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Missouri Public Service Commission

Direct Testimony

of

Jacob Freeman

On Behalf of

Confluence Rivers Utility Operating Company, Inc

December 21, 2022

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DIRECT TESTIMONY OF
JACOB FREEMAN
CONFLUENCE RIVERS UTILITY OPERATING COMPANY, INC.

I. WITNESS INTRODUCTION

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is Jacob Freeman. My business address is 1630 Des Peres Road, Suite 140, St. Louis, Missouri, 63131.

Q. BY WHOM ARE YOU EMPLOYED AND IN WHAT CAPACITY?

A. I am Director of Engineering for CSWR, LLC ("CSWR"), the affiliated company responsible for providing management services and oversight to Confluence Rivers Utility Operating Company, LLC ("Confluence Rivers" or "Company") and all its affiliated utility operating companies. More specifically, I oversee all engineering, surveying, and facility construction for all newly acquired CSWR-affiliated water and wastewater utilities. I also oversee ongoing capital upgrades for all CSWR-affiliated facilities.

Q. ON WHOSE BEHALF ARE YOU FILING THIS DIRECT TESTIMONY?

A. I am filing on behalf of Confluence Rivers, which is a subsidiary of CSWR, LLC.

Q. HAVE YOU PREVIOUSLY FILED TESTIMONY BEFORE THIS COMMISSION?

A. I have not testified before the Missouri Public Service Commission ("Commission"). I have testified before the Louisiana, Kentucky, and Mississippi state utility commissions.

Q. PLEASE DESCRIBE YOUR EDUCATIONAL AND PROFESSIONAL BACKGROUND.

A. I hold a Bachelor of Science degree in Mechanical Engineering from the University of Missouri - Columbia. I am a licensed Professional Engineer in the states of Missouri, Illinois, and Kansas.

Before joining CSWR in January 2019, I was employed for two years by Corrigan Mechanical, a design-build mechanical contractor in St. Louis, Missouri. In that position my responsibilities included designing, estimating, and managing plumbing, HVAC, and process piping construction projects in Missouri and southern Illinois. After leaving that position, I spent eleven years performing similar tasks for Brotcke Well & Pump, one of the Midwest's largest well and pump service contractors, servicing wells and water treatment equipment throughout Missouri, Illinois, Kentucky, and Kansas. Immediately prior to leaving Brotcke, I served as Vice President and Principal in charge of all the company's engineering services. I also managed Brotcke's regional office in Kansas City, Missouri.

Q. WHAT IS THE PURPOSE OF YOUR DIRECT TESTIMONY IN THIS PROCEEDING?

A. In his direct testimony, Josiah Cox, the President of Confluence Rivers and CSWR, generally describes the condition at closing of the Missouri systems that Confluence Rivers has acquired. My testimony is designed to supplement Mr. Cox's testimony by describing in greater detail the nature of the problems confronted by Confluence Rivers associated with its more recent acquisitions and the steps that it has taken to resolve those problems. To this end, I will provide specific examples of water and wastewater systems that Confluence Rivers has acquired, including the condition of such systems when they were acquired by Confluence Rivers. I will also detail the measures that Confluence

Rivers has taken, to date, to begin resolving the problems with those systems as well as the measures that Confluence Rivers plans to take moving forward. Finally, I will provide, for the different categories of water and wastewater systems that Confluence Rivers has acquired, a more generalized overview of the problems that Confluence Rivers has routinely confronted.

Q. IN THE COURSE OF ADDRESSING COMPLIANCE PROBLEMS, DOES CONFLUENCE RIVERS CONSULT WITH THE MISSOURI DEPARTMENT OF NATURAL RESOURCES?

A. Yes. Even before Confluence Rivers begins actual operations at individual systems in Missouri, it engages with the Missouri Department of Natural Resources ("DNR") to: (1) identify current problems at the water and wastewater facilities that it seeks to acquire, (2) set out the remedial measures necessary to bring those facilities into compliance, and (3) establish a schedule for completing this remediation. Given the constructive relationship that Confluence Rivers has with the DNR, compliance agreements have been arranged for all the currently owned facilities specifying the short- and longer-term steps Confluence Rivers will take to bring each of those facilities into compliance. These agreements begin with an assessment conducted by a third-party engineering partner which identifies basic improvements that should be made. Should the facility have complex compliance issues or require more significant improvements to achieve compliance, a facility report is submitted to DNR, which includes reporting milestones for bringing the facility into compliance. Confluence Rivers expects to continue to enter into similar agreements with DNR for all future water and wastewater facilities acquired in Missouri.

II. CONFLUENCE RIVERS SCOPE OF OPERATIONS

Q. WHAT IS THE SCOPE OF CONFLUENCE RIVERS' OPERATIONS IN MISSOURI?

A. Confluence Rivers acquired its first system in Missouri in 2016, when it acquired the Hillcrest wastewater system in Cape Girardeau County.[1] Since that time, Confluence Rivers, through its various predecessor companies, has acquired a total of 26 drinking water systems and 42 wastewater systems in Missouri.

In the following section, I will provide detailed examples of the multitude of compliance and operational problems that Confluence Rivers has encountered with the systems that it has acquired since its last Missouri rate case. Specifically, through references to such recently acquired systems, I will discuss Confluence Rivers' experience with: (1) lagoon wastewater facilities (Freeman Hills and the three-cell and single-cell lagoons at Terre du Lac); (2) activated sludge wastewater facilities (Chelsea Rose, the Terre du Lac Oxidation Ditch and Glenmeadows); (3) recirculating sand filter facilities (Cedar Glen and Cimarron Bay); and (4) groundwater drinking water systems (Eagle Woods; Port Perry, Terre du Lac and Glenmeadows). Following those specific examples, I will then address in a broader more generalized fashion many of the problems that Confluence Rivers encounters when it acquires water and wastewater systems.

[1] Confluence Rivers is the surviving entity of a merger that closed on February 9, 2022. Pursuant to that merger, Confluence Rivers Utility Operating Company; Hillcrest Utility Operating Company; Elm Hills Utility Operating Company, Osage Utility Operating Company; Raccoon Creek Utility Operating Company; and Indian Hills Utility Operating Company were merged into Confluence Rivers. The first acquisition was made by Hillcrest Utility Operating Company on March 15, 2015.

III. SPECIFIC SYSTEMS

A. Lagoon Wastewater Systems

1. FREEMAN HILLS

Q. PLEASE DESCRIBE THE CONDITION OF THE FREEMAN HILLS LAGOON WASTEWATER SYSTEM AT THE TIME THAT IT WAS ACQUIRED.

A. The Freeman Hills Lagoon is a small three-cell lagoon wastewater treatment facility located near Mexico, MO (Audrain County) serving sixteen single family homes. The system is a facultative lagoon treatment system with no aeration and consists of a large primary cell followed by two smaller cells. There was no form of disinfection installed on the system at the time of acquisition. This is not surprising in that originally, there were no limits established related to disinfection for the facility and system discharge went directly from the terminal third cell into the receiving waters. That said, however, disinfection became necessary following the renewal of the discharge permit shortly after Confluence Rivers closed on the system.

In general terms, the system was in satisfactory physical condition at the time of acquisition. That said, several issues were obvious with the system. The lagoon berms had been rocked with rip rap to help prevent varmint damage to the berms which could potentially cause berm leaks. Nevertheless, vegetation had grown through the rock and, due to poor system maintenance, had become overgrown around the lagoon berms. Basic system maintenance should be done to prevent such vegetation as it could result in berm damage. Similarly, all three lagoon cells were covered in duckweed, indicating low levels of dissolved oxygen in the lagoon cells and therefore poor wastewater treatment.

Typical condition of berms and duckweed layer on lagoon surface

The facility fencing was composed of hog-wire with two strands of barbed wire at the top. Some portions of the fence were in poor condition and had not been repaired, with barbed wire hanging and the fence sagging or leaning over in some locations. One of the access gates was also failing as the supporting fence post had fallen over allowing the gate and fence to topple. These issues compromise site security, potentially exposing any trespassers to wastewater and/or treatment equipment.

Examples of fence damage in need of repair

There were also erosion issues at the transfer pipes between the cells as well as at the lagoon outlet. This erosion allowed wastewater flow around the transfer structure and scouring out soil instead of flowing through the transfer and outlet pipes. Thus, such erosion can result in sanitary sewage overflows ("SSO") releasing untreated or partially treated wastewater into the environment.

Erosion behind transfer pipe

Notwithstanding all of these structural issues, the system is not capable of meeting permitted limits without process improvements. The facility has occasionally struggled to comply with total suspended solids ("TSS") indicating that inadequate

contact time is occurring resulting from reduced lagoon cell capacity due to sludge accumulation. Without additional treatment processes sludge will continue to accumulate at a rate faster than it breaks down, therefore requiring sludge hauling to restore settling time. The lagoon system has also continuously violated *E.coli* limits since the implementation of limits during the permit renewal process. The failure to meet *E.coli* limits results from the previously discussed absence of a disinfection system. Finally, the system is also not capable of treating to ammonia limits. Process improvements are required for the system to achieve compliance with each of these permit requirements and to provide safe and reliable wastewater treatment.

Q. WHAT IMPROVEMENTS HAS CONFLUENCE RIVERS MADE AT THE FREEMAN HILLS SYSTEM?

A. Recognizing the generally satisfactory physical condition of the system when it was acquired, basic improvements consisted largely of facility cleanup. Beyond such basic improvements, design work and permit renewal have also been completed and an improvement project recently awarded to a contractor to complete process improvements at the facility.

