

2020 ECR Plan Status Update Report Quarterly Report – Update #16 October 30, 2024

Executive Summary:

General

This report covers LG&E and KU’s (“Companies”) progress on the 2020 Environmental Cost Recovery (“ECR”) Plan through the third quarter of 2024. The Companies filed applications requesting approval of their 2020 ECR Plan on March 31, 2020¹ and received approval on September 29, 2020.

The 2020 ECR Plan safety performance through the third quarter of 2024 remains excellent with a Year-to-Date OSHA Recordable Incident Rate of 0.0 and an Inception-to-Date OSHA Recordable Incident Rate of 0.0, compared to the industry average of 2.4.

Work to date continues to focus on construction and startup activities at two of the three stations: Ghent (“GH”) and Mill Creek (“MC”). Trimble County (“TC”) Effluent Limitation Guidelines (“ELG”) system and the GH Bottom Ash system achieved Commercial Operations in the second quarter of 2024. Both GH and MC ELGs are both mechanically and electrically complete, and start-up activities began.

Compared to the total 2020 ECR Plan projected cost of \$405.2 million (net)², as provided in Case Nos. 2020-00060 (KU) and 2020-00061 (LG&E), the projected spend, as of the third quarter of 2024, has increased to \$301.8 million (net)². This projected spend represents a \$103.4 million (net) reduction from the original filing. The total spend to date increased to \$254.9 million (net)² through September 30, 2024.

Background

The Environmental Protection Agency’s (“EPA”) 2015 ELG Rule and amendments precipitated the need to construct ELG water treatment systems at TC, MC and GH, as well as a Bottom Ash Transport Water (“BATW”) recirculation system at GH. The EPA’s proposed amendments to the 2015 ELG Rule were finalized in the Fall of 2020. The current ELG Rule includes daily maximum and monthly average limits for the concentration of mercury, nitrates/nitrites, selenium and arsenic allowed in Flue-Gas Desulfurization (“FGD”) wastewater effluent.

To meet the revised limits for these constituents, the Companies are required to install ELG water treatment systems to treat the effluent from the physical/chemical FGD process water treatment systems recently placed into service as described in the 2016 ECR Plan quarterly reports. Without the proposed 2020 ECR Plan projects at TC, MC, and GH stations, the Companies would not be able to continue steam generating operations at these generating stations and simultaneously comply with the ELG Rule, as enforced by Kentucky Pollutant Discharge Elimination System (“KPDES”) permits at each generating station. This would significantly impair the Companies’ ability to fulfill their mandate to provide adequate, efficient,

¹ Case No. 2020-00060 and Case No. 2020-00061

² Co-Owners of the Trimble County plant: Illinois Municipal Electric Agency (IMEA) and Indiana Municipal Power Agency (IMPA) are responsible for 25%. IMEA owns 12.12% and IMPA owns 12.88%. Co-owner shares are not included in the costs provided in this report.

and reasonable service to their ratepayers, as these generating stations are the three largest generating stations within the Companies' generating fleet. The ELG Rule requires compliance for the FGD wastewater as soon as possible on or after November 1, 2020, but no later than December 31, 2025.³

The final ELG Rule also includes up to 10 percent volumetric discharge limit (on a 30-day rolling average) for BATW, which also must be complied with "as soon as possible" but in no event later than December 31, 2025. This proposed discharge limit requires KU to construct a BATW recirculation system on the existing bottom ash transport system at GH. The recirculation system will collect the transport water currently discharged from the remote bottom ash dewatering facility and reroute it through tanks and piping systems back to the four generating units for reuse. TC and MC do not require a BATW recirculation system due to their bottom ash transport systems being previously converted to a dry transport instead of a wet sluicing system like GH's.

On May 9, 2024, the EPA promulgated the final ELG Rule ("ELG") requiring membrane filtration followed by solidification or thermal evaporation for zero discharge of FGD Wastewater; zero discharge of Bottom Ash Transport Water; and zero discharge of combustion residual leachate waters and did not establish specific limitations for Legacy Waste Water as the permitting authority will be responsible to establish site-specific technology-based limits. The ELG stipulates compliance as soon as possible, but no later than December 31, 2029. The ELG also creates a 2034 Permanent Cessation of Coal Combustion ("PCCC") subcategory. To qualify for the 2034 PCCC, facilities must file a Notice of Planned Participation ("NOPP") by December 31, 2025 committing to retire all coal-fired units by December 31, 2034. The EPA has set interim limits based on the 2020 ELG, and all facilities must fully comply starting on their respective 2020 ELG applicability date, until their 2024 ELG applicability date, or their 2034 PCCC retirement date. The Companies are currently reviewing the final ELG rule and are formulating a compliance strategy.

Because of the uncertainties created by ELG, the Companies expect legal challenges to the ELG. Respective outcomes may influence future compliance direction.

³ 84 Fed. Reg. 64664.

Schedules

FGD Process Water Treatment Facilities and Diffusers

<u>Project</u>	<u>Project #</u>	<u>Awarded Contractor</u>	<u>Status</u> ⁴	<u>Planned / Actual In-Service Date</u> ⁵
Trimble County Effluent Limitations Guidelines Water Treatment System ⁶	KU Project 44 LG&E Project 32	OKEP	Awarded March 15, 2021	Placed in service May 2024
Mill Creek Effluent Limitations Guidelines Water Treatment System ⁶	LG&E Project 31	OKEP	Awarded March 15, 2021	November 2024
Mill Creek Outfall 025 Diffuser	LG&E Project 31	Tetra Tech	Awarded May 12, 2021	Placed in service December 2021
Ghent Effluent Limitations Guidelines Water Treatment System ⁶	KU Project 43	OKEP	Awarded March 15, 2021	December 2024
Ghent Bottom Ash Transport Water Recirculation System ⁷	KU Project 43	OKEP	Awarded March 15, 2021	Placed in service May 2024
Ghent Outfall 001 Diffuser	KU Project 43	MAC Construction & Excavating	Awarded March 22, 2021	Placed in service December 2021

⁴ Project Engineering Department or Engineering, Procurement, and Construction (“EPC”) Contract work status.

