expected to be back in service sometime in March 2023. Sand filter #48 was scheduled to be in service by February 2023; however, issues with the influent gate have delayed getting the filter back in service
- 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; however, electrical repairs are still underway.
 - A procurement request for three sand filter backwash return pumps has been submitted for approval.
 - Ten pumps and 20 isolation valves were received for sand filter repairs and installation.

Biosolids Management

On 3/15/23, an explosion that led to a fire occurred at the Synagro Technologies biosolids treatment facility. Synagro is a third-party contractor that converts the sewage sludge under high temperatures to pellets for agricultural use. Since the incident, all biosolids treatment operations at the Synagro plant have been suspended. The Synagro plant produced Class B biosolids using centrifuges and agricultural pellets (Class A) using Dryers. Before the explosion, normally the Synagro Facility was processing 55-58 dry tons/day. However, during the month before the explosion it was down to about 40 - 45 dry tons/day. According to Baltimore City DPW, the centrifuges at the Synagro facility are estimated to be back in 2 portable belt presses operated by Synagro will be used as a backup until Synagro's centrifuges are back online. One of the portable centrifuges is on-site and the other is expected to arrive the afternoon of 3/22/23. The portable belt presses will operate 24/7 and are able to process 20 -25 dry tons/day, which will be taken to Pennsylvania and Southern Virginia for disposal .

- Sludge dewatering managed by the Back River WWTP is done using centrifuges.
- The Back River WWTP has 4 centrifuges for dewatering of the biosolids and 3 of the 4 centrifuges are operational as described below. However, there have been issues with the polymer pumps and now the polymer system requires calibration for efficient operation. According to the plant manager, arrangements have been made to recalibrate the system.
- Centrifuges #1 and #3 have been in use before the explosion and are functional.
- Centrifuge #2 has a wire problem; however, according to the Plant Manager, #2, can still function.
- Parts are now on order for #2 and the #4 centrifuge which was recently refurbished, requiring further evaluation and parts before it will be functional.
- 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.
 - Only two of the eight polymer pumps used for polymer addition are functional.
 - The other six need to be replaced.

The Department is now awaiting the submission of a Centrifuge Maintenance Plan, which was specified in previous inspection reports.

- The latest biosolids processing data reviewed on 3/22/23 show that the centrifuges operated by the Back River WWTP are routinely processing 16 - 20 dry tons/day.
- There is still approximately 1.5 feet of sludge and liquid in the #4 HRD (high rate digester) managed by MES and Synagro. The sludge is being stored on a transfer pad located on-site and later sent to a landfill.

Gravity Belt Thickeners

- There are 8 GBTs and currently there are 4 online (#3, 4, 7, and 8). 6 GBTs are needed for current flows and 7 for design capacity.
 - GBT #1 has problems with the roller, #2 requires a complete rehabilitation, #5 has a torn belt and #6 has a problem with the pump. There is no redundancy.

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.
 - Three 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.

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 latest monthly report states that the City is advancing their efforts to utilize idle staff time and improve efficiency of operations. Current staffing needs, based on current vacancies, are 44 operators and 52 maintenance staff (all crafts).
 - The Department has requested that the Back River WWTP submit a staffing plan to assess and address current and future staffing requirements.

