

## 2020 ECR Plan Status Update Report Quarterly Report – Update #11 July 31, 2023

### Executive Summary:

#### General

This report covers LG&E and KU's ("Companies") progress on the 2020 Environmental Cost Recovery ("ECR") Plan through the second quarter of 2023. The Companies filed applications requesting approval on March 31, 2020<sup>1</sup> and received approval on September 29, 2020.

The 2020 ECR Plan safety performance through the second quarter of 2023 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 3.2.

Work to date continues to focus on delivery of equipment/materials and construction activities at all three stations: Trimble County ("TC"), Ghent ("GH"), and Mill Creek ("MC"). At all three sites, work has included installation of above ground piping and electrical conduit/cable; installation of process equipment and electrical gear; installation of fiberglass tanks; erection of pre-engineered buildings and associated interior walls and roof panels is completed; loop checks for the control wiring have started and will continue into next quarter along with start-up activities for Bottom Ash at Ghent.

As previously reported, the total 2020 ECR Plan projected cost of \$405.2 million (net)<sup>2</sup>, as provided in Case Nos. 2020-00060 (KU) and 2020-00061 (LG&E), was reduced to \$242.8 million (net)<sup>2</sup>. The total spend to date has increased from \$192.8 million (net)<sup>2</sup> last quarter to \$210.3 million (net)<sup>2</sup> through June 30, 2023.

#### Background

The Environmental Protection Agency's ("EPA") 2015 ELG Rule and amendments precipitated the need to construct Effluent Limitation Guidelines ("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

<sup>1</sup> Case No. 2020-00060 and Case No. 2020-00061

<sup>2</sup> 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.

would significantly impair the Companies’ ability to fulfill their mandate to provide adequate, efficient, 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<sup>3</sup>.

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.

In March 2023, the EPA released a proposed revision to the ELG Rule requiring membrane filtration followed by solidification, or thermal evaporation for zero discharge of FGD Waste Water; zero discharge of Bottom Ash Transport Water; new discharge standards for combustion residual leachate waters, and best professional judgement for regulation of legacy combustion waters. The proposal stipulates compliance as soon as possible, but no later than December 31, 2029. A final rule is anticipated in 2024.

**Schedules**

**FGD Process Water Treatment Facilities and Diffusers**

<b><u>Project</u></b>	<b><u>Project #</u></b>	<b><u>Awarded Contractor</u></b>	<b><u>Status</u></b> <sup>4</sup>	<b><u>Planned / Actual In-Service Date</u></b> <sup>5</sup>
Trimble County Effluent Limitations Guidelines Water Treatment System <sup>6</sup>	KU Project 44 LG&E Project 32	OKEP	Awarded March 15, 2021	December 2023
Mill Creek Effluent Limitations Guidelines Water Treatment System <sup>6</sup>	LG&E Project 31	OKEP	Awarded March 15, 2021	June 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 <sup>6</sup>	KU Project 43	OKEP	Awarded March 15, 2021	November 2024
Ghent Bottom Ash Transport Water Recirculation System <sup>7</sup>	KU Project 43	OKEP	Awarded March 15, 2021	December 2023
Ghent Outfall 001 Diffuser	KU Project 43	MAC Construction & Excavating	Awarded March 22, 2021	Placed in service December 2021

<sup>3</sup> 84 Fed. Reg. 64664.

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

<sup>5</sup> 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.

<sup>6</sup> ELG Equipment OEM: Frontier

<sup>7</sup> 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 TC and GH, work has included continued installation of above ground piping and electrical conduit/cable; installation of process equipment and electrical gear; installation of fiberglass tanks; heat tracing; Controls installation continues and startup has commenced on the bottom ash transport water project. At MC, work included completion of the ELG building, installation of skid equipment, and majority of process piping. Electrical work completed consisted of setting of switchgears, MCC’s, installing cable tray, and nearly half of conduit. All coatings for chemical containment areas, sump, battery room, and electric rooms is complete. The piling system for the Maintenance tank was installed.

Additionally, the scope of work for developing common and plant-specific training manuals and operation procedures was awarded to the same provider used for the TC, GH, and MC process water systems.

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 cost to implement these facilities remains at \$47.2 million (net)<sup>2</sup>, being allocated between KU and LG&E, with construction planned for completion in July 2023. This is allocated as KU’s 48 percent being \$22.7 million (Project 44) and LG&E’s 52 percent being \$24.5 million (Project 32) – both of these costs are net<sup>2</sup>.