⁵ The Planned In-Service Dates are per the 2020 ECR Plan filing (Straight Testimony, page 4-5) or the current, active construction schedule. Actual in-service dates are signified with red font.

⁶ ELG Equipment OEM: Frontier

⁷ BATW Equipment OEM: United Conveyor Corporation

Quarterly Status Update:

General

The engineering, procurement, and construction (“EPC”) contracts for TC, MC, and GH were awarded on March 15, 2021 to Old Kentucky Energy Partners (“OKEP”), which is a joint venture between Bowen Engineering (a local company) and United E&C. At GH and MC, work has included completion of the following: installation of above ground piping and electrical conduit/cable; installation of process equipment and electrical gear; installation of fiberglass tanks; heat tracing. GH ELG achieved mechanical completion and start-up activities began. MC’s ELG system completed commissioning work and began performance testing.

Burns & McDonnell (“B&McD”) is the ELG Owner’s Engineer and is assisting the Companies with reviewing engineering, design and construction support related to submittals and fieldwork from the EPC (OKEP) and ELG technology providers (Frontier – ELG) or United Conveyor Corporation (Ghent BATW).

KU Project 44 and LG&E Project 32 – Trimble County (TC) Station Effluent Limitations Guidelines (ELG) Water Treatment System

General

Project 44 (KU) and Project 32 (LG&E) are for construction of an ELG water treatment system at the TC generating station. The current forecasted capital costs to implement these facilities have increased to \$74.5 million (net)⁸, allocated between KU and LG&E.

⁸ KU’s 48 percent ownership allocation equals \$24.8 million (Project 44) and LG&E’s 52 percent ownership allocation equals \$26.8 million (Project 32) – both costs are net.

ELG

The ELG system was constructed in close proximity to the recently completed process water treatment system (“PWS”). All facilities were installed on land currently owned by KU and LG&E at the generating station. The system is designed to handle water flow capacity up to 750 gallons per minute. The engineering home-office remains focused on completion of as-built drawings. Field work continued with commissioning of the Maintenance Tank and pump house and completion of punch list items.

Commercial Operation was achieved during the second quarter of 2024 and Final Completion is anticipated within the fourth quarter of 2024.

The previously noted long-term reliability and economic considerations has resulted in a contract with B&McD to review possible FGD system chemical, mechanical, and/or operational modifications to TC1. The B&McD studies indicate modifications to the TC1 oxidation air system will be required as the primary component of the solution. Until these modifications are developed and installed, the generating station will utilize the same chemicals which facilitated the successful Performance Test.

Reliable operations and maintenance of the new ELG facility requires on-site spare parts and materials. A new warehouse is necessary for this purpose and will be constructed adjacent to the ELG facility. This construction contract was awarded to East & Westbrook Construction, Inc (“E&W”). The warehouse is planned to be a 22,500 square foot pre-engineered metal building with internal shelves and racking. During this quarter, E&W completed civil/site and structural design work, obtained the site and foundation permit, mobilized and began site preparation activities, began installing spread footing foundations around the perimeter of the warehouse footprint, and began electrical design work..



Trimble County – ELG Water Treatment Location – March 2024 – July 2024 No Changes

LG&E Project 31 – Mill Creek (MC) Station Effluent Limitations Guidelines (ELG) Water Treatment System and Diffuser

General

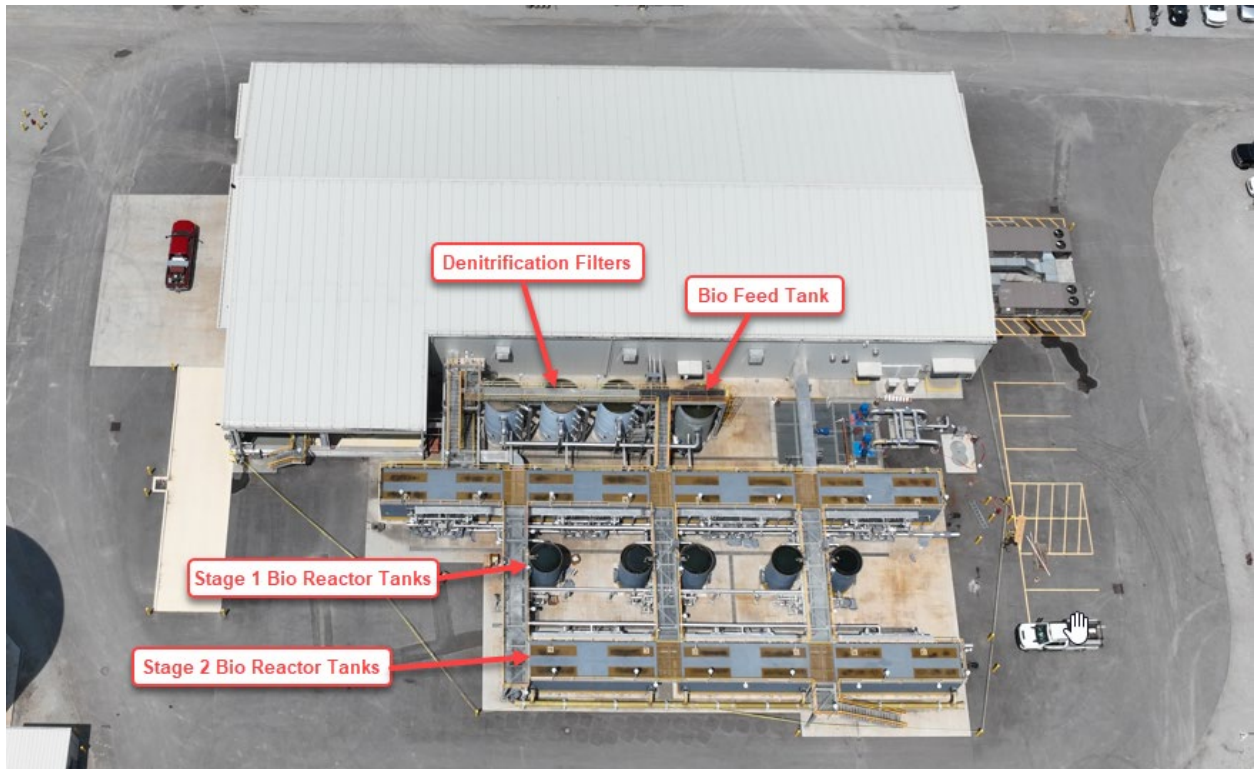
Project 31 is for construction of an ELG water treatment system and wastewater diffuser at the MC generating station. The current forecasted capital costs to implement this project have decreased to \$69.6 million. The MC project team has engaged the TC and GH project teams during all major reviews to apply lessons learned from the other projects. This collaborative effort was implemented to ensure lessons learned are applied across all the projects to promote a common fleet approach to the ELG program.

