

2020 ECR Plan Status Update Report Quarterly Report – Update #10 May 1, 2023

Executive Summary:

General

This report covers LG&E and KU’s (“Companies”) progress on the 2020 Environmental Cost Recovery (“ECR”) Plan through the first quarter of 2023. The Companies filed applications requesting approval on March 31, 2020¹ and received approval on September 29, 2020.

The 2020 ECR Plan safety performance through the first 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 engineering, procurement and delivery of equipment/materials 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; installation of fiberglass tanks; erection of pre-engineered buildings and associated interior walls and roof panels; controls factory acceptance testing occurred on the bottom ash transport water project.

As previously reported, 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), was reduced to \$242.8 million (net)². The total spend to date has increased from \$176.9 million (net)² last quarter to \$192.8 million (net)² through March 31, 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

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.

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, 2025³.

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

| <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 | August 2023 |
| Mill Creek Effluent Limitations Guidelines Water Treatment System ⁶ | 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 ⁶ | KU Project 43 | OKEP | Awarded March 15, 2021 | November 2024 |
| Ghent Bottom Ash Transport Water Recirculation System ⁷ | 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 |

³ 84 Fed. Reg. 64664.

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). 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. Work to date has focused on engineering at all three stations and procurement and delivery of equipment/materials. At TC and GH, work has included installation of above ground piping and electrical conduit/cable; installation of process equipment; installation of fiberglass tanks; erection of pre-engineered buildings and associated interior walls and roof panels; controls factory acceptance testing occurred on the bottom ash transport water project. At MC, work included excavation and installation of underground piping and duct banks, installation of a concrete sump, ELG building foundation, and erection of ELG building components.

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)², 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 net².

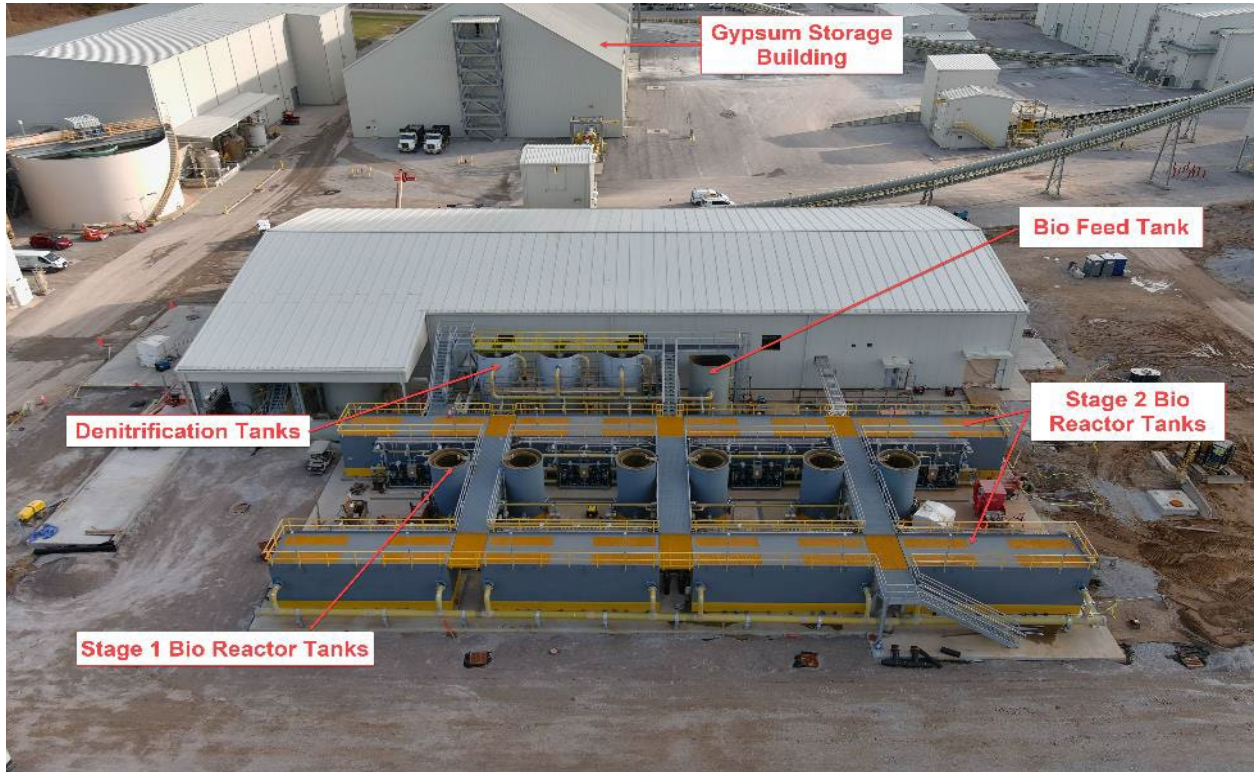
To streamline the review process and to take advantage of multiple internal resources, the TC project team continues to include the MC and GH project teams during all major reviews. This collaborative effort was implemented to minimize issues associated with the TC project, all while accelerating the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