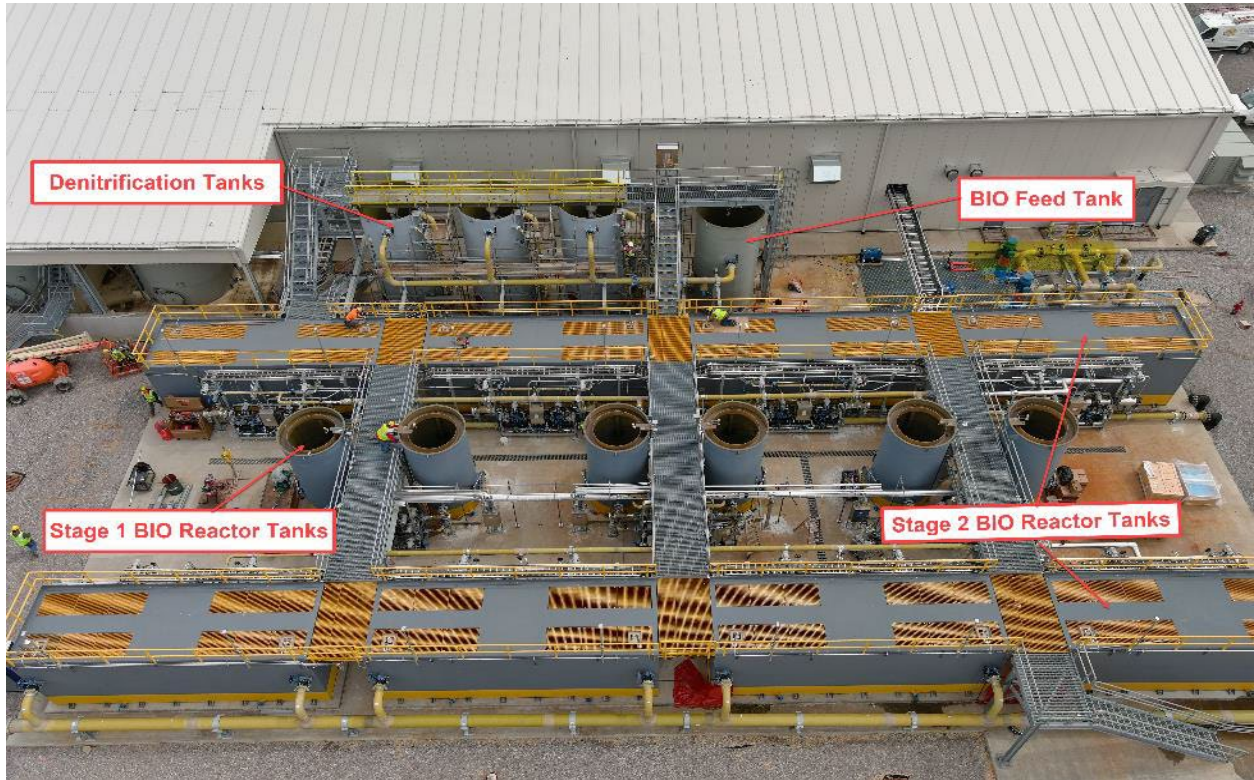
To streamline the review process and to take advantage of multiple internal resources, the TC project team continues to include the MC and GH project teams during all major reviews. This collaborative effort was implemented to minimize issues associated with the TC project, all while accelerating the review process on the subsequent projects.

## **ELG**

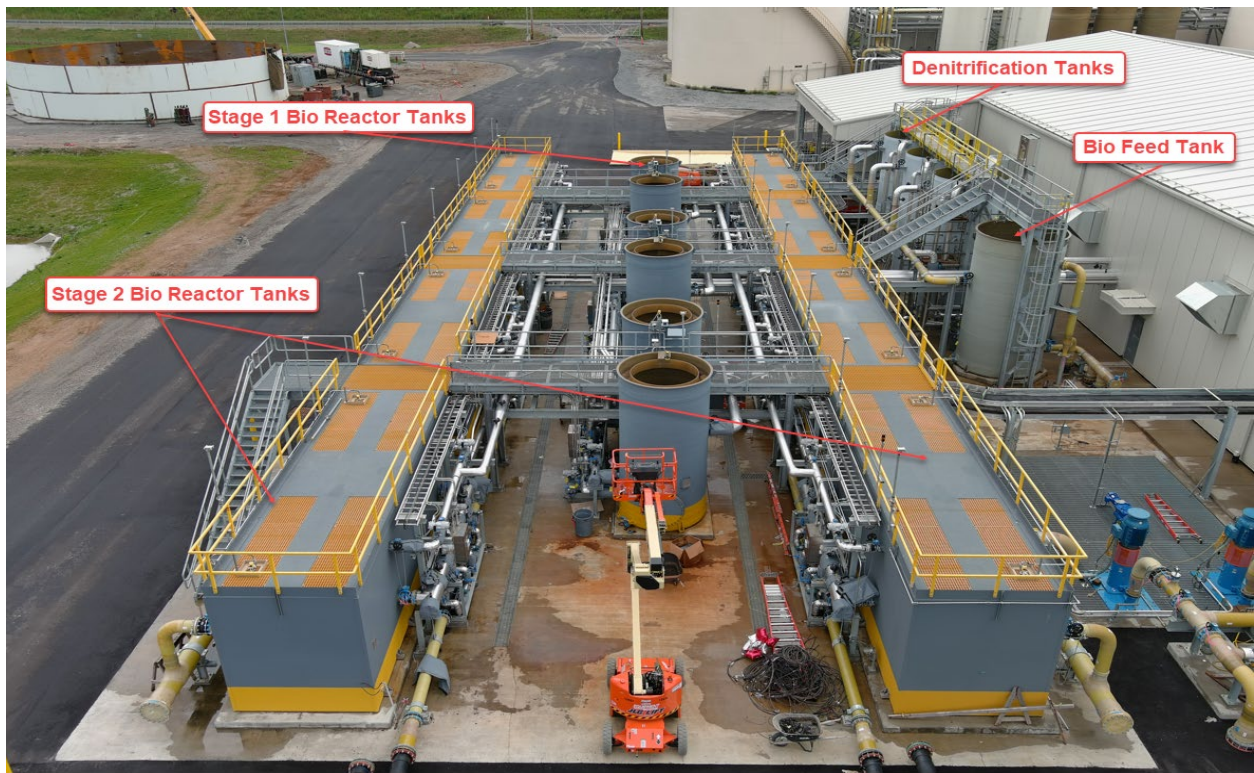
The ELG system is being constructed in close proximity to the recently completed process water treatment system (“PWS”). All facilities are being installed on land currently owned by KU and LG&E at the generating station. The system is designed to handle water flow capacity up to 750 gallons per minute.