ELG

In the third quarter of 2024, OKEP achieved mechanical completion and began performance testing. At this point, OKEP has passed 3 of their 4 required weeks of performance testing. OKEP continues to work through the remaining punch list items and is on track to achieve Commercial Operation in the fourth quarter of 2024.

Diffuser

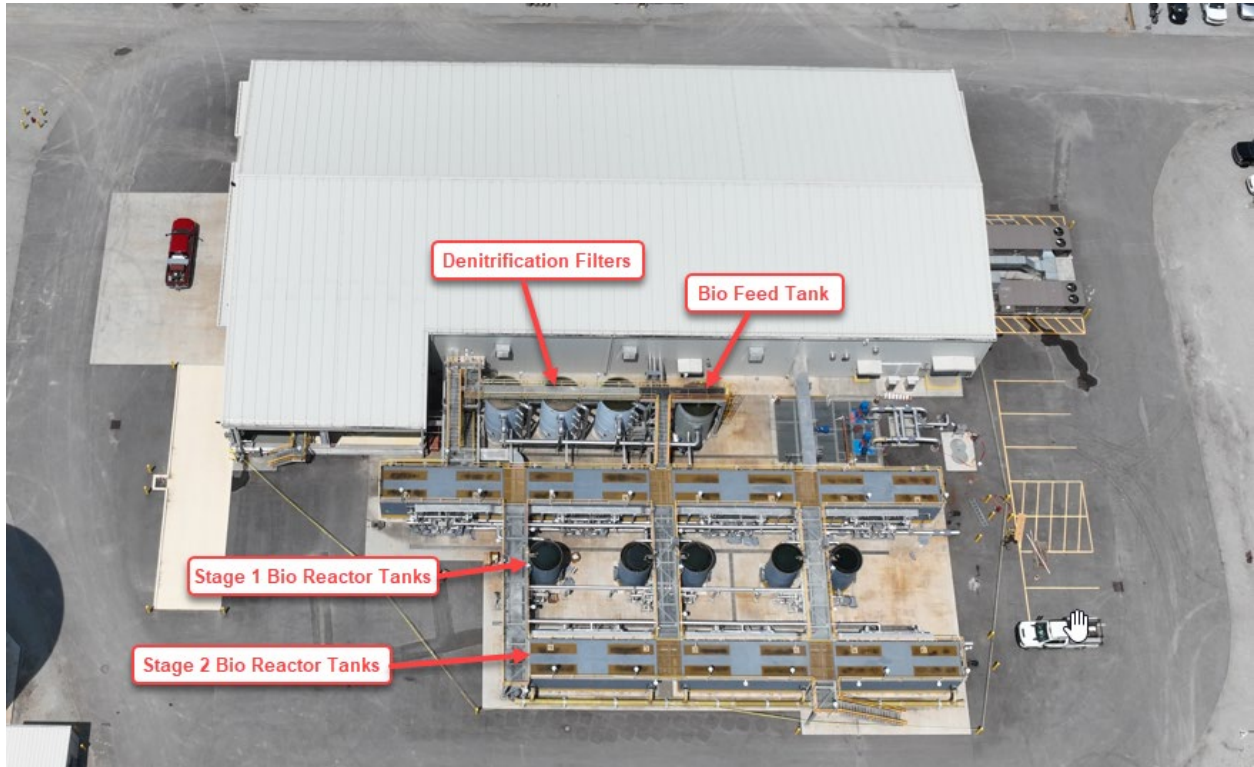
The diffuser was installed and placed into service in 2021.