Q. WHAT PROCESS IMPROVEMENTS ARE PLANNED FOR THE FREEMAN HILLS SYSTEM?

A. As discussed, the Freeman Hills facility was not capable of consistently meeting ammonia, TSS and *E.coli* limits established during the permit renewal using the current treatment processes. Necessary operational improvements to comply with the permit required approval from the DNR as well as utilization of the bid process to identify a

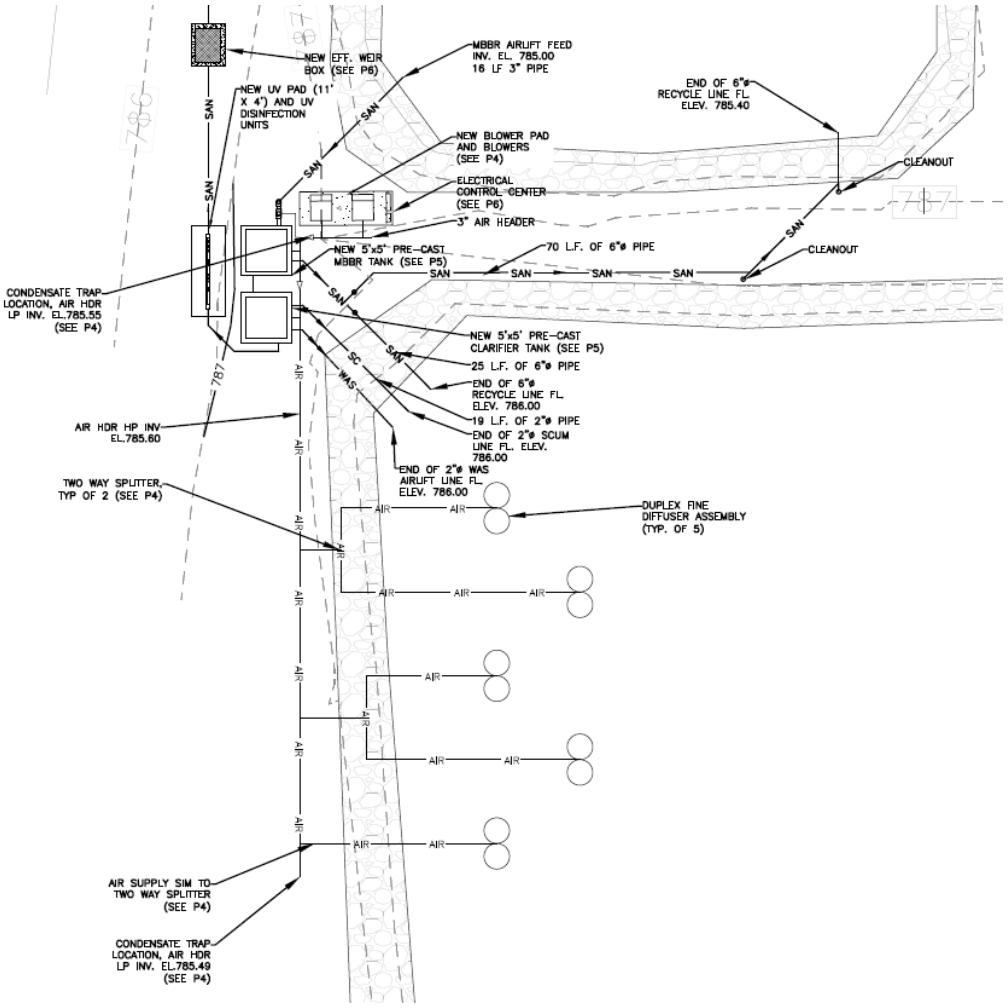
qualified contractor. Therefore, such improvements could not commence until very recently.

The selected third-party engineer designed significant process improvements for Freeman Hills. Specifically, the design improvements call for the addition of a single stage Moving Bed Biofilm Reactor ("MBBR")[2] run by two blowers which will also supply air to fine air diffusers installed in the primary cell of the lagoon. Here, the MBBR pulls water from the third lagoon cell, treats the water, then splits the water with half being discharged into a new clarifier and half recirculated back to the first and third cells of the lagoon. By recirculating portions of the flow back into the lagoon treatment process, the MBBR introduces active biology developed in the MBBR treatment process back into the lagoon cells which will, over time, dramatically improve the treatment in the lagoon cells. Ultimately, these process improvements result in significantly improved treatment in the lagoon and gradual breakdown of the organic component of the sludge retained in the lagoon, thereby reducing sludge volume without the need for sludge hauling. To further improve the treatment in the lagoon and take full advantage of the blowers which must be installed to operate the MBBR, fine air diffuser assemblies will be installed in the first cell of the lagoon. This dramatically increases the level of dissolved oxygen in the lagoon and enhances treatment.

As mentioned above, the other half of the MBBR effluent will run through a new clarifier for settling then to disinfection and ultimately discharge. The sludge and scum returned from the clarifier will flow back into the first cell of the lagoon, and the clarified

[2] A MBBR is an attached growth treatment technology where loose media is contained in an aeration basin to provide massive surface area for biofilm to form. This biofilm provides dense and varied microbiology which can efficiently and effectively break down nutrients in wastewater including ammonia in order to dramatically enhance the treatment processes present at the facility.

treated wastewater will flow through a new ultraviolet disinfection system. After flowing through the disinfection system, the flow will go through a new effluent weir with flow measurement and then to the existing discharge. See the basic layout of these improvements plans below.



These improvements will enable the Freeman Hills system to consistently comply with recently permitted limits of TSS, *E.coli*, Biochemical Oxygen Demand ("BOD") and ammonia.

In addition to these process improvements, a power and control system with remote monitoring will be installed. This will not only be used to operate the system but

will also: (1) allow operations staff to remotely track the status of wastewater equipment, and (2) provide notifications of any abnormal operating condition. Equipment monitoring will also allow operators to track and observe the performance of the MBBR remotely, enabling greater operational control and improved ability to identify when equipment needs maintenance work.

Confluence Rivers anticipates that all improvements will be completed by the end of February 2023. An example of a similar MBBR and clarifier project which was constructed at the Lake Virginia Lagoon is pictured below.

Lake Virginia Lagoon MBBR and clarifier project

2. <u>TERRE DU LAC SINGLE AND THREE-CELL LAGOON SYSTEM</u>

Q. WHAT PORTIONS OF THE TERRE DU LAC WASTEWATER SYSTEM WILL BE ADDRESSED IN THIS PORTION OF YOUR DIRECT TESTIMONY?

A. The Terre du Lac wastewater system consists of three wastewater treatment facilities each with its own collection systems serving the Terre du Lac community. This portion of testimony will focus on two of these systems (a three-cell aerated lagoon and a single cell facultative lagoon) which Confluence Rivers plans to consolidate into a single treatment system.

Q. PLEASE DESCRIBE THE CONDITION OF THE TERRE DU LAC THREE-CELL AERATED LAGOON WHEN IT WAS ACQUIRED.

A. The Three-Cell lagoon system at Terre du Lac is located near Bonne Terre, MO (St. Francois County) and serves a portion of the Terre du Lac community. The system consists of 2 aerated cells utilizing traditional floating aeration and a third settling cell prior to discharge. From the third cell the water flows through a disinfection contact chamber and is ultimately discharged into a creek. The system was in very poor condition at acquisition. The entire site was severely overgrown, with all berms covered in thick brush and willow trees making ingress beyond the access road virtually impossible.

Vegetation growth around 3-cell lagoon

There was significant berm damage in many locations due to muskrats digging burrows into the berms and lack of access caused by vegetation growth prevented anyone from attempting to repair the damaged berm. Poor flow through the facility had also led to the formation of sludge islands in the lagoon's second and third cells.

Accumulation of solids in second lagoon and varmint damage to berm visible in background

When acquired, the aerator in the first cell was nonfunctional due to poor maintenance and inaccessibility caused by the above referenced overgrowth. This resulted in a serious diminishment of the primary treatment process. Furthermore, the aerator in the second cell was underperforming, again likely due to a lack of proper maintenance, further compromising treatment.

The access road to the facility is a steep road running down the back of a dam which holds back one of the lakes in the Terre du Lac community. The road had a gravel surface which had not been re-rocked in some time making the facility difficult or impossible to access in inclement weather. Similarly, the gravel road around the facility berms was in poor condition making it difficult for operations staff to conduct basic operations and maintenance activities.

Poor condition of road around facility berm

The control structure which housed the power and control systems for the two floating aerators was also extremely overgrown and in a failing condition, putting the function of the primary treatment equipment at risk of imminent failure. The poor condition of the control structure shortened the useful life of all the housed equipment and poor operational control of the facility.

Condition of power/control structure at acquisition

Beyond these issues with the assets at the facility, treatment at the three-cell lagoon was severely hampered by massive inflow and infiltration ("I&I") into the

collection system and ultimately into the treatment facility. Older wastewater facilities often struggle with increased flow following rainstorms causing infiltration of stormwater and groundwater. The three-cell Lagoon at Terre du Lac, however, had a much more significant issue in which high flows always occurred regardless of how recent a rainfall event had occurred. These high flows resulted from a failing collection system near the lake above the lagoon continuously allowing infiltration from the lake. The flow through the facility was therefore consistently above the design flow of the system. This has caused solids retained in the lagoon to wash into the receiving waters and dramatically lowers detention times in the lagoon. The consistent high flows have rendered the disinfection system ineffective as it is undersized for these elevated levels of flow coming to the facility. In fact, flows have been so high that effluent has overflowed the walls of the chlorine contact chamber. The dilution of wastewater with storm/lake water has made the facility visually appear to be meeting some permitted limits, however dilution is not an acceptable means of treatment as even with the dilution occurring the facility has consistently violated limits for *E.coli* and ammonia. Furthermore, the excessive flows have led to excessive erosion in the ditch around the outfall, as the system was not designed for the level of flow received. Even if the maintenance and I&I issues were resolved, it is likely that the facility would still be incapable of meeting the ammonia limits. Therefore, process improvements would still be necessary to meet all permitted limits.

Disinfection system overwhelmed with high flows due to I&I issues. Note overflows over the sides of the contact chamber walls

Q. PLEASE DESCRIBE THE CONDITION OF THE TERRE DU LAC SINGLE-CELL FACULTATIVE LAGOON WHEN IT WAS ACQUIRED.

A. As with the three-cell Terre du Lac lagoon, the Single-Cell Lagoon is located in Bonne Terre, MO (St. Francois County) and serves a portion of the Terre du Lac community. This facility consists of a single, round lagoon cell with no form of aeration, disinfection, or any other treatment process in place. Like the three-cell facility, the single-cell system was severely overgrown with young trees growing in the berms on the edge of the lagoon and substantial amounts of varmint damage to the berm. The excessive vegetation overgrowth prevented operators from repairing the varmint damage. Unaddressed varmint damage and burrows in the berms can eventually lead to leaks in berms and unauthorized/illegal release of wastewater to the environment.