ELG

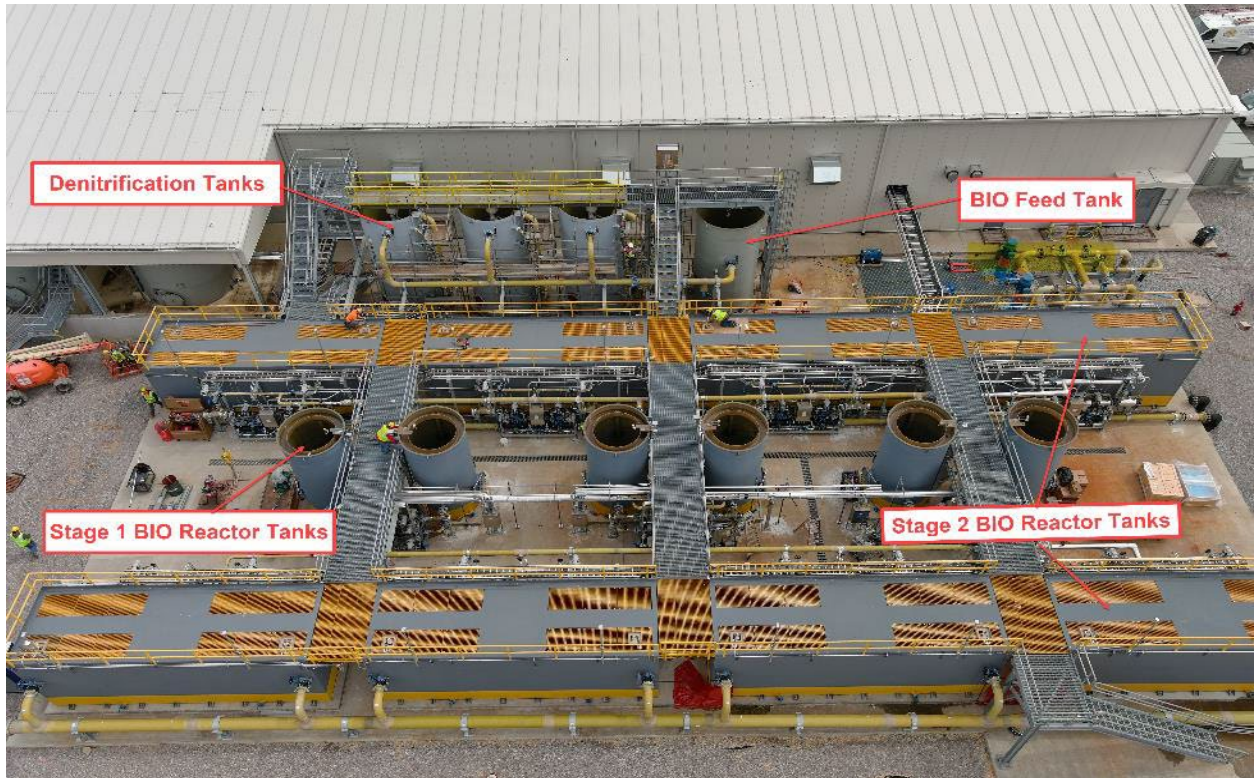
The ELG system is being constructed close to the recently-completed process water treatment system (“PWS”). All facilities will be installed on land currently owned by KU and LG&E at the generating station. The system is being designed to handle water flow capacity up to 750 gallons per minute.