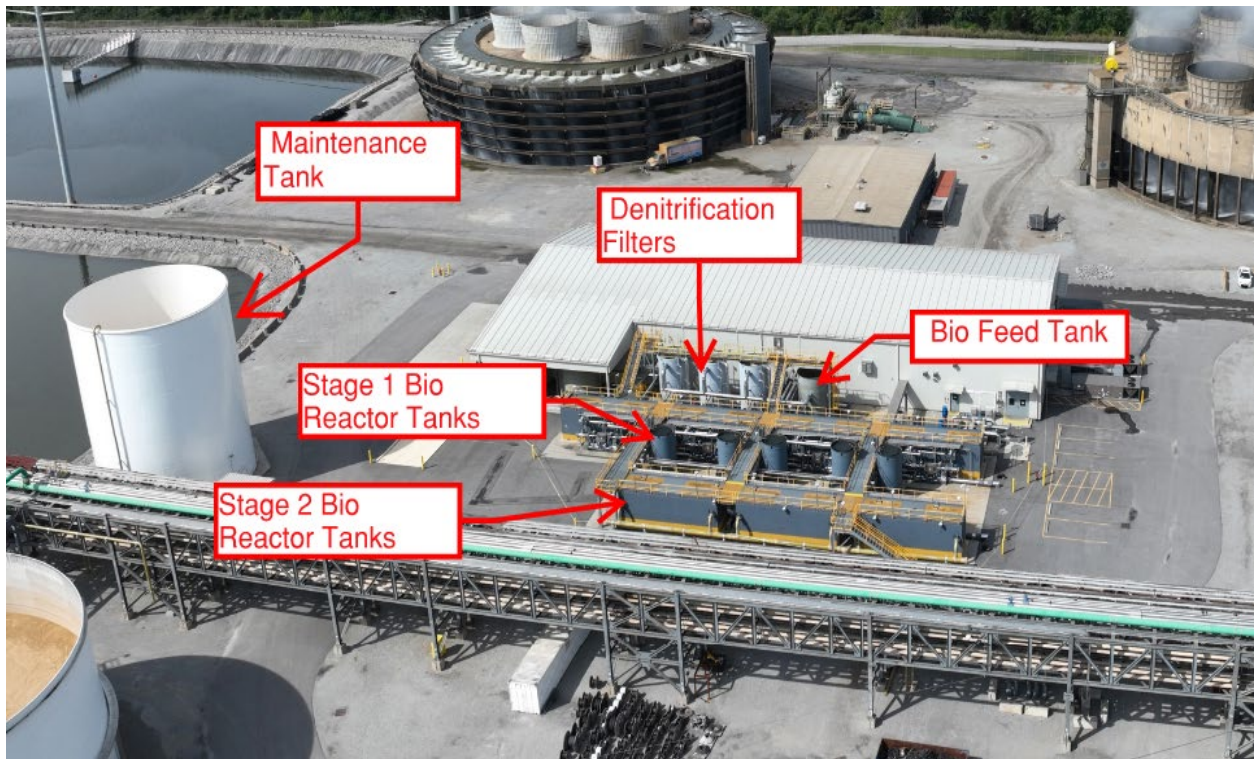
Mill Creek – ELG Water Treatment – July 2024



Mill Creek – ELG Water Treatment – September 2024



Mill Creek – ELG Water Treatment – July 2024



Mill Creek – ELG Water Treatment – September 2024

KU Project 43 – Ghent (GH) Station Effluent Limitations Guidelines (ELG) Water Treatment System, Bottom Ash Transport Water (BATW) Recirculation System, and Diffuser

General

Project 43 is for construction of an ELG water treatment system, a BATW recirculation system, and a wastewater outfall diffuser at the GH generating station. These facilities are designed to process and lawfully discharge wastewater from GH in accordance with the EPA’s existing and proposed amendments to the ELG Rule and the existing Kentucky Pollutant Discharge Elimination System (“KPDES”) Permit for GH. The current forecasted capital costs to implement these facilities have increased to \$157.7 million, with construction recently completed for the BATW recirculation system and anticipated for December 2024 for the ELG water treatment system.

The GH project team continues to engage the TC and MC project teams during all major reviews, to apply lessons learned from the other projects. This collaborative effort was implemented to ensure lessons learned are applied across all the projects to promote a common fleet approach to the ELG program.

ELG

Throughout the third quarter of 2024, electrical installation efforts were completed including pulling and testing cable, installation of lightning protection systems, and energization of the ELG Building. The project team completed system walkdowns of ELG turnover packages, unloaded initial system chemicals, and is nearing completion of preparations for upcoming performance testing. Tank farm area heat trace, insulation and lagging work continued, as well as addressing mechanical and electrical punch list items. Soil borings and preliminary construction activities have begun in preparation for the maintenance tank's expected installation in October.

Bottom Ash Transport Water (“BATW”)

During the third quarter, the BATW project requested Final Completion but was denied due to documentation concerns which the contractor will address in the fourth quarter.