Work completed during the second quarter of 2023 includes completion of the civil grade-work and site paving, electrical conduit and heat trace installations, installation of lab cabinets and casework; installation of the Maintenance Tank foundation submittal and review of various ELG project documents; and commercial and procurement activities.

The remaining engineering focus will be on final vendor package reviews and Maintenance Tank design work. Installation continues to progress for the above ground electrical cabling and cable terminations, which are nearing completion. OKEP’s commissioning team mobilized and began mechanical and electrical system checkouts, including such effort as motor bump and pump rotations, line flushing, and wiring loop checks, electrical gear and system energizations.



*Trimble County – ELG Water Treatment Location – April 2023*



*Trimble County – ELG Water Treatment Location – June 2023*

## **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 remains \$73.5 million as reported last quarter. 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**

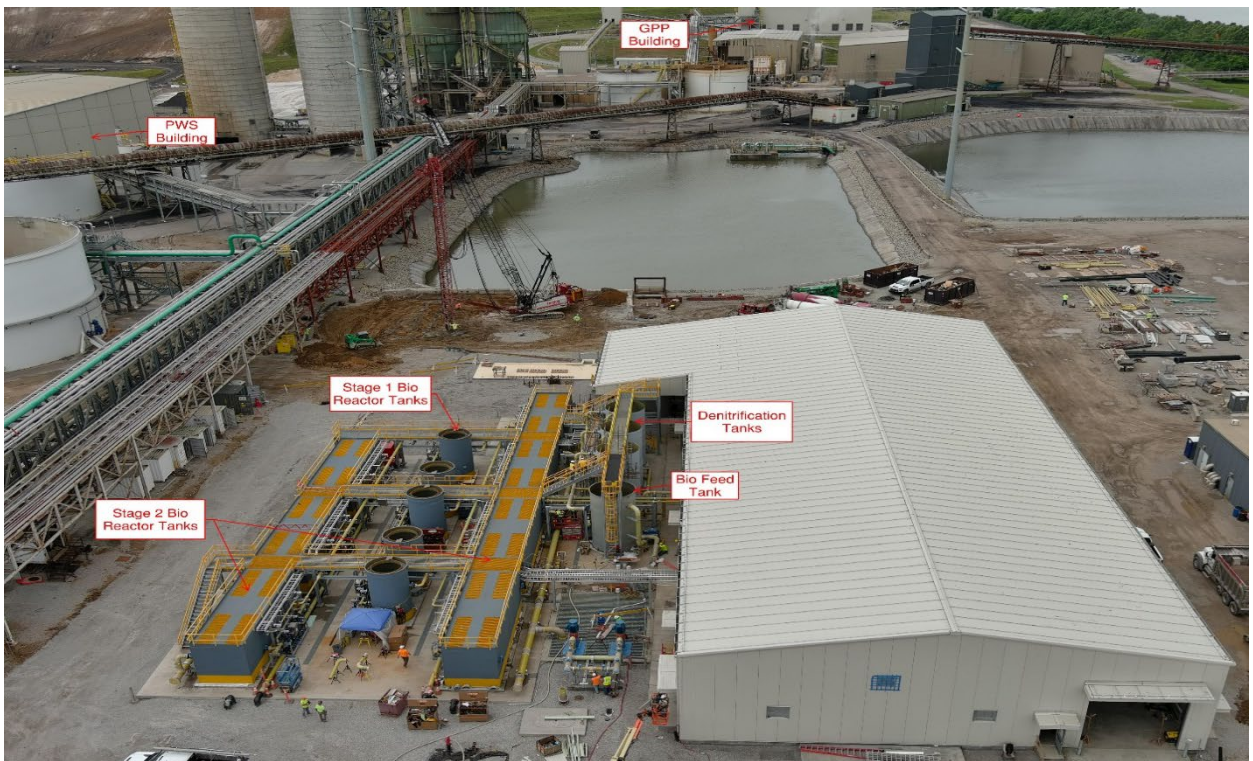
Work completed during the second quarter of 2023 includes continued participation in project technical, engineering, and construction meetings with OKEP; review of submittals and various project documents; commercial activities; and construction progress and schedule reviews. During the second quarter of 2023, OKEP completed the installation of the ELG building, installed the majority of process piping and completed testing, and began installing electrical equipment. Electrical work completed consists of setting switchgear, MCCs, installing cable tray, and approximately 40% of conduit has been installed. Subgrade has been prepared for asphalt which will be installed the first week of Q3. All coatings for chemical containments areas, the sump, battery room, and electrical room have been completed. The piling system for the Maintenance Tank was installed in June.