Overgrowth around lagoon, varmint damage on berms visible

In addition to the overgrowth and varmint issues, the access road and roads around the berms were poorly maintained with no rock to ensure that the facility remains accessible to operations staff during inclement weather events. As mentioned, the system had no disinfection installed. This meant the facility was incapable of meeting *E.coli* limits, allowing harmful pathogens to be released into the environment. Beyond the system's inability to meet limits associated with disinfection, the single cell lagoon is also incapable of achieving consistent compliance with BOD limits and meeting the newer nutrient limits which are now implemented in NPDES permits (ammonia, phosphorus, etc.). Without significant process improvements the facility will be in constant noncompliance.

Discharge from single cell lagoon with no disinfection equipment

In addition to the issues with the treatment facility, one of the lift stations feeding the lagoon was in poor condition with failing check and flapper valves, and damaged PVC suction piping instead of proper stainless-steel piping.

Q. WHAT IMPROVEMENTS HAS CONFLUENCE RIVERS MADE TO THE THREE-CELL LAGOON SYSTEM AT TERRE DU LAC?

A. Confluence Rivers has begun to make significant improvements to the Terre du Lac Three-Cell Lagoon wastewater treatment facility. The nuisance vegetation was removed from the lagoon berms, access road, and fencing around the facility and varmint damage on berms was repaired. The facility access road, paths along the tops of the berms, and lagoon banks were rocked as well. These improvements will prevent further damage to berms and ensure that operations staff can access the facility in any weather condition. By preventing damage to berms, Confluence Rivers will stop any unauthorized/illegal discharges of partially treated wastewater into the environment.

Cleared and rocked berms and paths around lagoon

As described in the section previously, the aeration systems in the Terre du Lac three-cell lagoon were in failed or poor condition, with the aerator in the first cell not functioning and the aerator in the second cell functioning poorly. The Company has replaced both aerators with more powerful "Airmaster" aerators which achieve a higher level of treatment than the ones previously installed. Furthermore, Confluence Rivers has moved both aerators to the first cell of the lagoon. This is a temporary reconfiguration until the I&I repairs in the collection system can be completed. As long as the flows are elevated due to the I&I, it is better not to aerate in the second cell, as aeration processes stir up sludge in the water. If the facility was only receiving flows consistent with design levels, the third cell would provide adequate settling time for these stirred up solids to settle out prior to discharge. With the elevated flows caused by I&I, the system needs to use both of the second two cells to provide adequate settling time without aeration causing solids to be stirred up again.

New Airmaster aerators installed in first cell of the lagoon system

The failed power and control structure has been torn down and a new power pole added to ensure reliable power is present to operate not only the new aerators, but also the additional treatment processes to be installed as improvements continue at the facility. New control systems were also installed to operate the new aerators. The area where the control structure was located has been graded to prepare for the equipment that will be installed as part of the remaining process improvements still to be implemented.

Site of old control shack and new power service to site

Remote monitoring equipment and a flow meter have been installed at the facility to provide both ongoing live monitoring for greater operational control of the facility as well as to allow the levels of I&I to be quantified. The live flow data will also allow

clear quantifiable verification when the repairs to the collection system have effectively eliminated I&I issues or reduced it to a negligible level.

Temporary installation of flow meter and remote monitoring, note that while flow is still excessively high it is significantly reduced from flow at acquisition

To combat the severe I&I issues facing the facility, Confluence Rivers has begun repairing the collection system structures (manholes and cleanouts), and lining both the structures and sewer mains. While the level of I&I has been reduced, the flows are still significant and repairs to the collection system continue. Finally, Confluence has reworked and rocked the area around the outfall to prevent further erosion around the outfall caused by excessive I&I.

Q. WHAT IMPROVEMENTS HAS CONFLUENCE RIVERS MADE TO THE SINGLE-CELL LAGOON SYSTEM AT TERRE DU LAC?

A. Confluence Rivers has also begun to make improvements to the Terre du Lac Single-Cell lagoon facility. Vegetation overgrowth has been removed from around the berms, fencing, and access road to improve facility access for operations and maintenance work and to prevent damage to the berms which can lead to unauthorized/illegal releases of partially treated wastewater. Brush clearing around the exterior of the fence is also

occurring to prevent additional overgrowth and to prevent plant debris from falling into the lagoon and rotting, affecting the treatment process. Varmint damage on the berms has been repaired, and rock has also been applied to the access road, berms, and lagoon banks to ensure that the facility can be reached in all weather conditions and to prevent further varmint damage from occurring. The damaged lift station has been repaired with the installation of new check valves, flapper valves, and stainless-steel suction piping. Remote monitoring was installed on all three lift stations in the collection system to allow operators to monitor equipment status remotely and so operators can respond immediately to any abnormal operating condition before they can cause damage to the environment, damage to equipment or customer property, or service interruptions to customers.

Q. WHAT REMAINING IMPROVEMENTS ARE STILL PLANNED FOR BOTH OF THE LAGOON SITES?

A. There are several remaining issues that must be addressed to allow these facilities to provide safe, reliable, and environmentally compliant wastewater service to the Terre du Lac community. Currently, neither facility has adequate treatment processes in place to reliably meet permitted limits. Most notably, the current facilities, even if running perfectly, are not capable of meeting modern ammonia limits or achieving effective disinfection. Confluence Rivers and its third-party engineer have concluded that the most efficient and cost-effective approach to achieving reliable treatment and compliance with permitted limits is to consolidate the two facilities. The single cell lagoon will be retained as a pretreatment step to maximize the utility of the existing infrastructure, but rather than discharging to waters of the state, a lift station will be constructed to convey

wastewater to the nearest point where the gravity collection system of the three-cell lagoon has the capacity to carry the additional flow. Improvements necessary to meet modern permit levels can then be made to the Three-Cell lagoon system, eliminating the need to install additional treatment processes at the single cell lagoon site.

The process improvement plans at the Three-Cell lagoon consist primarily of the additions of an attached growth treatment system called an Algae Wheel® and an alum sulfate feed as a coagulant. As planned, the three-cell facility will continue to be configured with flow entering the facility from the current influent points (two gravity lines into the first cell of the lagoon) and then proceeding through the three cells. The process change will be implemented by adding a wet well at the end of the third cell with a duplex pumping station. Flow from this wet well will be pumped to the South end of the lagoon (by the Southeast corner of the first cell) to two Algae Wheel® systems running in parallel. The Algae Wheel® is an attached growth treatment system running in shallower tanks relative to those used in a traditional MBBR/IFAS system. Aeration applied below the Algae Wheel® provides air for biofilm to form on the media, and the system is designed to encourage algae growth on the fins and drums. This algal growth produces additional dissolved oxygen to the biology of the biofilm, reducing the amount of aeration needed to achieve effective treatment. The Algae Wheel® system is both operationally cheaper than a traditional MBBR/IFAS in that it uses less energy, but also from a capital standpoint in that it requires shallower tanks and smaller blowers to run the system. The system must be located at the south end of the lagoon in order to keep it out of the flood plain.

Multiple Algae Wheels® running in parallel, algae growth on fins and aeration piping

The two trains of the Algae Wheel® system will run in parallel with a separate duplex pump feeding each train. Flow from one of the treatment trains will feed directly back into the first cell of the lagoon, introducing active biology from the biofilm into the lagoon which will improve the treatment in the entire lagoon system. The second train will have an alum sulfate coagulant feed and discharge into the third cell of the lagoon for settling prior to discharge. The alum sulphate feed will increase coagulation of solids, allowing the facility to achieve consistent compliance with TSS limits. Alum sulphate has been selected here over a polymer feed in that it provides the added benefit of achieving successful treatment of phosphorus, an additional nutrient which will likely have limits implemented in some future permit renewal.

In addition, the disinfection system will also be overhauled to utilize ultraviolet disinfection rather than the existing contact chamber. The system as it exists today would

require replacement as it is undersized for the expected flows even after the completion of I&I repairs, but also has no proper means of applying either the chlorine disinfection chemicals or the subsequent dechlorination. The ultraviolet disinfection system will eliminate the need for these chemicals all together and eliminate the need for a contact chamber.

As discussed above, I&I repairs to the collection system are ongoing and must be completed in order to achieve effective treatment at the plant. Efforts made to date have significantly reduced I&I, but the flows are still significant and must be further reduced to allow the facility to function properly.

B. Activated Sludge Wastewater Systems

1. CHELSEA ROSE

Q. PLEASE DESCRIBE THE CONDITION OF THE CHELSEA ROSE EXTENDED AERATION TREATMENT FACILITY WHEN IT WAS ACQUIRED.

A. The wastewater treatment plant at Chelsea Rose is an extended aeration treatment facility located in Sunrise Beach, MO (Camden County) serving 30 homes in the Chelsea Rose subdivision. The system is a typical extended aeration style activated sludge wastewater treatment plant fed by a low-pressure collection system fed by septic tanks and grinder pumps which serve one or two homes each. The facility was in generally poor condition when it was acquired.

Overview of facility at acquisition

Upon acquisition there were many problems at the Chelsea Rose facility. The entire facility had large amounts of accumulated sludge in the digester and debris from overhanging trees on all equipment and in all treatment basins. The digester was so full of sludge that it was filled to capacity with almost completely solidified solids. The overfull digester is indicative not only of a past failure to haul away waste sludge from the facility, but also of the past operational neglect at the facility. As a result, there were signs that the digester had regularly overflowed and poured untreated wastewater and sludge onto the ground around the plant. This sort of overflow releases harmful pathogens into the environment, creates unsanitary working conditions for operations staff, and potentially exposes members of the public to untreated wastewater.

Overfilled sludge digestor

Large amounts of sludge deposited on the ground around the facility from past overflow, signs of recent overflow with wet sludge on the top edges of the facility tankage. Also note poor piping practices with flex hoses attached with hose clamps on sludge return lines rather than proper plumbing returns

In addition to the overfull digester, there was also significant amounts of sludge and debris from overhanging trees floating in the clarifier. As a result, the clarifier was not functioning properly resulting in TSS and BOD exceedances.