Diffuser

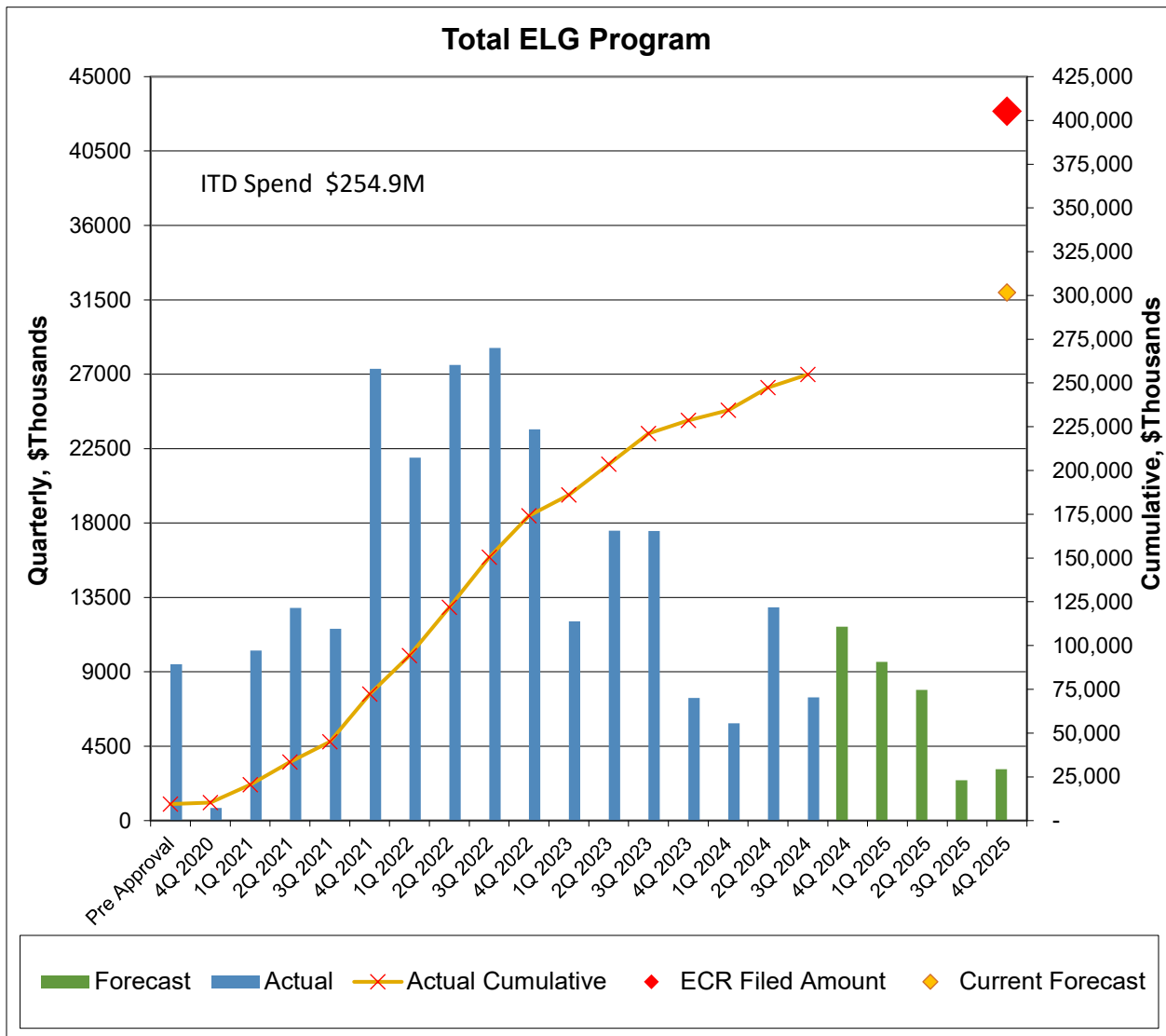
The diffuser was installed and placed into service in 2021.



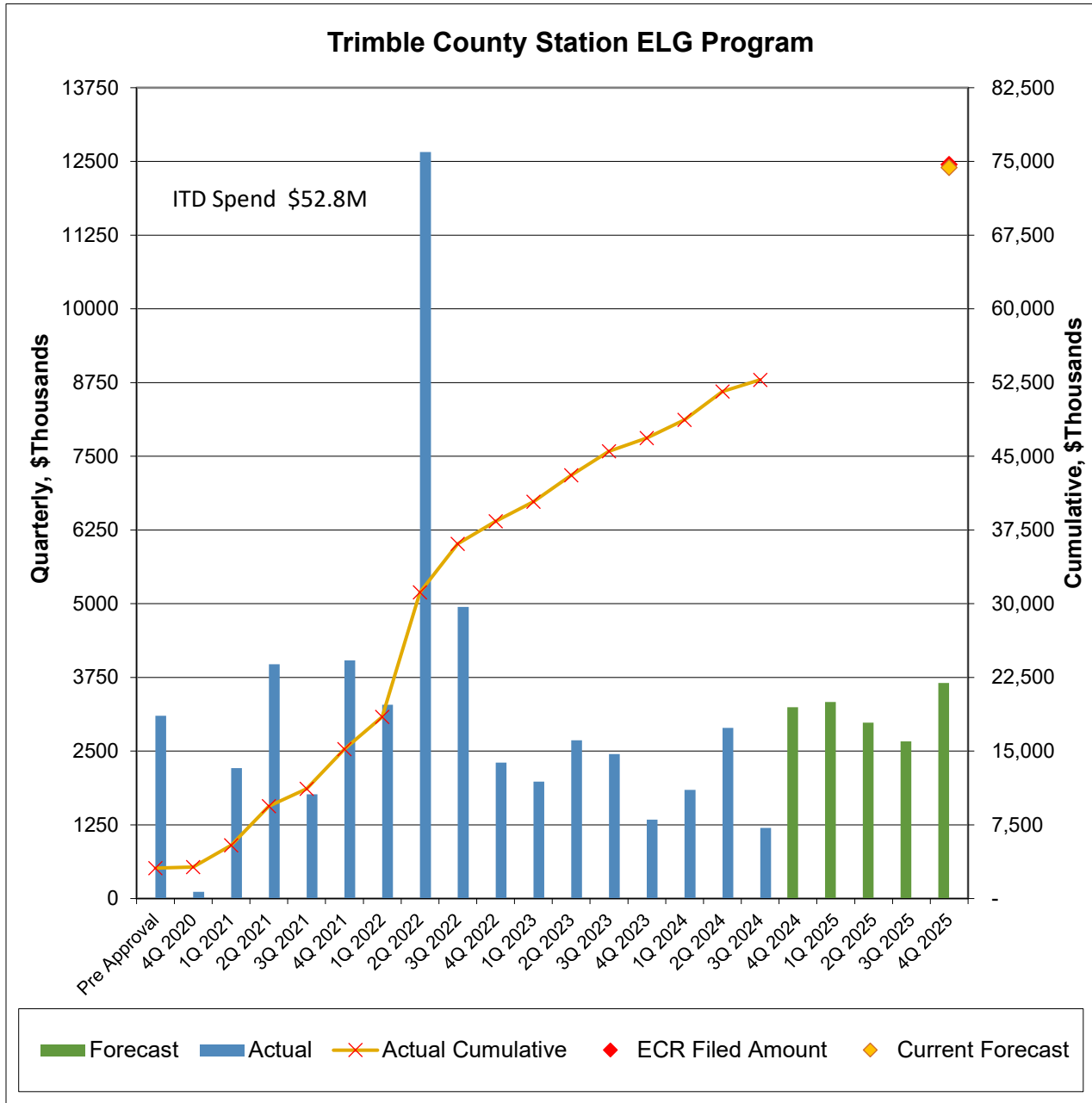
Ghent – ELG Water Treatment – July 2024, September 2024 – No Changes