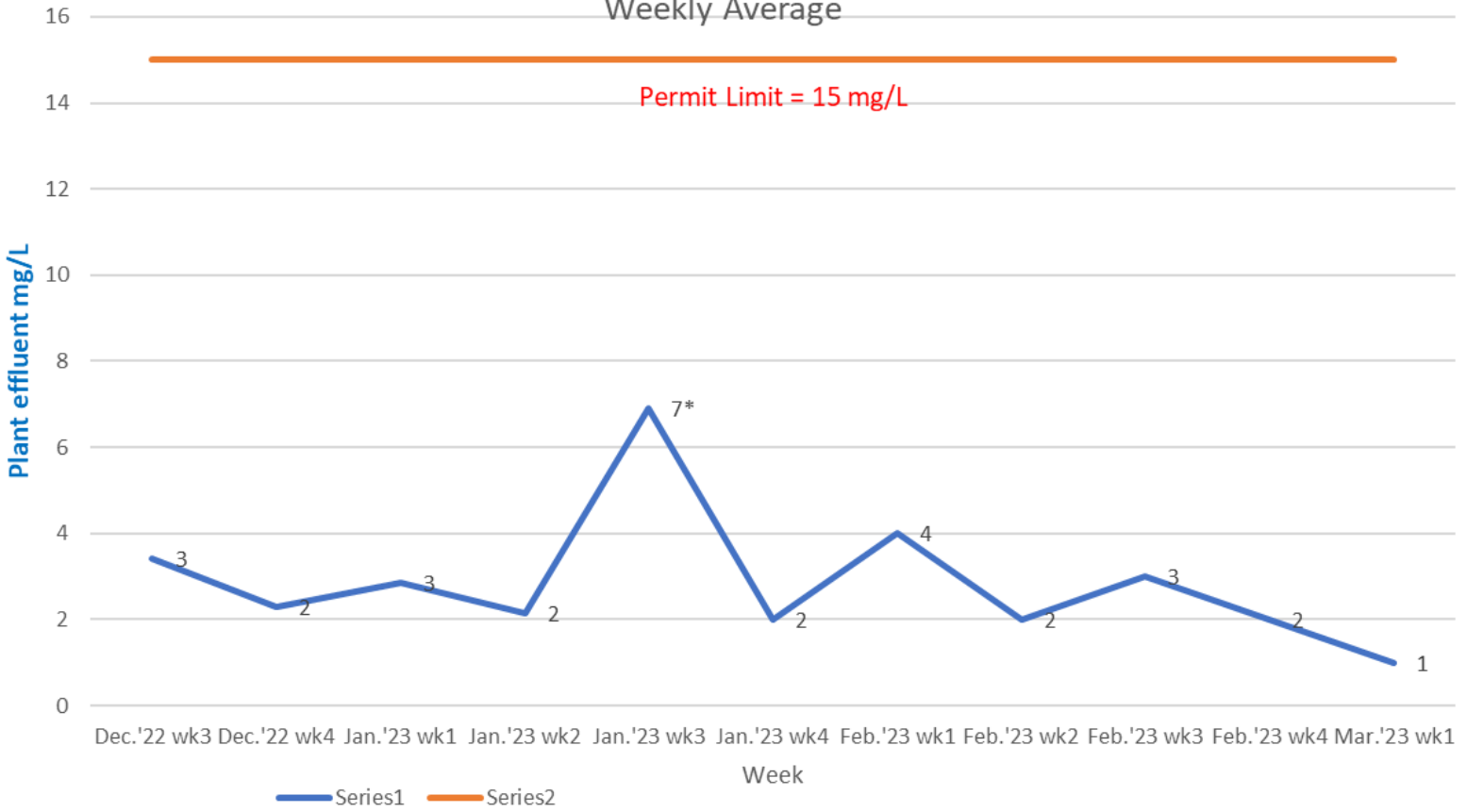
Monitoring Results

- 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 February 2023 show that the monthly average TSS concentration at discharge point Outfall 001 is 3.0 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, 3.0 mg/L for October 2022 and 2.0 mg/L for November 2022, 2.0 mg/L for December, and 3.1 mg/L for January 2023..
 - 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.*