Sludge floating in clarifier basin, cobbled together PVC piping

The condition of the aeration and piping equipment throughout the facility was also extremely poor. As is visible in the images above, most of the piping around the facility was often composed of cobbled together from scraps of piping with numerous connectors on even short straight runs of piping (visible in the above photo of the clarifier). This indicates poor maintenance practices as well as a general unwillingness to reinvest in the system by previous ownership. A majority of these clarifier components were poorly secured with many simply tied in place with rope. The steel aeration piping that was present at the facility was severely corroded, especially at the connection points

making the system prone to air leaks reducing the efficiency of the aeration system. As with the PVC piping at the facility, some of the steel pipes were also held in place with ropes.

Poor condition of steel aeration piping (note blue ropes holding pipes in place at left) also note aeration system was not running and floating sludge in aeration basin

Beyond the poor condition of the aeration piping throughout the facility, the electrical and mechanical components of the aeration system were also in very poor condition. The power service ran across the ground to the control panel, and there was exposed wiring and signs of water infiltration in the control panel. The blowers were in poor condition and would not function when Confluence Rivers closed on the facility, effectively halting the primary treatment process of the treatment facility.

Poor condition/nonfunctional blowers and control system

Beyond the issues with the operations and function of the facility, other portions of the facility were also in poor or failing condition. The concrete tanks had many areas where cracking had occurred and which had not been patched or repaired, leading to seeping of untreated wastewater in an illegal SSO.

Cracks in concrete tankage

In addition, the facility outfall was also severely damaged at some point prior to acquisition by Confluence Rivers. The plant is situated in a gulley between hills on the edge of The Lake of the Ozarks. Due to the location and original installation of the outfall pipe, over time, erosion had caused damage to the outfall pipe. Rather than

repairing the pipe the previous owners simply cut the pipe off, well uphill of the receiving waters.

Outfall pipe terminating short of the receiving waters

The facility access road was in poor condition leading up to acquisition. Inaccessibility is likely part of the reason that sludge hauling had been neglected so long as the access road was too steep, damaged and primitive to allow access by a vac truck needed for hauling sludge. The site also had a large amount of trash and debris dumped haphazardly in the gully below the plant, most of which appeared to be components of the septic tanks and grinder stations previously utilized in the system. This was likely the result of maintenance work performed in the system, which produced waste that instead of being disposed of properly was simply dumped near the plant.

Old equipment dumped downhill from the facility

Leading up to acquisition, the facility had been operating for some time on an expired permit and the previous owners had failed to apply for a permit renewal. As part of Confluence River's acquisition process, the Company required the previous owner to apply for a permit renewal which went into effect in July of 2019. While this does not speak to the physical condition of the facility, the failure to maintain an active permit is a significant issue and indicates poor operational and managerial practices on the part of previous ownership. The only other significant issue, while unrelated to the physical condition of the plant, reflects on an operational challenge of the facility. The community served by the facility largely consists of seasonal homes, with flows in colder months often falling to less than 10% of the flows during busier months. This is further complicated by the fact that the biological processes in the plant are adversely affected by cold weather. This requires diligent attention to the operations of the facility in order to sustain the biological treatment process through colder months when lower loadings on the facility are seen.

Q. WHAT IMPROVEMENTS HAS CONFLUENCE RIVERS MADE TO THE CHELSEA ROSE WASTEWATER TREATMENT FACILITY?

A. Confluence Rivers has made numerous improvements to the Chelsea Rose facility. Confluence Rivers began by regrading and re-rocking the road leading to the facility. This was necessary so that sludge hauling trucks and equipment for construction could safely access the facility as well as to ensure that operations staff would have reliable all-weather access to the facility. With the road restored, Confluence Rivers continued by removing the accumulated sludge and solids from the facility and cutting back the overhanging trees to prevent additional vegetation debris from falling into the facility which detrimentally effect the treatment process. These steps helped to restore the full treatment capacity to the facility tankage and to eliminate the ongoing issue of regular overflows and SSOs from the facility. The trash and debris downhill from the facility was also removed and a general cleanup completed on the utility site. This basic cleanup of the site needed to occur before major improvements could be implemented and necessary equipment moved in for the construction activities.

Following the basic cleanup of the facility, Confluence Rivers overhauled the entire aeration system. This included replacing the power service to the site and expanding the fencing to provide security for a new power supply, control system, and blower housing structure. The housing structure was also replaced and now consists of a 3-sided steel structure with a roof to provide adequate protection for the blower equipment as well as additional space for storing disinfection chemicals and operations equipment which had previously been strewn haphazardly around the site.

New blower housing and fence area

The aeration overhaul included replacing the blowers, air piping and valving, drop pipes, diffusers, and sludge returns/wasting lines. The system had been in such poor condition that the aeration equipment needed to be replaced in order to restore proper treatment to the plant. As described above, the primary treatment process of the plant was not functioning at acquisition and has now been completely restored with these improvements.

New aeration piping, blowers, and valving

With the aeration system and proper treatment restored at the facility, Confluence Rivers secured permission from the DNR to formally return the discharge point to its original location and made improvements to the outfall structure. Improvements were also made to the disinfection system with the addition of feeders for both chlorine tablets and dechlorination tablets.

New dechlorination tablet feeder

Confluence Rivers also installed remote monitoring equipment at the facility. As with Freeman Hills and Terre du Lac, the remote monitoring equipment allows operations staff to remotely track the status of treatment equipment and to receive immediate notification of any abnormal operating condition. Immediate notification of abnormal operating conditions enables operators to quickly respond to any emergency condition before damage to the environment, interruption of proper treatment process, damage to equipment, backups that can damage customers property, or service interruptions to customers.

Newly installed remote monitoring system

Beyond the physical improvements made to the facility, Confluence Rivers has also significantly improved the operational attention given to the facility on a daily basis.

This attention allows operators to sustain the treatment process even during lower temperature and more lightly loaded periods of the year.

Q. ARE THERE ANY ADDITIONAL IMPROVEMENTS PLANNED FOR THE CHELSEA ROSE FACILITY?

A. Following the described improvements, the facility is now consistently complying with permitted limits. Repairs to portions of the collection system are ongoing on an as needed basis, however no additional improvements are currently planned at the treatment plant.

2. <u>TERRE DU LAC OXIDATION DITCH WASTEWATER SYSTEM</u>

Q. WHAT PORTION OF THE TERRE DU LAC WASTEWATER SYSTEM WILL BE ADDRESSED IN THIS PORTION OF YOUR DIRECT TESTIMONY?

A. As mentioned, the Terre du Lac wastewater system consisted of three wastewater treatment facilities each with collection systems serving the Terre du Lac community. In a previous section I discussed the condition and necessary improvements for the single cell and three-cell lagoon treatment facilities. In this section, I will focus on the Oxidation Ditch wastewater treatment facility.

Q. PLEASE DESCRIBE THE CONDITION OF THE TERRE DU LAC OXIDATION DITCH AT ACQUISITION.

A. Like the other Terre du Lac facilities, the Oxidation Ditch wastewater treatment facility is located in Bon Terre, MO (St. Francois County) serving a portion of the Terre du Lac Community. The system discussed herein is an oxidation ditch style activated sludge treatment facility with a return activated sludge ("RAS") line running from the clarifier back to the oxidation ditch. The system was also designed for disinfection in a baffled

chlorine contact chamber. While the facility was originally designed to have dechlorination and even listed a dechlorination process in the NPDES permit, the previous owner never installed the dechlorination system. The facility receives flow from a low-pressure collection system with septic tanks and grinder pumps at each home.

The facility had many issues at the time of acquisition. The main treatment component of the system is a long oxidation ditch track with wastewater being circulated and aerated by two sets of brush aerators situated at either end of the track. At acquisition, one of these brush aerators had completely failed, while the other had significant damage to the brush comb greatly reducing its treatment capacity. The result of this failure to maintain the equipment was that the system was receiving less than half of the aeration for which it was designed (the primary treatment process), calling into question whether the facility could operate in compliance with permitted limits. This concern was ultimately confirmed by a regular pattern of ammonia limit exceedances.

Failed brush aerator at Oxidation Ditch

Beyond the issues related to underperforming aeration, the inactive and damaged brush aerators also reduced the speed of flow through the oxidation ditch track. With a slower flow rate, solids were able to settle out in track, potentially compromising the

function of the system and disrupting flow. In the 180° turns at each end of the track the flow had diminished such that sludge had accumulated to the point that it broke the surface of the basin.

Sludge accumulation breaking the surface of water in the Oxidation Ditch

This problem was further exacerbated by the fact that the previous owner had not removed any sludge from the system for several years prior to its acquisition by Confluence Rivers. This was revealed in the previous owner's responses to a DNR enforcement action which, among other things, cited the facility for failing to complete annual sludge hauling reports. The owner ultimately admitted that no sludge had been removed from the facility in the years with missing reports. Given the lack of sludge hauling, a large portion of the sludge in the treatment process was necessarily of an extremely high age. As sludge ages in an activated sludge treatment process, more and more of the organic component of the sludge is broken down, leaving inorganic sludge which is an impediment to the biological treatment processes of the plant. At an earlier point in the facility's history, there had been an unpermitted (added without submitting a construction permit) sludge holding tank, where some sludge could be wasted from the system to help reduce the average sludge age. This tank, however, began leaking

approximately 6 years prior to acquisition by Confluence Rivers, and rather than repairing and permitting the holding tank, the tank was removed from the system. These poor operations and maintenance practices essentially handicapped the facility's ability to perform its primary treatment process.

Beyond the issues with sludge age and inadequate aeration, there were other signs of poor operations and maintenance practices at the facility. In preliminary site visits, a dead animal (a rabbit) was seen in the sluice box between the oxidation ditch track and the outflow to the clarifier that had obviously been present for an extended period. Animal decay in the treatment plant releases dangerous bacteria which can be harmful to the treatment process and speaks to a general level of neglect by the previous operators.

Dead rabbit in sluice box

Additionally, the general condition of the concrete structure of the Oxidation ditch was also poor, with many points where concrete had cracked and degraded, causing locations where wastewater could potentially leak out of the facility.