Financials:

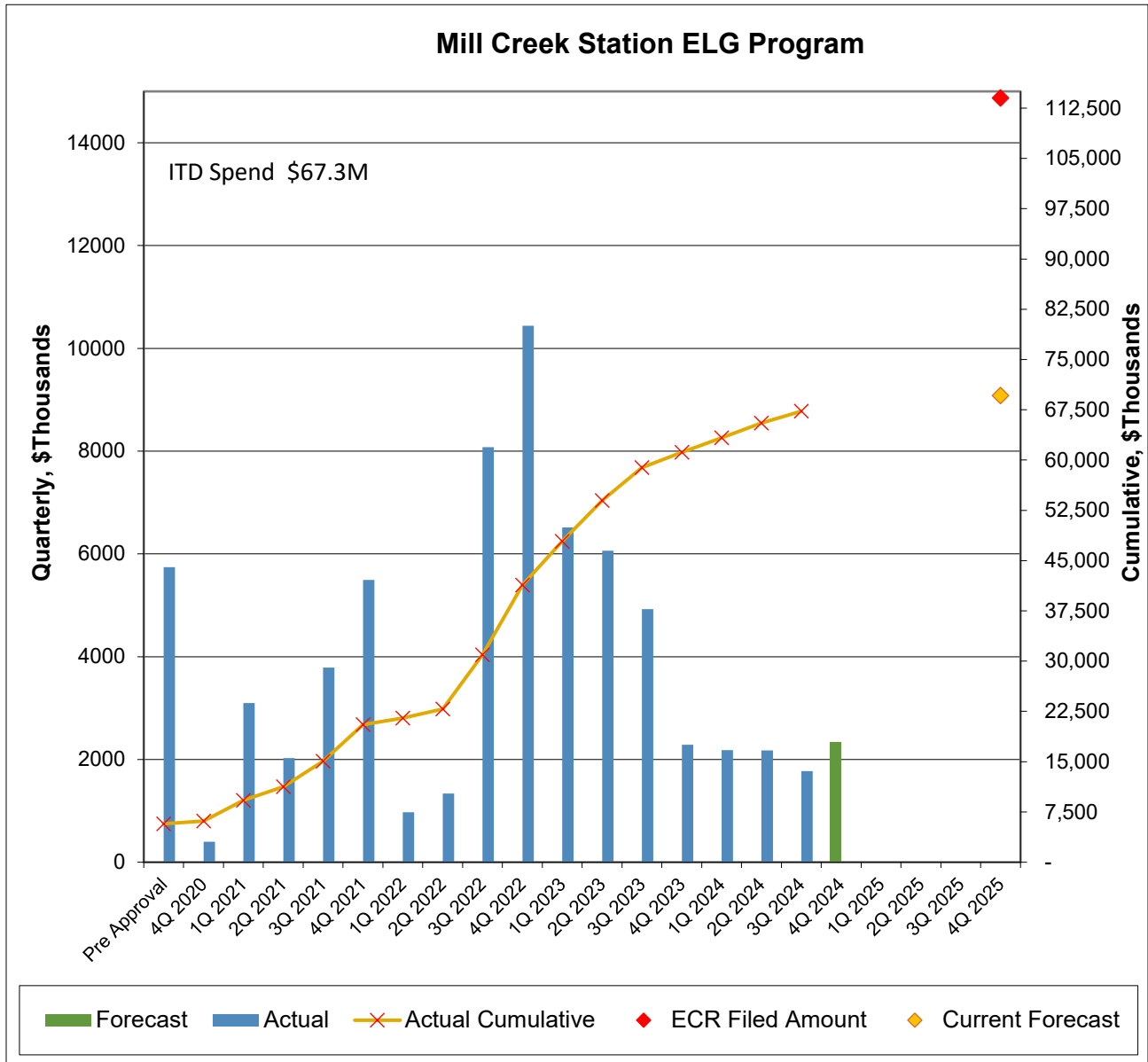
As previously reported, the total 2020 ELG Program approved forecasted cost was over \$405 million (net). As noted in prior quarterly reports, this forecasted cost was reduced significantly. Although this quarterly report indicates a projected spend of \$301.8 million (net), this cost is still well below the filed amount. Total spend increased to \$254.9 million (net)² through September 30, 2024. The graph below includes: 1) a symbol (◆) to show the current forecast to completion and 2) inception-to-date (“ITD”) Spend in the upper left of the chart.