Work completed during the first quarter of 2023 includes completion of the civil, structural, mechanical, piping, and electrical design base scope work; submittal and review of various ELG project documents; and commercial and procurement activities.

The remaining engineering focus will be on construction team support, final vendor package reviews and Maintenance Tank design work. OKEP’s onsite construction activities during the first quarter of 2023 included design, mobilization, site grade work, and concrete pad installation of the ELG Maintenance Tank; and completion of electrical cable tray installation. Installation continues to progress for the above ground electrical conduit, electrical equipment, wire pulls, as well as installation of process piping heat trace and insulation, and supports.



Trimble County – ELG Water Treatment Location – December 2022



Trimble County – ELG Water Treatment Location – April 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 first 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. Remaining tanks and skid equipment were delivered and received by OKEP at the jobsite. During the first quarter of 2023, OKEP completed the installation of the stormwater drainage system and connection to the Station’s service water system. Remaining concrete equipment pads and the concrete chemical unloading slab and sump were poured. Chemical and electrical room roofs were completed with the installation of precast planks and grouting of joints. All exterior and interior ELG building tanks and skids were installed and piping work commenced. ELG building steel was erected with siding completed. Roof panel installation began in late March. In the Biological Area, pipe rack steel was set along with platforms and stairs to provide for access to first and second stage bioreactors. Concrete coatings in the nutrient and hydrogen peroxide tank containment areas were installed. Electrical conduit and trays installation commenced.

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 – December 2022



Mill Creek – ELG Water Treatment – April 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 first 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 at GH, work involved installing the stormwater drainage and production well water systems, connecting to the Station’s service water system, and installing siding, roofing, and doors on the ELG building, as well as pouring concrete equipment pads, a chemical unloading slab, and the building sump. Interior and exterior ELG building tanks and equipment skids were installed, and piping work and grading around the building commenced. In the biological area, pipe rack steel was set with

platforms and stairs to access bioreactors. Concrete coatings were installed in nutrient and hydrogen peroxide tank containment areas. Motor control centers and switchgear were set in the ELG electrical room, and cable tray installation continues.

Bottom Ash Transport Water (“BATW”)

During the first quarter of 2023, work continued on technical, engineering, and construction projects with OKEP and United Conveyor Corporation. Additionally, there were commercial activities and reviews of project documents and construction progress. Onsite, work included installation of siding, roofing, and doors on the BATW building and electrical room, pouring of the remaining concrete equipment pads and exterior building sump, and continuing piping work and final grading. OKEP completed installation of the BATW building Surge Tanks and interior equipment skids, and is continuing work on BATW system DCS control logic. The installation of the BATW transport piping and the construction of the BATW pump building is complete, and progress is being made on above ground electrical conduit and cable, installing electrical equipment in the BATW building, and the low pressure recirculation pumps, as well as high pressure pumps in Unit 1 and Unit 4.