### **Diffuser**

The diffuser was installed in the Ohio River by Tetra Tech and placed into service in December 2021. Final completion was achieved during the fourth quarter of 2021. Tetra Tech was contracted to retire two decant lines that were abandoned as a result of the installation of the diffuser. Work commenced in June 2022 and was completed during July. The Construction Progress Report (“CPR”) was submitted to Kentucky Dam Safety, at their request, during the fourth quarter of 2022.



*Mill Creek – ELG Water Treatment – April 2023*



*Mill Creek – ELG Water Treatment – June 2023*

## **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 remains at \$128.7 million, with construction completed in the fourth quarter of 2021 for the diffuser and expected to be completed in December 2023 for the BATW recirculation system and November 2024 for the ELG water treatment system.

The ELG Rule requires that BATW be recirculated, instead of used once, to transport bottom ash and then discharged. The BATW recirculation system at GH consists of transfer tanks, low pressure pumps, high pressure pumps, piping, foundations, controls, and related equipment. This system will collect the bottom ash sluice water, after being dewatered from the bottom ash solids in the remote bottom ash dewatering facility and pump the water to collection tanks where the water will then be pumped back to the bottom ash removal systems underneath the four generating unit boilers to be used again for sluicing bottom ash to the remote dewatering facility. The water will be recirculated as necessary, with fresh water being added to replace evaporated water. A purge system, up to 10 percent of the volumetric discharge limit (on a 30-day rolling average) for BATW per the ELG Rule, will be included to control pH and other constituent buildup in the recirculation system.

The GH project team has engaged 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**

The ELG system is being constructed close to the process water treatment system. All facilities will be installed on land currently owned by KU at the generating station. The system is being designed to handle water flow capacity up to 1,000 gallons per minute.

In the second quarter of 2023, activities included attending technical, engineering, and construction meetings with OKEP, reviewing project documents, engaging in commercial activities, and monitoring construction progress and schedule. Onsite construction activities are ongoing and include the installation of above-ground piping, HVAC systems, electrical conduits, and cable trays in both the ELG building and Biological Area. Additionally, there is work being done on sump pit coatings and steel installation, process piping and conduit installation in the Biological area, Denitrification area, and within the ELG Building. OKEP has received materials for piping heat trace, electrical cable (power, controls, fiber, instrument),



raceway, and cable trays. Engineering work for the Maintenance Tank is also ongoing in preparation for future installation. Furthermore, OKEP has completed the installation of the ELG Building canopies and doors, all non-lined chemical piping in the ELG Building's interior pipe racks and within the chemical pump room, the above-ground instrument air piping, cable trays in the biological area, and setting of the ELG Building's switch gear, MCCs, transformer, and DCS Panels.

### **Bottom Ash Transport Water (“BATW”)**

During the second quarter of 2023, work continued on installation of outstanding control/electrical wiring, in addition to winding down mechanical installation activities near the high/low pressure pump locations with OKEP and United Conveyor Corporation. Engineering activities included completion of several project documents (manuals and start-up procedures) along with construction progress reports. Onsite construction activities focusing on the installation of electrical conduits and cable trays in the BATW Building and in/around the units. Work also involved the installation of the Submerged Flight Conveyor (“SFC”) sump and bypass pump, the flocculant chemical injection system, piping heat trace, insulation, and controls in the BATW and SFC Buildings. Additionally, OKEP successfully completed the installation of various components, including electrical connections to the Surge Tanks, low-pressure pumps, Unit 1 and Unit 4 high-pressure pumps, as well as piping to Unit 3 and Unit 4 high-pressure pumps. Tie-ins were made for the service and potable water systems, and the instrument air piping reroute has been finalized.

### **Diffuser**

The diffuser was installed and placed into service in the Ohio River by MAC Construction in December 2021.