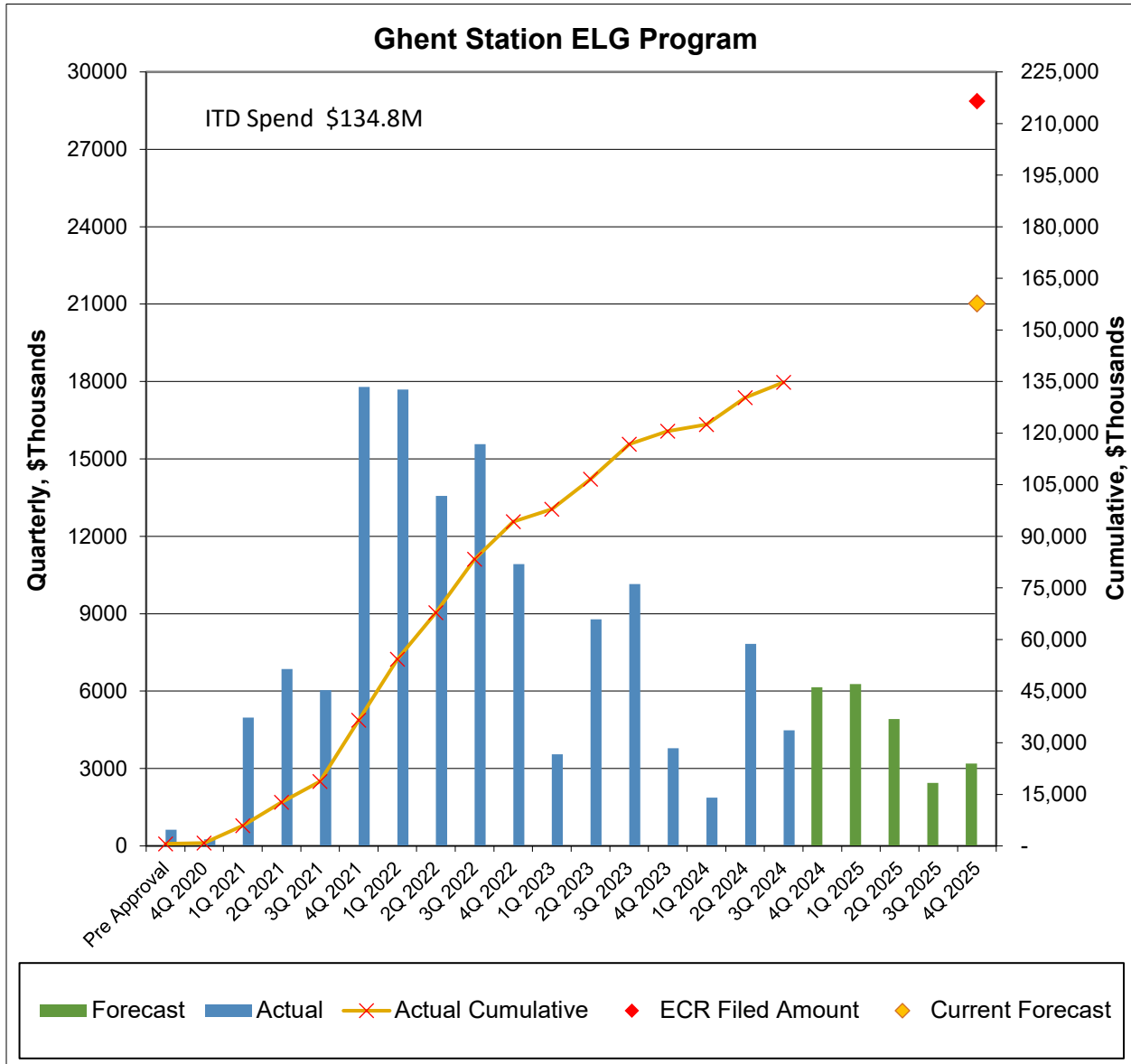
The total Trimble County Station ELG Program forecasted cost has increased to \$74.5 million (net)². Total spend increased to \$52.8 million (net)² through September 30, 2024. The graph below includes: 1) a symbol (◆) to show the current forecast to completion and 2) inception-to-date (“ITD”) Spend in the upper left of the chart.



The total Mill Creek Station ELG Program and Diffuser forecasted cost has decreased to \$69.6 million. Total spend was \$67.3 million through September 30, 2024. The graph below includes: 1) a symbol (◆) to show the current forecast to completion and 2) inception-to-date (“ITD”) Spend in the upper left of the chart.



The total Ghent Station ELG Program, BATW, and Diffuser forecasted has increased to \$157.7 million. Total spend increased to \$134.8 million through September 30, 2024. The graph below includes: 1) a symbol (◆) to show the current forecast to completion and 2) inception-to-date (“ITD”) Spend in the upper left of the chart.



Planned Activities for Next Quarter:

KU Project 44 and LG&E Project 32 – Trimble County (TC) Station Effluent Limitations Guidelines (ELG) Water Treatment System

ELG – OKEP plans to complete the update of remaining as-built drawings for record. B&McD will continue evaluating potential mechanical, chemical, and process modifications to the TC1 FGD, further developing oxidation air system upgrades as a component of the solution. E&W will complete the foundations, slab on grade, and structural steel framing for the warehouse; complete underground utilities installation, including fire protection, potable water, and electrical; and begin installing siding and trim on the exterior of the warehouse.

LG&E Project 31 – Mill Creek (MC) Station Effluent Limitations Guidelines (ELG) Water Treatment System and Diffuser

ELG – OKEP plans to achieve Commercial Operations in November Punchlist items will continue to be completed. Edits to Construction Turnover Books (CTO) books will be incorporated and resubmitted to the MC Project Engineering (“PE”) team. OKEP will complete record drawings and submit for review. Final Completion expected at the end of the fourth quarter in 2024 or early 2025.

Diffuser – No further work expected.