Diffuser

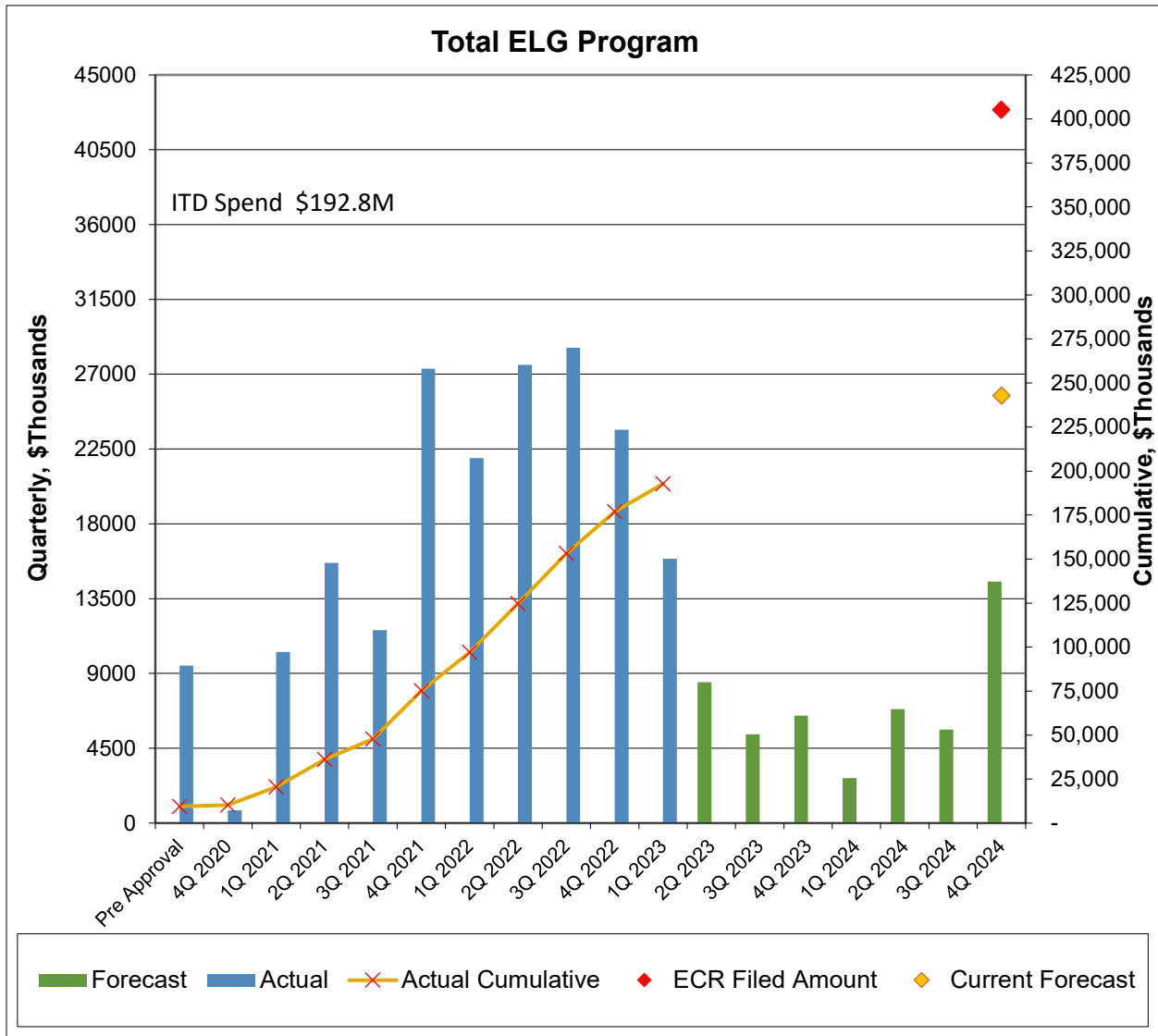
The diffuser was installed and placed into service in the Ohio River by MAC Construction in December 2021.