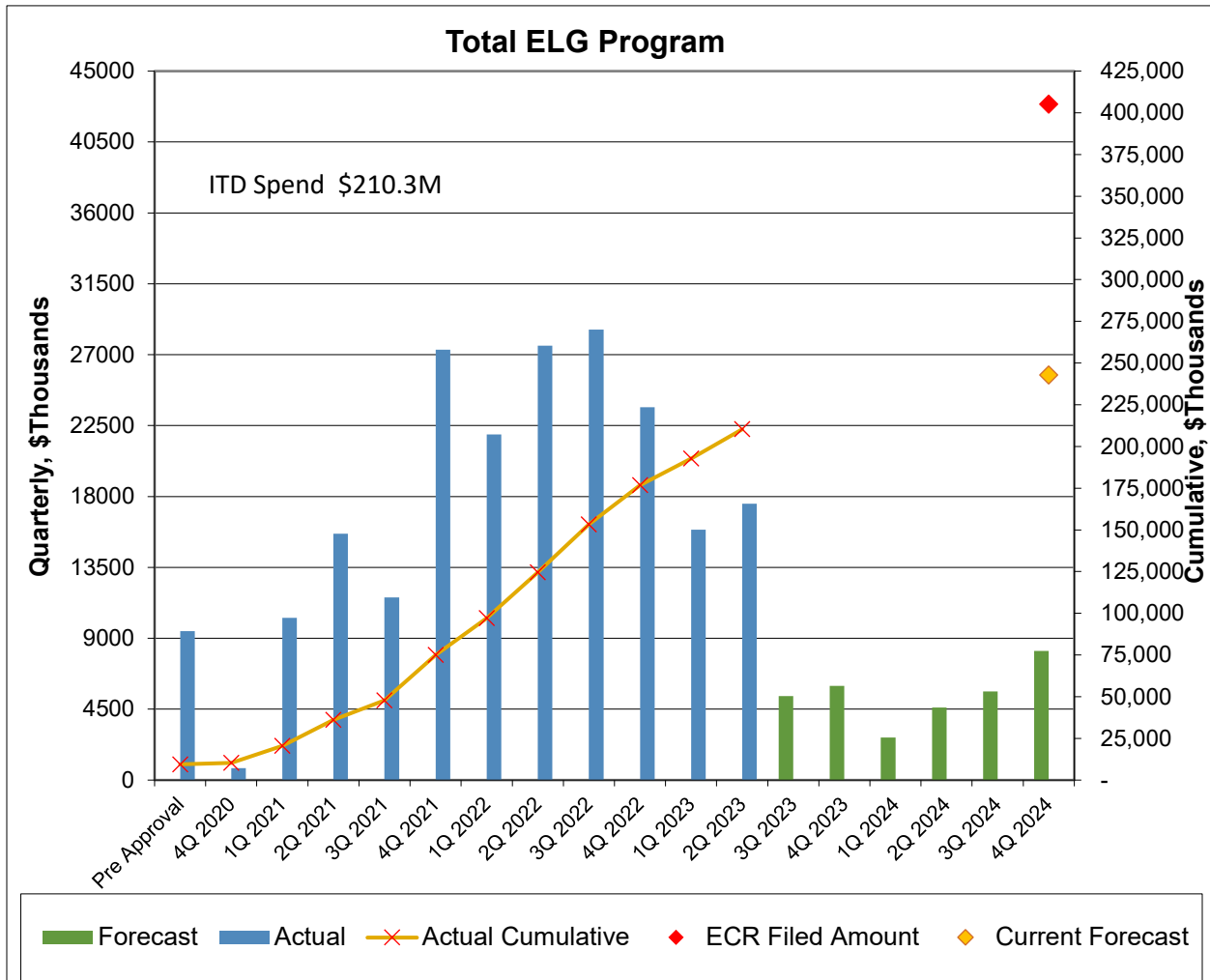
*Ghent – ELG Water Treatment – April 2023*



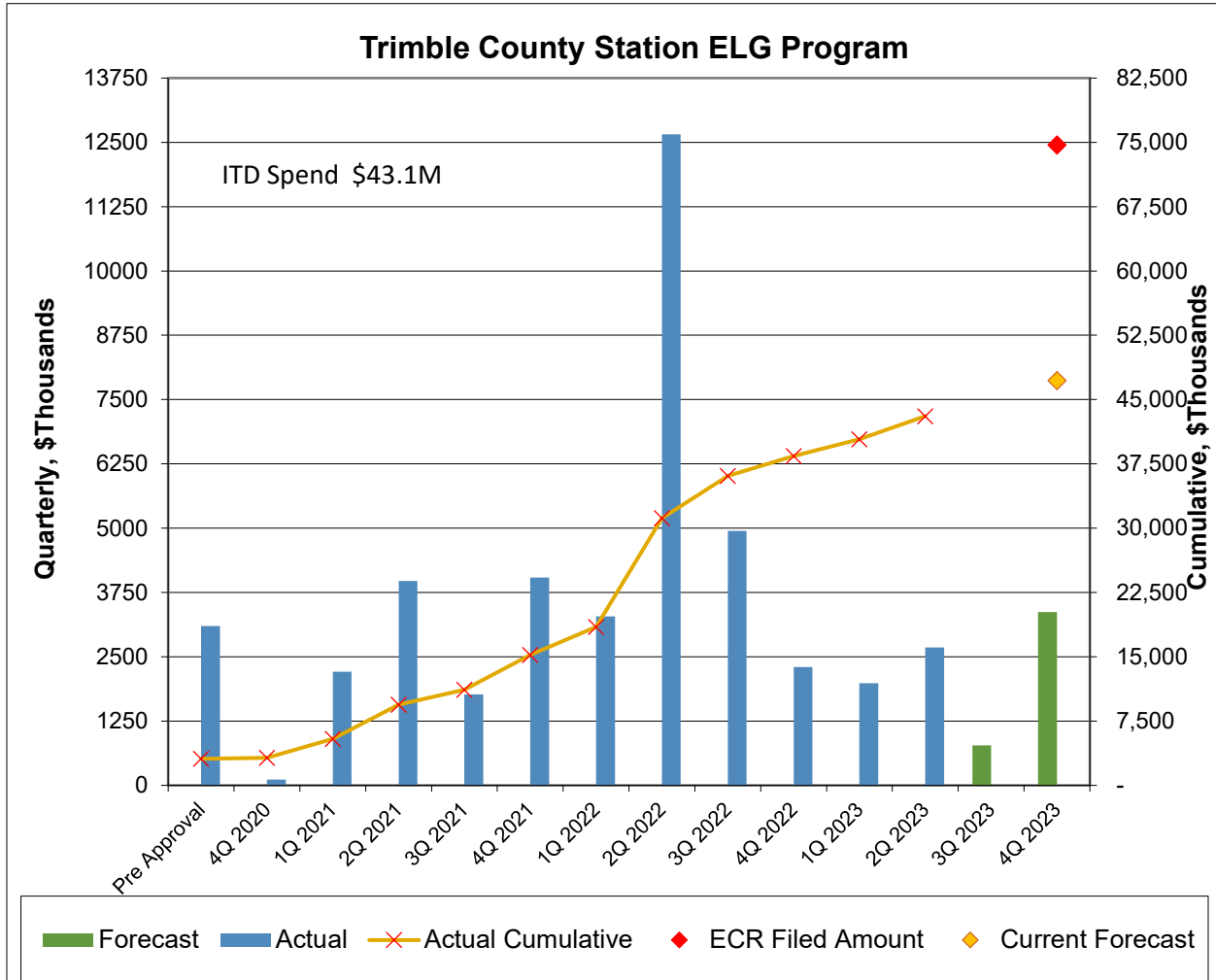
*Ghent – ELG Water Treatment – June 2023*