KU Project 43 – Ghent (GH) Station Effluent Limitations Guidelines (ELG) Water Treatment System, Bottom Ash Transport Water (BATW) Recirculation System, and Diffuser

ELG – OKEP expects to complete the four (4) week performance test. Completion of punch list items will continue along with completion of record drawings. Final Completion targeted for the late fourth quarter of 2024.

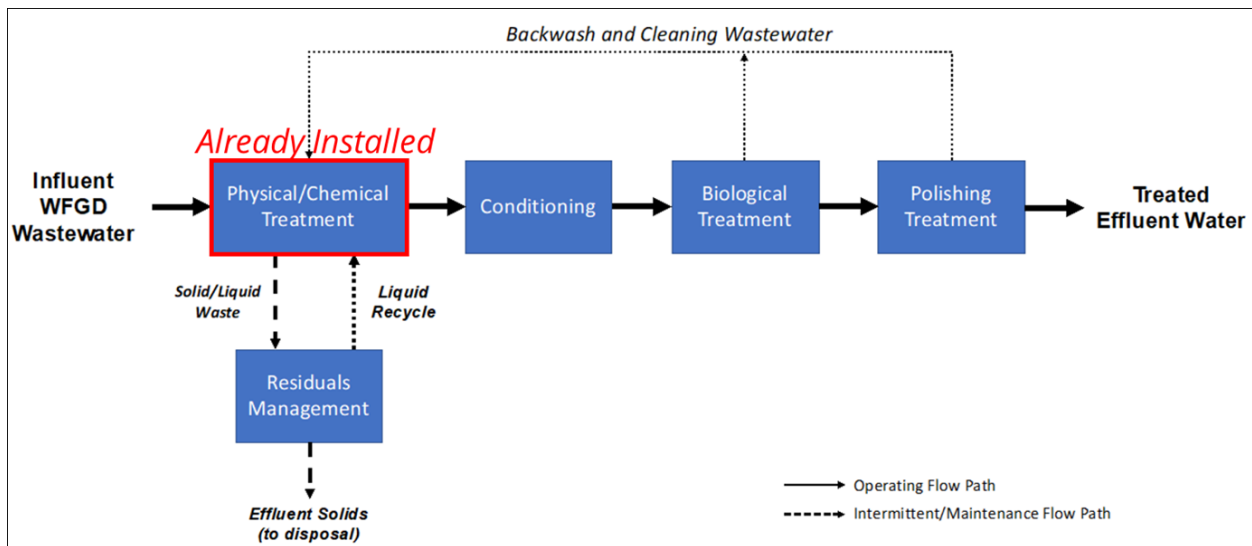
BATW – PE continues to work with OKEP to close punch list items and complete open remaining scope items that help reduce BATW water usage. These items include several smaller projects to minimize water intake into the reclaim tank in order to provide additional capacity for Bottom Ash water.

APPENDIX

ELG Water Treatment System Description – TC, MC, and GH

The ELG Rule requires the Companies to use the Best Available Technology Economically Achievable (“BAT”)⁹ to control particulate, metals, arsenic, mercury, selenium, and nitrates/nitrites. Current BAT technology is physical/chemical treatment plus biological treatment. The process water systems are physical/chemical systems designed to capture particulate and most metals; however, they are not designed to capture nitrates/nitrites and selenium. The levels of nitrate/nitrite and selenium capture required by the ELG Rule requires biological treatment of the process water treatment system’s effluent.

The first step in the biological treatment process is denitrification, which is the reduction in concentration of nitrates/nitrites through a biological process utilizing denitrification equipment. Effluent from the denitrification equipment is discharged to the first stage reactor, which is comprised of fiberglass vessels and internal reactor surfaces. The reactor contains living microorganisms, which are fed nutrients and convert the nitrates/nitrites and selenium molecules in an aerobic atmosphere, to an elemental form. Effluent from the first stage reactor flows into a second stage reactor, where additional biological processes reduce remaining selenium. The elemental form of selenium is transferred, via a backwash phase of the process, to the equalization tanks at the beginning of the process water treatment system for particulate removal. The second stage reactor feeds to an ultrafiltration (“UF”) system where remaining particulate metals are filtered out. The UF tank is then discharged to a series of clean water tanks, which can be used to backwash the biological and UF systems or be discharged. A “typical” flow diagram is shown below.



The majority of the mechanical and electrical systems will be constructed in a building for weather protection, whereas most of the biological process tanks will be located outside. The building houses the denitrification equipment, UF systems, effluent tanks, various pumps and support subsystems. The system also requires cleaning and chemical feed equipment, pumps, piping, valves, and electrical equipment.

⁹ 84 Fed. Reg. 64624.

Separate rooms must be constructed inside the treatment building to house battery systems and electrical equipment. A control room is also required, along with restrooms. The reactor area, including the vessels housing the microorganisms, will be constructed outside the building under a weather canopy. All of the tanks and reactors in the system must be large enough to handle the immense volume of water flowing through the effluent treatment process. In other words, the system must be sized commensurate with the process water treatment systems recently commissioned to enable treatment of the effluent of flow from the process water treatment systems.

Diffusers Description – GH and MC

The diffusers installed at GH and MC are large multi-port pipes that connect to the stations’ wastewater outfall pipe and are placed into the bottom of the Ohio River with the discharge ports above the riverbed and facing downstream. The pictures shown below provide a general concept of the GH diffuser, similar to the MC diffuser. As this graphic representatively shows, the diffuser is a single large discharge pipe that is installed in the riverbed. The diffuser ports face downstream to disperse the water out of multiple discharge ports instead of a single, larger point of discharge.

Ghent Outfall 001 Diffuser Concept