City of Baltimore Back River WWTP Outfall 001

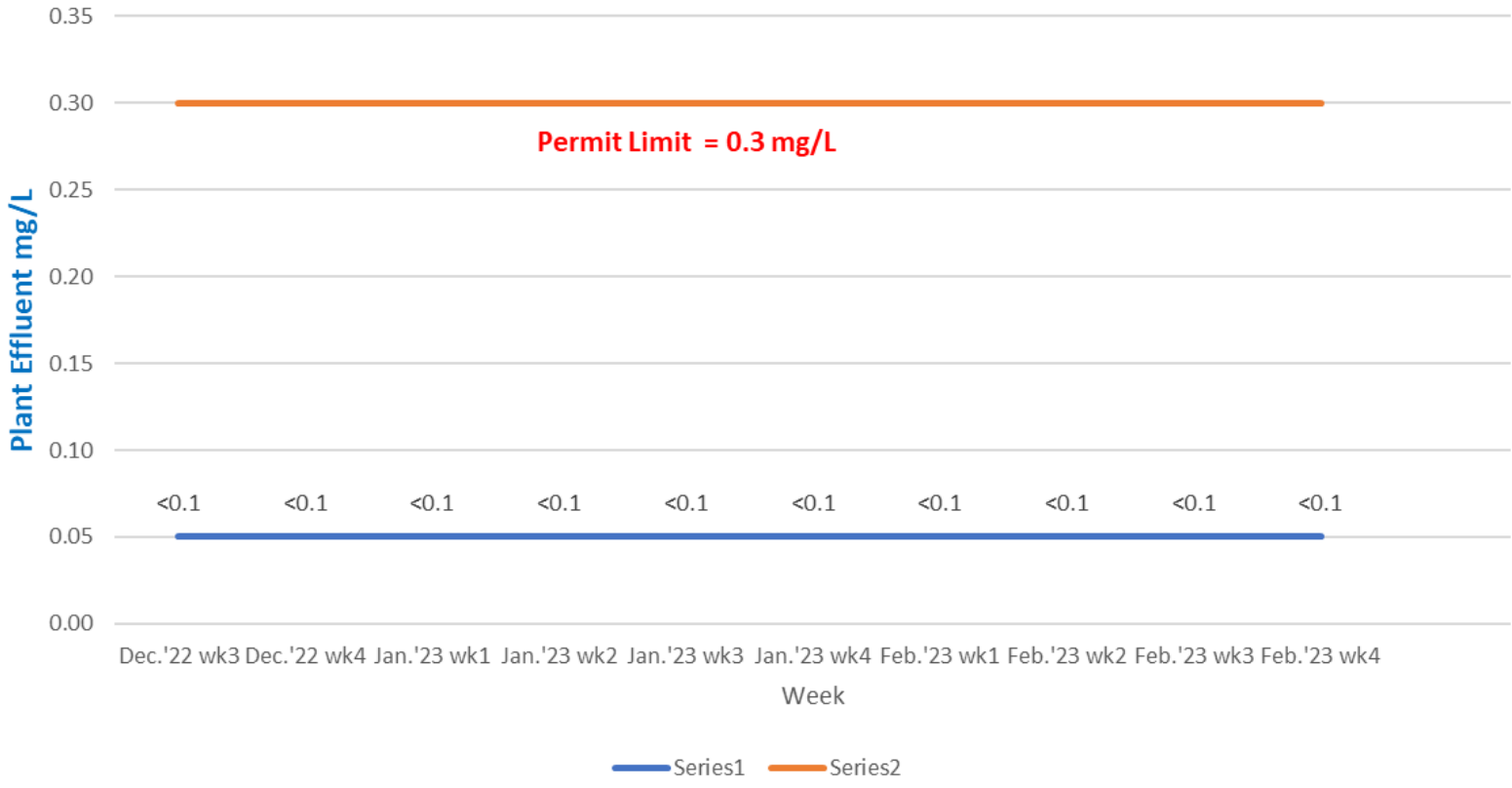
TSS Concentration in mg/L

Weekly Average



* In January 2023, Back River WWTP informed the Department there had been an increase in the number of backwashing cycles for the denitrification filters, which led to an overall rise in TSS concentrations at the final outfall. This is being done periodically to remove trapped solids and improve the efficiency of the filters. Since then, there has been a continual decline in TSS concentrations.

**City of Baltimore, Back River WWTP
TP Concentration Outfall 001
Weekly Average**



City of Baltimore, Back River WWTP
TN Concentration Outfall 001
Weekly Average