**Financials:**

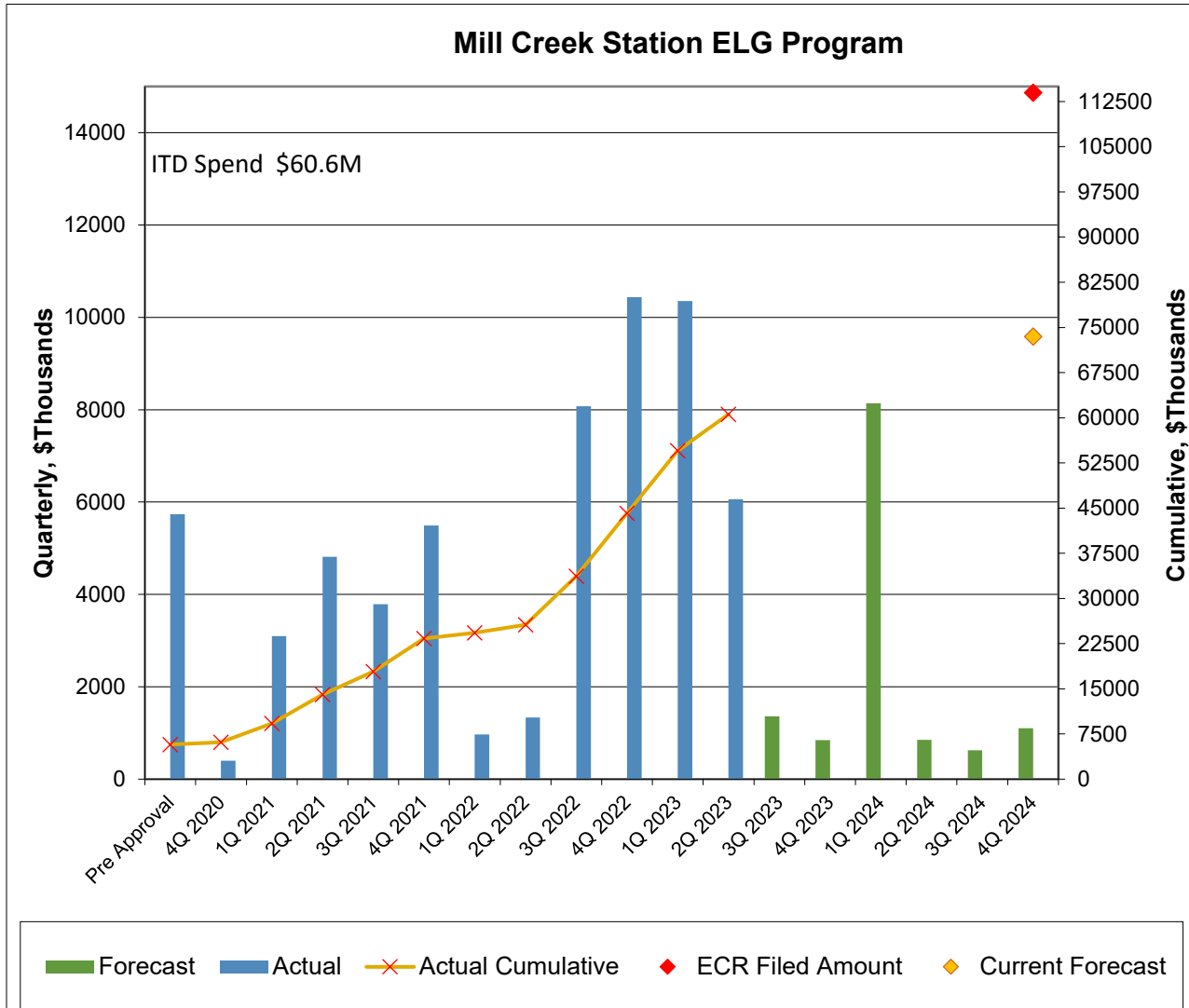
As previously reported, the total 2020 ELG Program forecasted cost was reduced from \$405.2 million, as filed, to \$242.8 million. Total spend increased from \$192.8 million (net)<sup>2</sup> to \$210.3 million (net)<sup>2</sup> through June 30, 2023. The graph below includes: 1) a symbol (◆) to show the current forecast to completion and 2) inception-to-date (“ITD”) Spend in the upper left of the chart.