Examples of damaged concrete in oxidation ditch track

At some point in the facility's history, the RAS line running from the clarifier to the oxidation ditch track had failed, and rather than properly plumbing in a replacement line, a line was run above ground from the clarifier to the oxidation ditch track. This creates a tripping hazard on the site, results in the new line being exposed to UV deterioration resulting in a shortened useful life and raises the possibility of freezing in cold weather causing the clarifier to be unable to return sludge and potentially resulting in sludge releases from the facility. Along with this, the telescoping valve on the RAS line was in poor condition and held together in part with ropes tied to the clarifier structure.

Above ground RAS lines at Oxidation Ditch

Beyond the issues with the sludge return, the clarifier was in generally poor condition. The rake arm, motor, and gearbox of the clarifier had failed, allowing floating scum and pin floc to build up and be released from the clarifier rather than being captured through the skimming system. While operations staff could combat this by regularly squeegeeing the floating solids into the skimming outlets, the general operational neglect at the facility had led to regular release of these solids and TSS exceedances.

Significant accumulation of sludge in skimmer trough due to failed mechanical components of clarifier

After the clarifier in the treatment process, the treated wastewater would flow to a chlorine contact chamber for disinfection. The chamber was well designed with a baffled flow path to provide for adequate disinfection contact time. From the end of the disinfection contact chamber, the effluent ran across the ground in a gravel trench about 150 ft to the receiving stream. The contact chamber was designed for chlorination through a chlorine tablet feeder. This disinfection was then supposed to be followed by dechlorination. As mentioned, however, the previous owner never installed the dechlorination tablet feeder. When cited for this in an enforcement action the owner stated that the facility did not need dechlorination because it did not exceed total residual chlorine limits (TRC). Discussions with the owner and operator revealed that the only

reason the facility was able to meet the TRC limits was because, while all other effluent samples occurred at the end of the contact chamber, samples for TRC were collected at the point of discharge after flowing approximately 150ft across the ground in an open gravel channel. This is not an acceptable method of dechlorination and has a detrimental effect on biology in the environment. There was a visible discoloration on the rocks in the open channel and in the creek where the effluent discharged into the receiving waters. This discoloration is symptomatic of an extended period of excessive chlorine levels in the effluent killing off natural biology in the creek. This issue seems to be confirmed in the sampling history as there is a pattern of TRC and *E.coli* exceedances, indicating over and under chlorinating in a reactionary manner in an attempt to make the system work without dechlorination installed.

No dechlorination installed at end of contact chamber

The general condition of the site was also poor. The fencing around the facility was intact, but was installed in a manner that left, on average, an 18-inch gap between the bottom of the fence and the ground. This was not immediately noticeable because grass and vegetation had been allowed to grow uncontrolled along the fence line, potentially causing damage to the fencing over time. Additionally, at some point prior to

acquisition, someone had built an elevated hunting blind at one end of the facility, an unacceptable use of the site. The access road to the facility was in need of regrading and re-rocking to prevent erosion damage which could compromise facility access.

Hunting blind on utility property

Q. WHAT IMPROVEMENTS HAS CONFLUENCE RIVERS MADE TO OXIDATION DITCH SYSTEM AT TERRE DU LAC?

A. Confluence Rivers has begun to make significant improvements to the Terre du Lac Oxidation Ditch facility. The nuisance vegetation was removed from the fence line to prevent damage to the fencing. Portions of the access road have been re-rocked to prevent erosion damage which could limit access to the facility. The damaged brush aerator was repaired, including installation of a new rotor, brushes, motor and gearbox assembly, and the damaged brush assembly was replaced on the functioning aerator. This has restored aeration in the facility to its designed capacity.

Repaired brush aerator

Additionally, Confluence Rivers has hauled excess sludge from the facility. The removal of the aged sludge will improve treatment and move the balance of the sludge in the treatment process to a mix that is more compatible with the treatment of wastewater. The RAS line was replaced, and the new line was properly buried to eliminate the tripping hazard and potential for freezing as well as to prevent the new line from deteriorating as rapidly as the old one. The damaged telescoping valve was also replaced as it had reached the end of useful life.

As with all Confluence River systems, remote monitoring and flow monitoring has been added to the facility to properly evaluate facility performance, provide operations staff with active monitoring of equipment status, and providing operators with immediate notification of any abnormal operating conditions.

Remote monitoring equipment in Oxidation Ditch control room

While a proper dechlorination tablet feeder has not yet been installed, the last portion of the contact chamber has had cinder block baffling temporarily installed and dechlorination tablets are now fed directly into the flow to provide dechlorination as required by the facility permit.

Q. WHAT REMAINING IMPROVEMENTS ARE PLANNED FOR THE OXIDATION DITCH FACILITY?

A. Several projects are still planned at the Oxidation Ditch facility. The repairs to the clarifier must be completed to restore the proper function of the skimming system. This will include replacing the rake arm, gearbox, motor, and scum baffle. This will prevent pin floc and floating solids from flowing out of the clarifier causing TSS exceedances and reducing the amount of manual squeegeeing required by operators to maintain clarifier functionality. A proper dechlorination tablet feeder must also be installed with a minor modification to the contact chamber to provide adequate contact time for dechlorination. The Company will also repair concrete on damaged portions of the Oxidation Ditch track. While not part of the initial planned improvements, Confluence Rivers anticipates the eventual installation of a digester or sludge holding tank to reduce the required

frequency of sludge hauling from the facility and to increase the operational ability to regulate sludge age in the activated sludge process.

3. GLENMEADOWS

Q. PLEASE DESCRIBE THE CONDITION OF THE GLENMEADOWS EXTENDED AERATION TREATMENT FACILITY.

A. The Commission issued its order approving Confluence Rivers' acquisition on December 8, 2022. Therefore, at the time that this testimony was prepared and filed, Confluence Rivers does not yet have any actual operating experience for this facility.

The wastewater treatment plant at Glenmeadows is an extended aeration treatment facility located South of Troy, MO (Lincoln County) serving 231 customers in the Glenmeadows subdivision. The system is a typical extended aeration style activated sludge treatment facility with flow equalization, aeration, clarification, chlorination/dechlorination disinfection, and an aerated sludge digester. The facility is generally configured with three treatment trains with gravity flow into the facility into two of three hydraulically connected equalization tanks. Both inlets are equipped with manually cleaned bar screens for removing nuisance solids. Flow from the equalization basins is pumped via airlift into the three treatment trains. There have been issues in the past with the airlifts not functioning properly (as reflected in their failure to maintain constant head chamber pressure; thus, causing backups into customers' homes in some portions of the collection system). This is further exaggerated during power interruptions as there is currently no way to connect an emergency generator to the electrical and control system.

Discussion with the existing facility operator revealed that the primary treatment issues were related to difficulty maintaining proper DO level in the aeration basins at a minimum of 2 mg/l. This is particularly an issue for the train situated furthest from the blowers. The facility blowers appear to be properly sized for the size of the plant, which indicates that the issue is with the sizing of the air headers preventing adequate air from reaching the furthest train.

Undersized air headers causing issues with DO levels in portions of the aeration basins (3" piping to aeration basins / 1.5" piping to the flow equalization basins)

While this has not resulted in effluent exceedances historically, it does indicate the facility is not operating to its full treatment potential. The issue is further exaggerated by the system having fewer diffusers installed than would be appropriate for the aeration tankage. In addition to reduced treatment effectiveness, the lower levels of DO encourage filamentous bacteria which thrive in the lower DO environment and lead to sludge bulking and retention, gradually reducing the treatment capacity of the facility.

Resolving the aeration issues, and increasing the DO levels, will improve treatment and simultaneously reduce the proportion of filamentous bacteria and the sludge bulking and retention. Solids were noted in the chlorine contact chamber, which is also likely the result of the issues with sludge bulking. This creates the potential for exceedances of TSS limits (which did occur in January of 2019). The blowers have also reached the end of their useful lives and are due for replacement.

Beyond issues directly related to the treatment at the plant, there are other issues at the facility which should be addressed. The blowers are currently housed in a shack which is in poor condition, largely due to poor interior finishing leading to early wear and tear.

Poor condition of blower building interior, also visible electrical and control system with no ability to connect emergency power source.

There is currently no means to measure flow accurately/continuously from the facility or monitor performance remotely. Inaccurate flow measurement makes it more difficult for operations staff to precisely run facilities and causes less accurate reporting with flow extrapolated from an instantaneous measurement rather than calculated from a

totalized flow measurement. Some of the grating over the flow equalization basins has degraded and is no longer safe to walk across.

Rusted grating over the flow equalization tank.

Q. WHAT IMPROVEMENTS DOES CONFLUENCE RIVERS PLAN TO MAKE AT GLENMEADOWS AND WHY ARE THESE NECESSARY?

A. Confluence Rivers plans various improvements for the Glenmeadows system to resolve the issues identified with the system and to ensure the facility can be properly operated and maintained going forward. An ultrasonic flow meter and remote monitoring system will be installed at the facility to allow for accurate flow measurement. Accurate flow measurement will help identify if I&I is occurring in the collection system; will improve the accuracy of reporting in DMR measurements; and will improve operators' ability to precisely operate the facility. The remote monitoring system will continuously report the flow data and will also allow for status monitoring of all equipment connected to it. This will give operators immediate notification of any power interruption or other abnormal operating condition (i.e. equipment failure). This allows operations staff to respond as soon as an incident begins, thus, potentially resolving issues before they can result in compromised treatment, equipment damage, or service interruptions. A new electrical

distribution panel with manual transfer switch and generator quick connect will be installed to provide power for new blowers. The ability to connect emergency power supply will prevent service interruptions in the event of a power outage and help to reduce the risk of continued backups into customer homes.

To stop the continued backups into the customers' homes due to issues with the air lift system from the flow equalization tanks, a duplex grinder pumping system with a vfd (variable frequency drive) to improve energy efficiency and reduce operating cost will be placed in each flow equalization basin. With this and the ability to connect an emergency backup generator the issues related to backups into homes should be eliminated.