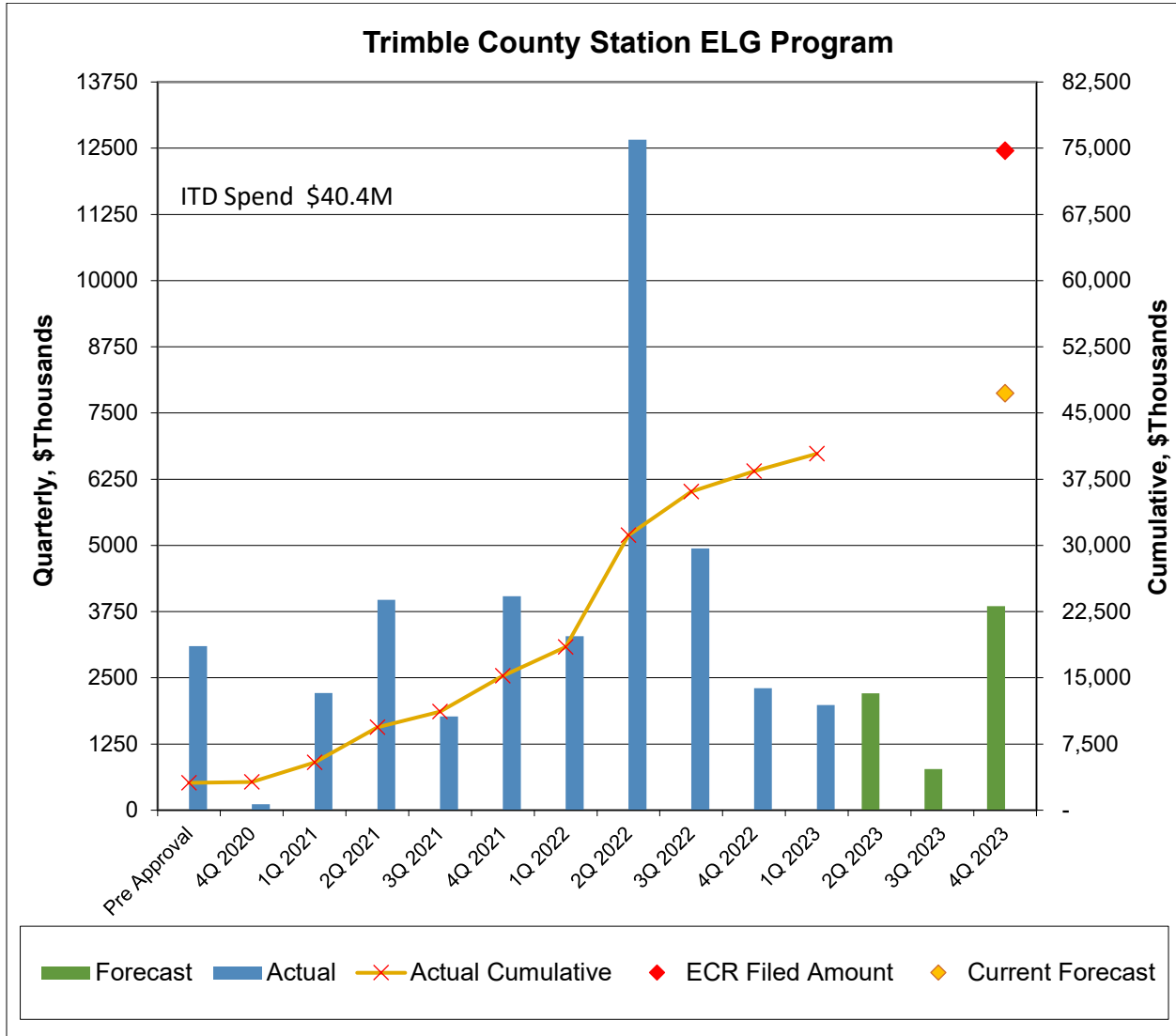
Ghent – ELG Water Treatment – April 2023

Financials:

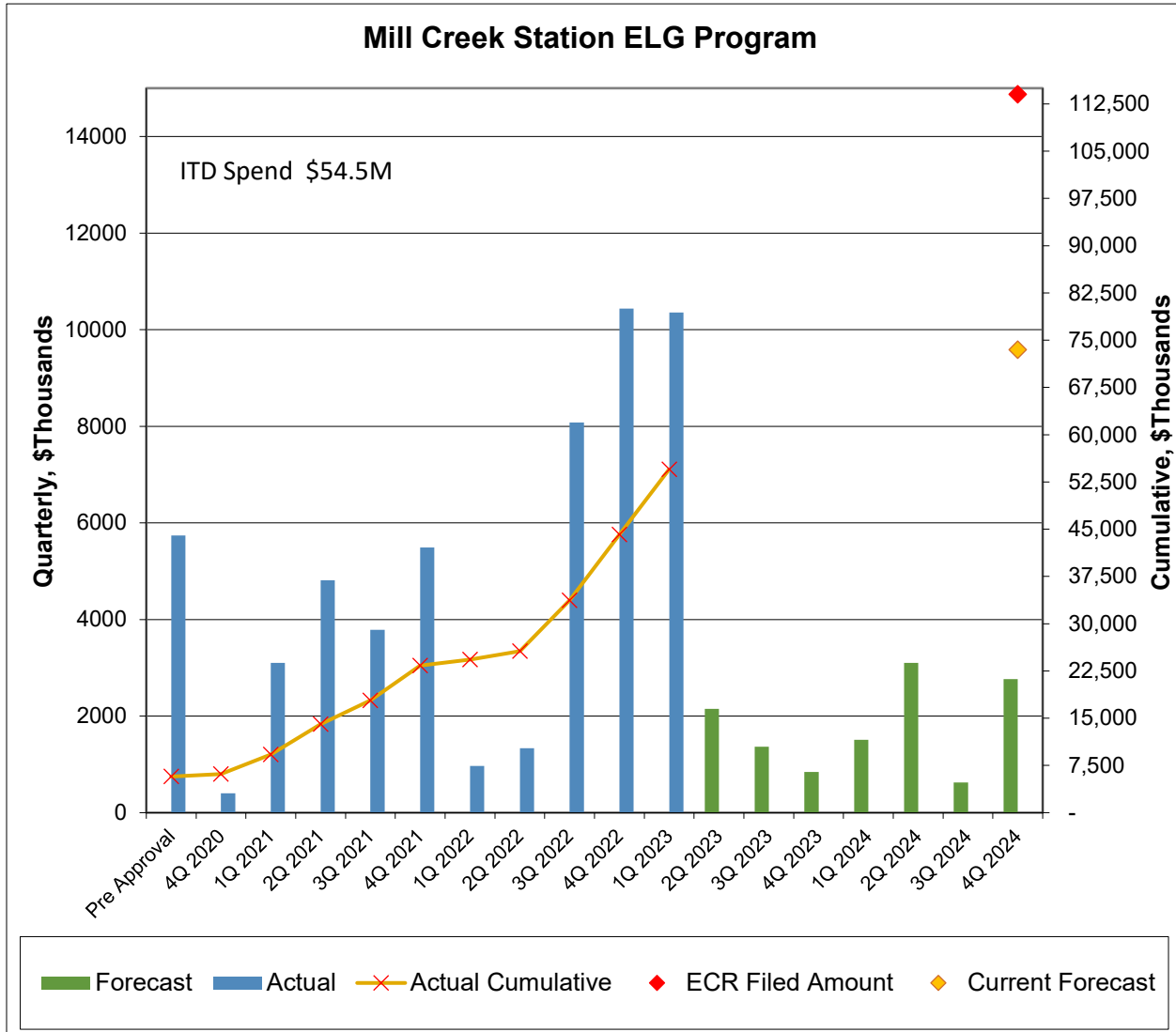
As previously reported, the total 2020 ELG Program forecasted cost was reduced from \$405.2 million, as filed, to \$242.8 million. Total spend increased from \$176.9 million (net)² to \$192.8 million (net)² through March 31, 2023. The graph below includes: 1) a symbol (◆) to show the current forecast to completion and 2) inception-to-date (“ITD”) Spend in the upper left of the chart.