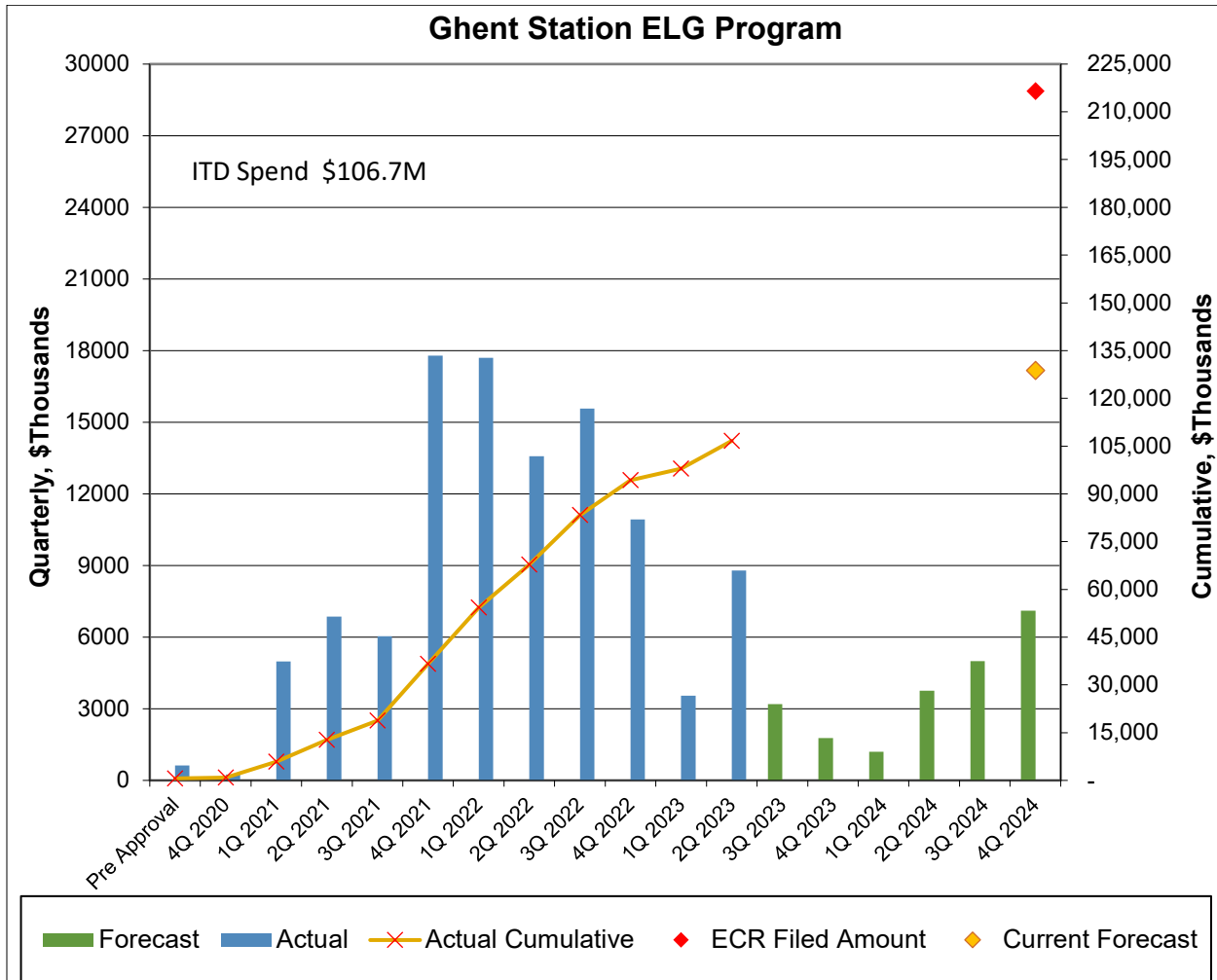
As previously reported, the total Trimble County Station ELG Program forecasted cost was reduced from \$74.7 million (net)<sup>2</sup>, as filed, to \$47.2 million (net)<sup>2</sup>. Total spend increased from \$40.4 million (net)<sup>2</sup> to \$43.1 million (net)<sup>2</sup> through June 30, 2023. 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.