As discussed above, the air headers are undersized which has resulted in difficulty in maintaining adequate DO levels, adversely effecting treatment, and causing higher levels of filamentous bacteria which increase sludge bulking and retention. Furthermore, the diffusers currently installed are inadequate for plant sizing. To resolve these issues, a new aeration system will be installed. Specifically, Confluence Rivers anticipates installing new triplex blowers with vfd (to improve energy efficiency and reduce operating cost) as well as a new control system, new air headers, drop pipes, diffusers and RAS/WAS (Return Activated Sludge/Waste Activated Sludge) lines. To prevent solids from continuing to enter the contact chamber, density current baffling will be added to the existing clarifiers, aiding in the settling of solids. This will prevent solids from being released from the facility in effluent. These improvements will help to ensure the facility is treating to its potential, no longer causing backups into customers' homes, and is in a maintainable condition moving forward.

C. Recirculating Sand Filter Wastewater Systems

1. CEDAR GLEN

Q. PLEASE DESCRIBE THE CONDITION OF THE CEDAR GLEN RECIRCULATING SAND FILTER FACILITY AT THE TIME IT WAS ACQUIRED.

A. The wastewater treatment plant at Cedar Glen is a Recirculating Sand Filter treatment facility located near Camdenton, MO (Camden County) and serving 213 customers in the Cedar Glen subdivision. The system was a typical recirculating sand filter treatment system with 4 sand beds, septic and recirculation tanks, and a chlorination/dechlorination disinfection system immediately prior to discharge. The facility was in generally fair condition at the time of acquisition.

Overview of Cedar Glen facility at acquisition

Despite the generally fair condition at the facility, there were still many issues at Cedar Glen that required attention. Nuisance vegetation had grown along the fence line which led to fence damage and compromised site security. Further vegetation growth was apparent in the sand beds. Vegetation growth in the sand bed is a serious issue as it

can damage the treatment equipment and is indicative of areas where sludge has built up in the sand filter compromising the treatment process. A properly functioning facility would not have solids pumped into the sand filters themselves as the solids will eventually lead to clogged areas of the filter, reduce the treatment capacity and allow areas of septic sewage to accumulate. While the sludge accumulation at Cedar Glen had not yet reached this point, absent intervention it could. The presence of sludge in the beds also is indicative of the fact that the septic tanks at the beginning of the process were failing to settle out sludge, either due to inadequate detention time, or issues with the pumping system configuration.

Vegetation growing on surface of Cedar Glen sand filter

Beyond the areas of vegetation and sludge accumulation in the sand filter, there was also discarded piping and trash present on the surface of the sand filters. While these should not adversely affect the treatment in the filter, it is indicative of operational neglect. More disconcerting, there were portions of a deer carcass on one of the filter beds during initial site visits. This can impact the treatment process and creates a potentially unsafe condition by introducing harmful bacteria and rotting meat in the

treatment process. The recirculation and septic tanks were in good condition with no signs of leaking, however there was a pile of burnt-out submersible pumps laying on the ground at the main septic tank at the beginning of the facility. The repeated failure of these submersible pumps in such a system is typically a sign of problem with either the system configuration or the system power supply. Further investigation eliminated a power supply problem. Therefore, as suggested previously when discussing the vegetation in the sand beds, the problem was caused by the pumps regularly pulling solids from the septic tank and into the sand filter. Furthermore, beyond the impact on the efficiency of the sand filter system, not correcting such an issue led to the wasteful replacement and expense of new facility pumps.

Pile of burnt-out submersible pumps near influent septic tank

The final issue that was a regular problem for the facility was that trees hung over the chlorine contact chamber and regularly dropped debris into chlorination chamber. Rotting leaves in the contact chamber have the potential to make disinfection ineffective, and, while breaking down, can release ammonia making it difficult to achieve ammonia compliance.

While the above-described issues require remediation, they do not represent a total failure of the Cedar Glen treatment process. The larger issue confronted by the facility was that, even if restored to perfect operating condition, the facility would still be incapable of achieving consistent compliance with permitted limits. Most notably the facility consistently violated ammonia limits in cold weather conditions. The facility simply had not been designed to meet the more stringent limits that were implemented after the facility was designed and constructed and would require some form of enhanced treatment process to achieve consistent compliance.

In addition to issues with the treatment plant, the flow to the facility came from six lift stations. The previous operator stated that during high flow periods, the lift stations occasionally failed to keep up with flows and overflowed. Such overflows constitute an unauthorized/illegal SSO. The operator stated that they were of the opinion that additional storage was needed at each lift station to prevent such overflows.

Q. WHAT IMPROVEMENTS HAS CONFLUENCE RIVERS MADE TO THE CEDAR GLEN WASTEWATER TREATMENT FACILITY?

A. Confluence Rivers has made various improvements to the Cedar Glen facility. Sludge has been removed from all facility tanks to improve treatment and recover from neglected solids hauling maintenance. Brush was removed from the sand beds and around the fence line. This should aide in preventing vegetation growth in the sand beds, stopping debris from falling onto the beds, and preventing damage to the fencing. The pumps in the influent septic tank were adjusted up in height and moved further from the influent lines to both reduce the quantity of solids pumped into the sand beds and to extend the useful life of the pumps. Covers were placed on the disinfection contact chambers to stop

debris from falling into them from overhanging trees. Trash and debris were removed from the sand beds and general site cleanup was performed. Five pumps in the system were found to be reaching the end of useful life and were replaced to ensure the system could run properly. These improvements served to restore the site to proper operating condition but did not address the issues with the system's inability to consistently meet ammonia limits.

In the past, recirculating sand filters that could not meet ammonia or other nutrient limits would require either: (1) total replacement with an activated sludge system, or (2) installation of additional tankage to house new treatment processes that would help to break down ammonia and other nutrients. Confluence Rivers has used this approach previously at facilities in Missouri (for example the Twin Oaks Recirculating Sand Filter in Knob Noster) and effectively achieved compliance with permitted ammonia limits. In those cases, the additional tankage housed an MBBR. These attached growth treatment systems provide ample surface area for biofilm to form, resulting in more varied and more dense biological activity to attack nutrients in wastewater, and effectively treating nutrients like ammonia. The downside of this approach in the past has been the need for additional tankage, which required a significant capital investment.

To aid in compliance with ammonia limits here, however, Confluence Rivers implemented a modified version of the MBBR technology to avoid the capital investment associated with additional tankage by utilizing existing tankage. Specifically, in this case, miniature MBBRs were constructed from sections of PVC piping and installed into existing tankage. Three of these micro MBBR units were placed in existing recirculation

tanks (one in each tank) in place of a more typical mixer/aerator in the tanks. This provided effective attached growth MBBR treatment in a way that would not require additional tankage as it ran in the existing recirculation tanks, and allowed for the use of smaller, quieter, less expensive blowers than a more typical MBBR. The three units have enabled the facility to consistently meet permitted limits at a massively reduced cost compared to more traditional approaches. This is a great example of how Confluence Rivers implements innovative technologies to minimize customer rate impacts.

Micro MBBR in Recirculation tank and small blower running MBBR

The issues with the overwhelmed lift stations during high flow periods was also resolved by installing higher capacity pumps. Thus, Confluence Rivers was able to avoid the more expensive additional storage that the previous operator had recommended. Again, this represents another example of Confluence River remediating problems while mitigating customer rate impacts.

The only other significant improvement made by Confluence Rivers was the installation of a remote monitoring system. As with all the other Missouri systems,

remote monitoring equipment allows operations staff to remotely track the status of treatment equipment and will provide operations staff immediate notification of any abnormal operating condition.

Q. ARE THERE ANY ADDITIONAL IMPROVEMENTS PLANNED FOR THE CEDAR GLEN FACILITY?

A. Following the improvements implemented at the Cedar Glen facility, the facility is now able to operate within permitted limits. Some repairs to portions of the collection system are ongoing in a reactionary/as needed basis, however no additional improvements are planned at this time at the treatment plant.

2. CIMARRON BAY

Q. PLEASE DESCRIBE THE CONDITION OF THE CIMARRON BAY RECIRCULATING SAND FILTER FACILITY AT THE TIME IT WAS ACQUIRED.

A. The Cimarron Bay treatment facility is a Recirculating Sand Filter plant located near Sunrise Beach, MO (Camden County) serving 19 customers in the Cimarron Bay subdivision. The system is a typical recirculating sand filter treatment system with 2 sand beds, septic and recirculation tanks, and a chlorination/dechlorination disinfection system prior to discharge. The facility was in generally poor condition at the time that it was acquired.

Overview of facility at acquisition (note debris from overhanging trees on filter beds)

Upon acquisition there were numerous issues with the Cimarron Bay facility. The facility had no fence to secure the facility and protect members of the public from being exposed to untreated wastewater and wastewater treatment equipment. The facility was located in a forest and there were numerous large trees surrounding the plant which, as in the Cedar Glen facility, regularly dropped branches and other debris onto the filter beds. Vegetation rotting on/in the plant can adversely affect the treatment process and should either be regularly removed from the filter bed or the trees trimmed back to prevent further accumulation of debris.

The sand filters were poorly constructed with liners secured around plywood frame walls. Plywood is not a proper building material from which to construct a wastewater treatment facility as there were several areas where the walls were beginning to fail. Some areas were bowed out severely and there were signs that the dress gravel on the surface of the sand filter bed had overflowed in the past, likely during rain events. The wooden structure was likely used as a cost savings measure at the time the facility was constructed and is rapidly approaching the end of its useful life.

While it appears that the liner is intact, the bowed plywood walls appear to have regularly allowed wastewater to flow out of the facility in an unpermitted/illegal SSO. The operations staff under the previous ownership stated that they had rarely been capable of sampling at the facility because almost no flow reached the outfall, likely due to these unpermitted overflows. As a result, there was no reliable compliance history or testing history to evidence the true operating status of the facility. The decision to construct the plant from such subpar materials and not repair it later demonstrates a history of poor managerial decisions in the construction and operation of the facility. This point was further demonstrated by the fact that when Confluence Rivers entered initial negotiation to purchase the system, the facility had no valid permit to operate. Rather, the previous ownership had allowed their permit to expire without seeking a permit renewal. As a condition for closing on the facility, Confluence Rivers facilitated renewal of a valid discharge permit.