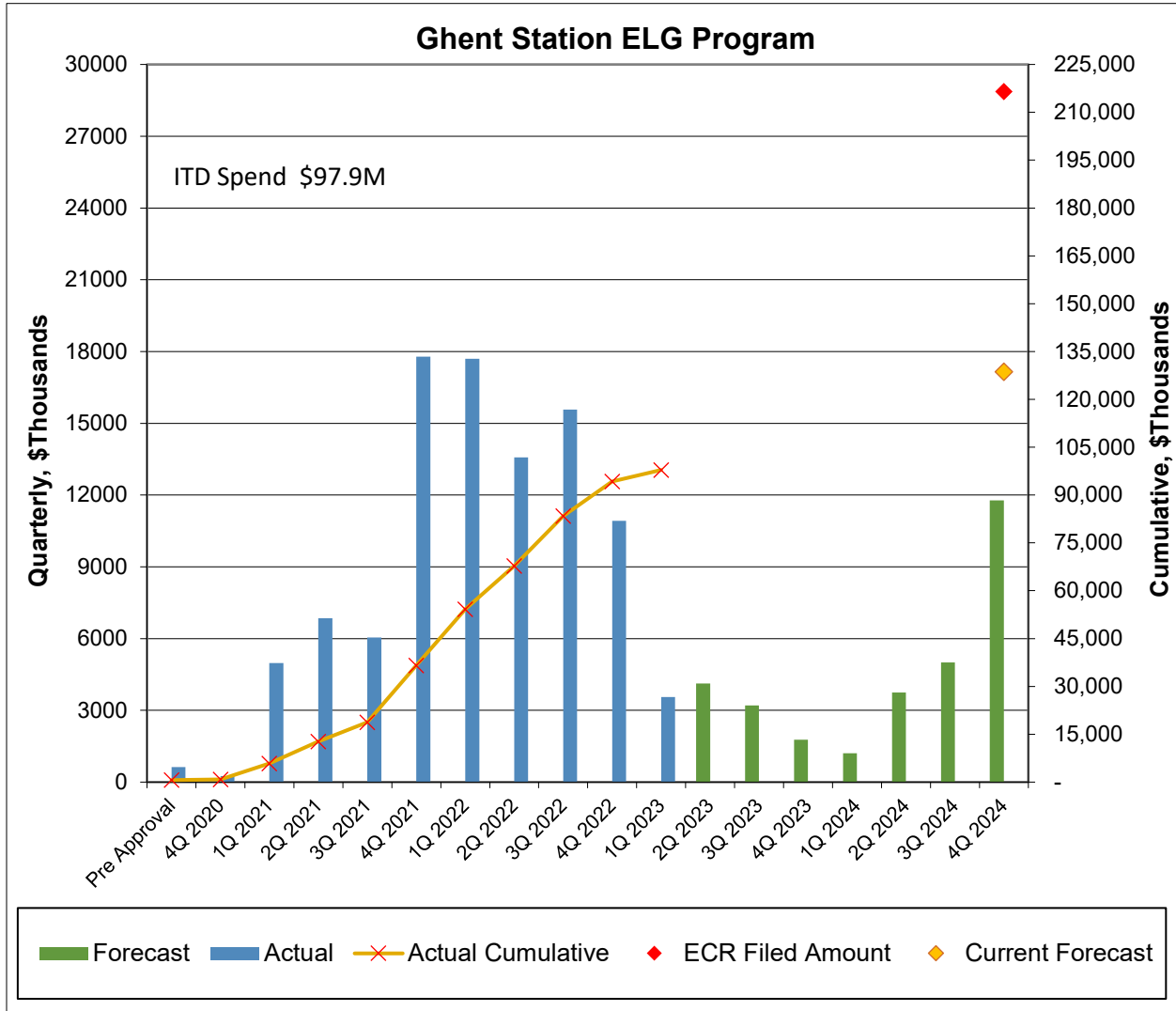
As previously reported, the total Trimble County Station ELG Program forecasted cost was reduced from \$74.7 million (net)², as filed, to \$47.2 million (net)². Total spend increased from \$38.4 million (net)² to \$40.4 million (net)² through March 31, 2023. The graph below includes: 1) a symbol (◆) 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 \$44.2 million to \$54.5 million through March 31, 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 \$94.3 million to \$97.9 million through March 31, 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 – All major electrical system components are anticipated to be onsite and installation work will follow. OKEP will continue wiring the electrical room and pulling power/control cable into cable tray and conduit. Above ground piping should be complete and several subsystems will have been turned over from construction to start-up. LG&E and KU will continue to conduct meetings with OKEP to coordinate the start of commissioning 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 the roof, gutters, and doors of the ELG building. They will continue with installation of piping, electrical conduits, and cable tray both in the ELG building and the Biological Area. Work will continue in the sump area with installation of coatings and steel. The electrical room will be painted, doors installed, and climate controlled such that electrical equipment can begin to be set. Engineering work for the maintenance tank will continue with piling work beginning in June. Grading work will begin in preparation for asphalt paving.