As previously reported, the total Mill Creek Station ELG Program and Diffuser forecasted cost was reduced from \$114.0 million, as filed, to \$73.5 million. Total spend increased from \$54.5 million to \$60.6 million through June 30, 2023. 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.



As previously reported, the total Ghent Station ELG Program, BATW, and Diffuser forecasted cost was reduced from \$216.5 million, as filed, to \$128.7 million. Total spend increased from \$97.9 million to \$106.7 million through June 30, 2023. 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 construction will be substantially complete and subsystem packages will continue to be assembled for turnover to the startup team. OKEP startup will continue to perform subsystem commissioning. The ELG OEM will arrive on-site to assist OKEP in checkout and prepare to operate under water load. Turnover packages will continue to be assembled and as-built records will be drafted for review. Chemical deliveries are anticipated. LG&E and KU will continue to conduct meetings with OKEP to coordinate the ongoing commissioning of subsystems.

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

ELG – LG&E will continue to conduct meetings with OKEP to review construction progress of the project and to review project submittals, RFI's, and schedules. OKEP will complete installation of asphalt paving, potable water lines, fire protection and detection systems, HVAC system, maintenance and piping hydro and air testing. Remaining electric will be received and begin installed. DCS equipment will be delivered to the site, installation will begin, and software/hardware FAT will occur. Installation of conduit and cable tray will be nearly complete. Power, instrument, and control cables will begin to be pulled and landed in equipment, cabinets, and panels. Initial civil and mechanical punch lists will be walked down and recorded for areas of work completed.

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 – KU will maintain regular meetings with OKEP to assess the progress of the construction project. This will involve reviewing project submittals, RFIs, and schedules, as well as receiving the remaining components. Onsite construction activities will continue, including the installation of process equipment, above-ground chemical, and process piping, as well as piping heat trace and insulation. Additionally, OKEP will proceed with the installation of electrical conduits and cable trays in both the ELG building and Biological Area. OKEP is also planning to start site grade work in preparation for pouring the Maintenance Tank pad as the tank engineering phase nears completion.

BATW – OKEP will conduct safety reviews, commercial activities, and schedule reviews while continuing electrical and instrumentation installation throughout the quarter. The BATW sump pumps and Unit 1 and Unit 4 high-pressure pumps will be completed, while commissioning continues of the Unit 2 and Unit 3 high-pressure pumps and the BATW low-pressure pumps. OKEP will continue to install electrical conduits

and cable trays in the BATW building and around the units. Furthermore, work will continue in the BATW and SFC buildings, including the flocculant chemical system, SFC sump and bypass pumps.

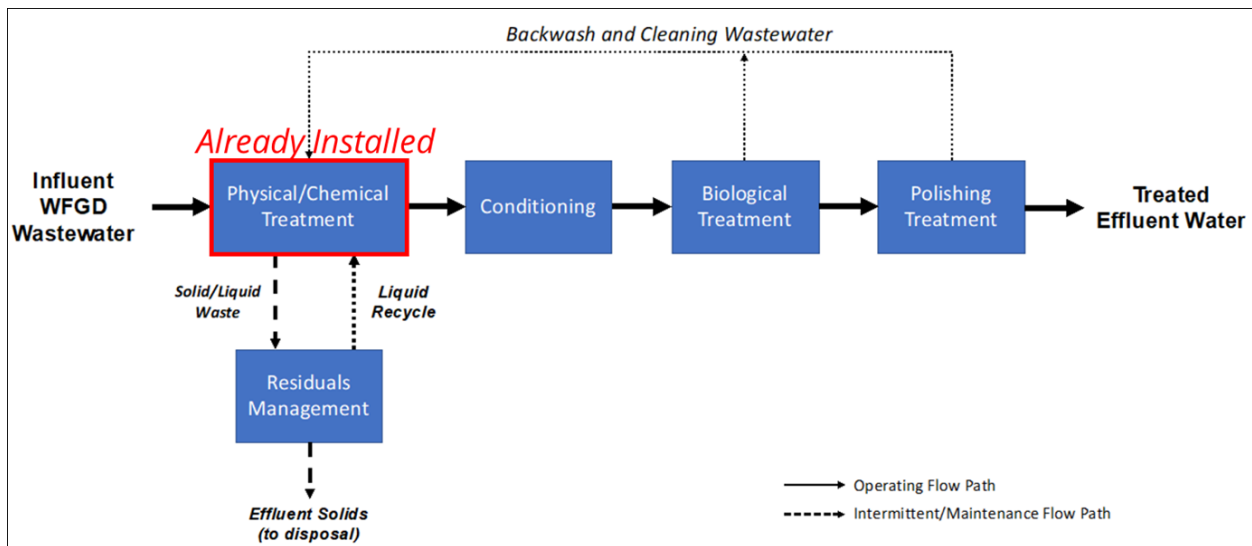


## APPENDIX

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

The ELG Rule requires the Companies to use the Best Available Technology Economically Achievable (“BAT”)<sup>8</sup> 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.

<sup>8</sup> 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 planned to be 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, which will be similar to the proposed 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