Bowed plywood wall and failing corners at Cimarron Bay Sand filter

Upon acquisition, in addition to the debris from overhanging trees, vegetation was also growing in the sand bed. Such vegetation is a serious matter as it can not only damage the treatment equipment, but also indicates areas where sludge has built up in the filter, compromising the treatment process. A properly functioning sand filter should not

have solids pumped into the sand filters themselves as they will eventually lead to clogged areas in the filter, reduce the system's treatment capacity, and allow areas of septic sewage to accumulate. The overflows from the damaged portion of the plywood walls may also be indicative of sludge blockages in the filter. The presence of sludge in the beds was likely caused by either septic tanks at the beginning of the facility that were failing to settle out sludge or issues with the pumping system configuration.

Beyond the areas of vegetation and sludge accumulation in the sand filter, there were also issues with the distribution piping in the filters themselves. The distribution piping adjacent to the bowing walls had bent with the walls, leading pipes to become exposed in some areas. Caps on the distribution piping were missing in some places as well, potentially allowing wastewater to spill over the surface of the filter and overflow rather than properly soaking through the filter.

Exposed piping in Cimarron Bay filter beds

The recirculation and septic tanks were in good condition with no signs of leaking, however, as indicated above, sludge accumulation in the filter beds likely was caused by solids in the main septic tank being pumped into the facility. The system is fed by a combination of low pressure and gravity sewer mains that are consolidated via a lift

station into force mains. There are two primary lift stations in the system which were in fair condition at the time of acquisition. Specifically, while basic repairs in the lift station had been neglected, the lift stations were still functioning in a satisfactory manner.

While the issues described above are significant, it is important to understand that even if all these items were repaired, the Cimarron Bay facility would still not be capable of treating to permitted limits due to shortcomings in its originally designed process. Most notably the facility is incapable of meeting ammonia limits, especially during cold weather. The facility simply had not been designed to meet the more stringent limits that were implemented after the facility was designed and constructed and would require some form of enhanced treatment process to achieve consistent compliance.

Q. WHAT IMPROVEMENTS HAS CONFLUENCE RIVERS MADE TO THE CIMARRON BAY FACILITY?

A. Confluence Rivers has made various improvements to the Cimarron Bay facility. Basic improvements included the removal of brush from the plant and trimming of surrounding trees to prevent further debris from being deposited on the sand filters. This will prevent any adverse effect associated with rotting vegetation on the sand filters. Temporary reinforcing measures have been employed to brace and reposition the failing walls of the sand filter to stop the ongoing illegal discharges from the facility. Basic repairs have also been made to the collection system lift station including replacing underperforming or broken pumps and ensuring that each lift station has a backup pump installed. Sludge has been hauled from both the facility tankage and the lift stations caused by deferred sludge hauling maintenance and to restore capacity to tanks and lift stations. The exposed distribution piping in the sand beds have been properly reseated and buried to prevent

overflows of sewage. Additionally, repairs have been completed on damaged portions of the distribution piping. Finally, as with the other systems that have been described, Confluence Rivers has installed remote monitoring equipment at the plant and lift stations which should improve system performance and provide advance notice of operational problems.

Remote monitoring unit at treatment facility

Finally, as described with regard to Cedar Glen, Confluence Rivers has implemented a process improvement to address compliance with ammonia limits. Specifically, rather than incurring the capital cost of additional tankage for the installation of a traditional MBBR, Confluence Rivers has instead installed micro MBBRs in existing tankage. Specifically, micro MBBRs were placed in two existing recirculation tanks (one in each tank). By utilizing this modified installation, Confluence Rivers not only avoided the cost of additional tankage, but also allowed for the installation of smaller, quieter, less expensive blowers than in a more traditional MBBR setup. This improvement now allows the facility to treat to permitted limits at a much-reduced cost as compared to more traditional approaches.

Micro MBBR in Recirculation tank and small blower running MBBR at Cimarron Bay

Q. ARE THERE ANY ADDITIONAL IMPROVEMENTS PLANNED FOR THE CIMARRON BAY FACILITY?

A. Following these improvements, the Cimarron Bay facility is now able to consistently comply with permitted limits. While compliance has been achieved, there are still unacceptable issues at the facility that must be addressed. Most notably, while temporary bracing has resolved the leaks, the wooden structure supporting the recirculating sand beds is still in terrible condition. To ensure the facility can be safely operated and extend the useful life of the system, Confluence Rivers will implement proper repairs to the structure and utilize proper building materials to replace the improper wooden structure. This repair will eventually require significant piping modification to the facility and the replacement of some of the filter media. These repairs/improvements will require the utilization of heavy equipment which will necessarily require a more robust access road. Additionally, Confluence Rivers still plans to install fencing around the facility in order to establish proper site security and prevent members of the public from being exposed to wastewater and wastewater treatment equipment.

D. Groundwater Drinking Water Systems

1. EAGLE WOODS

Q. PLEASE DESCRIBE THE CONDITION OF THE EAGLE WOODS WATER SYSTEM WHEN IT WAS ACQUIRED.

A. The Eagle Woods water system is a drinking water system constructed around 1995 to serve 34 customers near Osage Beach, MO (Camden County). When acquired the system had one active well using sodium hypochlorite treatment, three 57-gallon bladder tanks for maintaining pressure, and two 4,500-gallon ground storage tanks. The system was in fair condition but had several significant issues. First, the two ground storage tanks had points of significant corrosion and neither tank had proper screening on their overflow pipes (a violation of DNR drinking water system requirements).

Condition of ground storage tanks at acquisition

Next, in addition to the problems with the storage tanks, the well pump and housing also exhibited many problems. For instance, the well pump was reaching the end of its useful life, and the well head plate was rusted. There were many exposed wires in the well house and due to the use of garden hoses for chemical feed pumping there were numerous tripping hazards. There was also no proper air release installed on the well

head which can also cause issues with well operation. Also, there were bottles of household liquid bleach in the well room. Household bleach is not an approved disinfection chemical for drinking water applications

Well house interior, note coils of garden hose, rusted well head plate, exposed wiring, bleach bottle

Next, while the three bladder tanks were in good condition, they are undersized for the number of homes served in the distribution system and for the configuration of the system. This is reflected in the fact that the furthest house in the distribution system had filed a series of complaints concerning low pressure occurring while their next-door neighbor watered his lawn. This issue is further exacerbated by the use of undersized 2" distribution piping. The power supply and control systems were reaching the end of their useful lives and, upon acquisition, there was no chlorine analyzer or remote monitoring system present in the system.

Power and control system condition at acquisition

Finally, as mentioned, disinfection chemicals were being stored in the same structure as the well equipment. The presence of such disinfection chemicals can, and in this case had, lead to early corrosion and deterioration of steel equipment. A better practice is to store disinfection chemicals away from piping and other equipment or, if that is not possible, to equip the structure with a ventilation system to reduce corrosion caused by chlorine fumes. While a vent was present, no mechanical ventilation system was installed, and the structure had no space for isolating disinfection chemicals. The well house was also poorly organized and plumbed, likely due to the large amount of equipment in the small space.

Q. WHAT IMPROVEMENTS HAS CONFLUENCE RIVERS MADE TO THE EAGLE WOODS DRINKING WATER SYSTEM?

A. Confluence Rivers has begun to make significant improvements to the Eagle Woods drinking water system. The two ground storage tanks have had spot repairs made which consisted of sanding rust, patching and repainting deteriorating points on the tanks.

Point repairs on ground storage tank (note slightly different paint color)

Much of the equipment in the well house interior has been renovated or replaced. This included the replacement of the power system, disinfection system and piping; the installation of an air release on the well head; replacement of the rusted well head plate, and upgrades in the piping and wiring.

New disinfection system, improved wiring, piping, etc.

In addition to these basic repairs and replacements, an active remote monitoring and chlorine analyzer system has been installed at the well house. With the remote monitoring installation, accurate flow measurement devices, remote chorine analyzers,

and controls for the chemical feed pumps and sodium hypochlorite scales were installed. Accurate flow measurement enables Confluence Rivers to precisely track water loss in the system and therefore identify potential leaks or distribution system issues before they can cause service interruptions, water contamination, or environmental or property damage. The remote chlorine analysis and connection to the chlorination equipment: (1) allows for real time verification that disinfection efforts are effective; (2) reduces the operational cost of chlorine analysis by eliminating the need for manual testing; and (3) ensures that sodium hypochlorite does not run out at the sites causing a disinfection failure.

Chlorine Analyzer system

Q. ARE THERE ANY REMAINING DEFICIENCIES AT THE EAGLE WOODS DRINKING WATER SYSTEM THAT REQUIRE ATTENTION?

A. The primary remaining issue to be addressed at the Eagle Woods drinking water system is the pressure issues experienced by the homeowners furthest from the water production facilities. As described in the first portion of this section, this is primarily the result of the bladder tanks in the well house being inadequately sized to support the system during

periods of high demand, and potentially contributed to by the small size of the distribution piping. Confluence Rivers thought that installing variable frequency drive ("VFD") regulated booster pumps, in the place of the undersized bladder tanks, would help maintain pressure in the system. After installing these pumps, it could then be determined if any sections of distribution main would need to be replaced with larger piping. It was ultimately decided that this was not the best approach to resolving the issues with the system.

There are vacant lots in the subdivision that are waiting to be developed while these utility issues are resolved. While the booster pump solution would likely resolve issues for the system as it currently exists, it would not address problems that arise when additional homes are constructed. As a result, Confluence Rivers explored other options which would not become wasteful improvements when future subdivision development occurs. Ultimately, the Company contracted with the Margaritaville drinking water system (located across the street from the Eagle Woods development) to purchase its distribution system and customers.[3] Once acquired, the Eagle Woods system would be connected to the Margaritaville system, which would provide adequate water supply and pressure to resolve not only the current pressure issues, but also would supply new lots as they are developed. This will also allow the existing Eagle Woods well to be converted into an emergency water source and reduce the maintenance expenses in the system. The only remaining item to be addressed will be improving the ventilation in the well house or moving the chlorine disinfection chemicals to another structure to prevent corrosion of steel equipment in the well house by chlorine fumes.

[3] The acquisition application is currently pending before the Commission as WA-2023-0003.