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 evaluate the progress of the construction project. This will involve reviewing project submittals, RFI's, and schedules, as well as continuing the delivery of major components. Onsite construction activities will also be ongoing, such as the installation of above-ground piping, HVAC, and process equipment. OKEP will continue to install electrical conduits and cable trays in both the ELG building and Biological Area. Additionally, work will continue in the sump area with the application of coatings and steel installation. Engineering work for the maintenance tank will also persist in preparation for future installation.

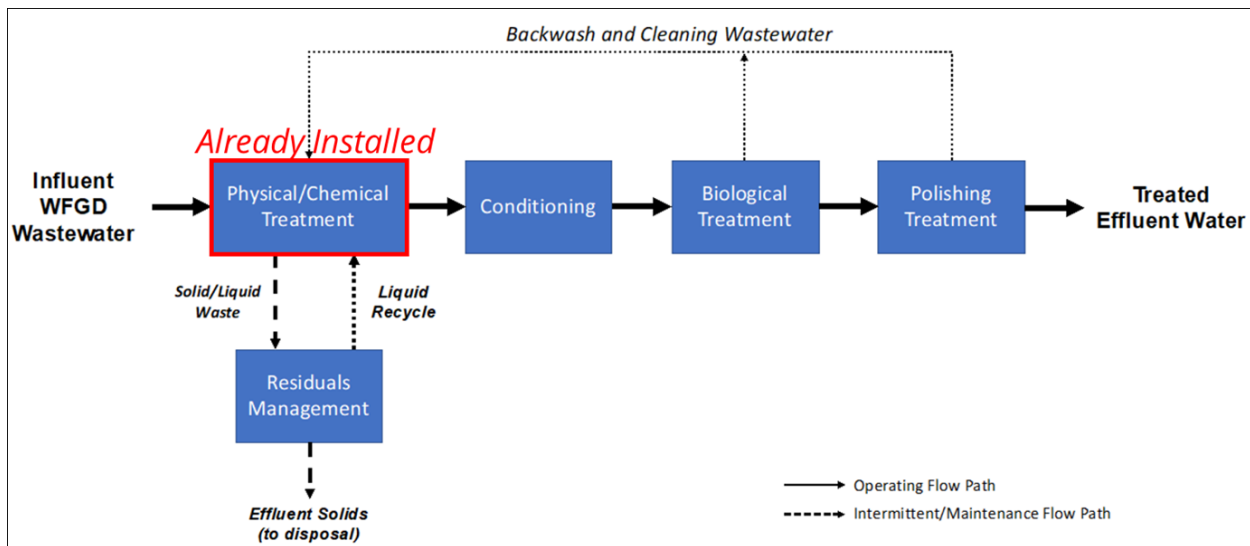
BATW – The Companies will conduct safety reviews, commercial activities, and schedule reviews while continuing electrical and instrumentation installation throughout the quarter. The BATW sump pumps and Unit 1 and Unit 4 high-pressure pumps will be nearing completion, while the commissioning of the Unit 2 and Unit 3 high-pressure pumps and the BATW low-pressure pumps will begin. 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, as well as piping heat trace, insulation, and controls.

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”)⁸ 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

⁸ 84 Fed. Reg. 64624.

also requires cleaning and chemical feed equipment, pumps, piping, valves, and electrical equipment. 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