2. PORT PERRY WATER SYSTEM

Q. PLEASE DESCRIBE THE CONDITION OF THE PORT PERRY WATER SYSTEM WHEN IT WAS ACQUIRED.

A. The Port Perry water system was constructed in 1975 and serves 434 water customers in Perryville, MO (Perry County). When acquired, the system consisted of one active well and one inactive well at separate well sites which provided water to a distribution system comprised of a high elevation standpipe which filled from system pressure (from well pump and the two hydropneumatic tanks) and aided in maintaining system pressure. Well #1 was a 6" diameter deep well which produced approximately 110 gallons per minute. The well head was in poor condition, with significant rust and poor electrical wiring to the well pump. Water from this well was chlorinated with sodium hypochlorite for disinfection and then pumped into two hydropneumatic storage tanks at the well site. The hydropneumatic storage tanks were in poor condition and showed signs of leaking. The well house was in fair condition, with some damage to interior finishing, exposed wiring, and poor housekeeping (piles of trash and debris). The well site had no fencing installed and therefore no proper site security to protect the water production equipment.

Rust and improper electrical wiring at Well #1 well head

Housekeeping and electrical issues in Well #1 well house

Leaking hydropneumatic tank in Well #1 well house

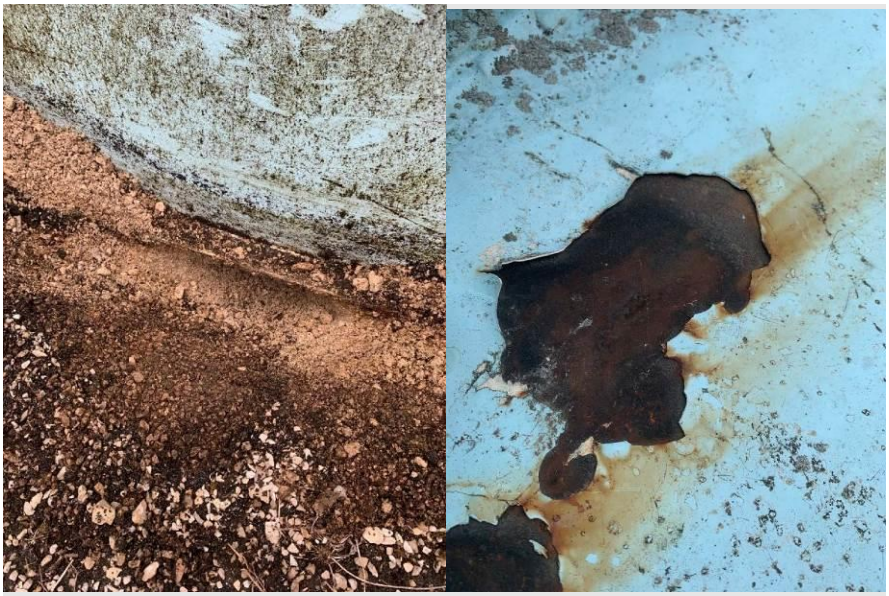
Well #2 was a 10" well rated to produce 270 gallons per minute. The well casing was severely rusted, and the top had been left off for an extended period allowing some components to become damaged due to exposure. Exposed wiring was noted on the site and the power service pole serving the site had fallen at some point in the past. Piles of rusted pipe were left around the well site and vegetation had been allowed to overgrow the site. Well #2 was piped directly into the distribution system and when the pump turned on, excessive water hammer resulted causing damage to the distribution system. The pump was setup on an across the line starter and the surge on startup was too much for the system to manage the sudden change in pressure. Due to this, Well #2 was only

used in emergencies and operated manually so that hydrants could be opened to alleviate startup pressure. As with well #1, there was no fencing or access road present for the inactive well site. This made it difficult for operators to access the facility and there was no proper site security to protect the well infrastructure.

Well #2 – note rusting and lack of fencing

Distribution system pressure is generated by the well pump at the active well and the two hydropneumatic tanks. The pressure in the system filled the standpipe at the highest point in the distribution system. The standpipe is a 223,000-gallon ground storage tank which is approximately 37 feet tall. Once filled the standpipe helped maintain pressure in the system, preventing the well pump from having to run continuously. Typically, the standpipe fills overnight with water level dropping throughout the day when water usage is higher. This cycle is repeated into the next day. There were areas with corrosive damage to the standpipe coating which can lead to damage to the underlying steel. Upon acquisition, there was no screening installed on the overflow pipe, and there were places where overflow had led to washout of the gravel tank footing, potentially destabilizing the standpipe. As with both wells, there was no fencing or access road present at the storage site. This made it difficult for operators to

access the facility for repairs and operations activities, and there was no proper site security to protect the storage infrastructure.



Erosion around standpipe gravel footing / corrosion to standpipe coating

The distribution system, while functioning, had very few isolation valves installed and only three flushing hydrants. The lack of isolation valves meant that the effect of distribution system repairs could not be minimized to only those customers around the section needing repairs. The lack of flushing infrastructure reduced the ability to effectively flush the distribution system as a regular maintenance activity designed to reduce sediment in the system.

Q. WHAT IMPROVEMENTS HAS CONFLUENCE RIVERS MADE TO THE PORT PERRY DRINKING WATER SYSTEM?

A. Confluence Rivers has made many improvements to the Port Perry drinking water system since acquisition. Improvements included replacing the above ground well head casing and well pump at well #2; installing remote monitoring, a new control system, and a flow metering device; replacing the damaged electrical service including placing a new power pole; and installing new sampling ports. The formerly inactive well (well #2) was

outfitted with a VFD to alleviate the water hammer issue that had caused damage to the distribution system. A VFD allows the well pump to ramp up in power as the well turns on, meaning the pressure increase is gradual and does not cause a damaging pressure event. The electrical improvements also include a manual transfer switch which will allow a mobile generator to be connected in the event of a power interruption. Since the elevated storage tank provides 24 hours of stored water and passive maintenance of system pressure, a permanent on-site generator was deemed unnecessary. Ultimately these improvements resolved the issues that led Well #2 to be generally unused. The improvements also addressed the deteriorated components of the well head and the missing and damaged control systems. Thus, reliable power has now been ensured and system resiliency improvement with well #2 being returned to service.

Rehabilitated Well 2

Various improvements have been made at well #1 as well, including installation of a new well pump, flow measurements device, air release valve, pressure transducer, remote monitoring, an improved control system, new sample port, replacement of the above ground casing, and general cleanup of the site. Repairs made to the well house included patching leaks in the structure, removing various trash and debris from the well house and site, repairing the roof, improving the insulation, adding a heater, replacing the

chemical pump on the disinfection system, adding a chemical containment pallet for sodium hypochlorite storage, and removing the leaking hydropneumatic tanks from service. Additionally, improvements were made to damaged and deteriorating pipes present in the well house. The electrical and control systems were also overhauled in the well house, eliminating exposed wiring, and providing a greater degree of control to the system. The repairs to the well head and pump were required to restore the useful life of the well, halt deterioration and corrosion of the above ground steel piping and equipment and enhance the reliability of the water production. As with the rehabilitated well #2, the electrical improvements included the installation of a manual transfer switch/quick connect to allow for the connection of a mobile emergency generator in the event of a power outage.

The hydropneumatic tanks have been removed from service as neither tank was needed to maintain system pressure. Further both tanks were leaking badly which risked corrosion to other equipment in the well house. The improved insulation and heating in the well house will prevent pipes from freezing in winter which could interrupt service or damage other equipment. Following other improvements on the site, fencing was installed to provide adequate site security and protect water production equipment.

New gravel, well head equipment, and coating at Well #1

New fencing, gate, gravel and access road at Well #1

Remote monitoring installed at Well #1

Both well sites and the ground storage tank site have had gravel installed at the site to ensure access to the site and to prevent nuisance vegetation from growing up on the site. Fencing has also been installed at all three locations. As with the Eagle Woods facility, the remote monitoring equipment provides telemetry between water storage and production facilities for greater automated control of the water production and allows operators to check equipment status remotely and become immediately aware of any abnormal operating conditions. Screening has been installed on the overflow of the storage tank to meet state requirements and the tank area was re-rocked to combat the erosion under one edge of the tank. Fencing has been installed at the ground storage tank to provide adequate site security and protect the storage facility. Finally, the ground storage tank has undergone a full rehab with steel welding repairs and interior and exterior coating applied to extend its useful life.

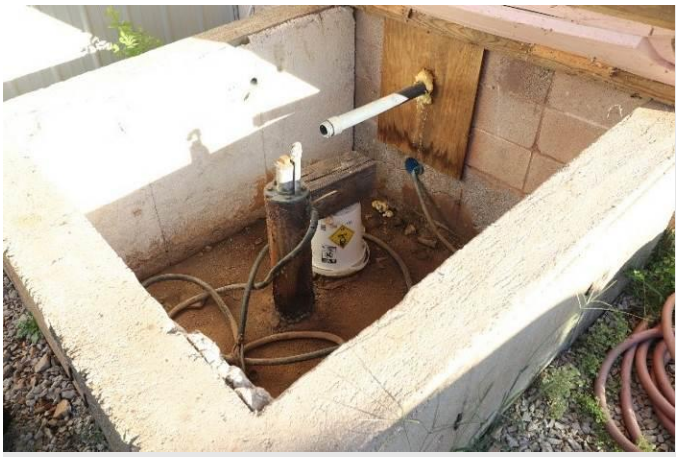
Q. ARE THERE ANY REMAINING DEFICIENCIES AT THE PORT PERRY SYSTEM THAT CONFLUENCE RIVERS INTENDS TO ADDRESS?

A. The only remaining issue to address at the Port Perry drinking water system has to do with the hydropneumatic tanks that have been removed from service. The leaking hydropneumatic tanks at the Well #1 facility will either be repaired, replaced, or formally decommissioned as, given their current condition, they will leak which necessitated that they be bypassed to avoid such leakage.

3. <u>TERRE DU LAC WATER SYSTEM</u>

Q. PLEASE DESCRIBE THE CONDITION OF THE TERRE DU LAC WATER SYSTEM WHEN IT WAS ACQUIRED.

A. The Terre du Lac water system was constructed in 1968 and serves 434 water customers near Bonne Terre, MO (St. Francois County). Upon acquisition the water system consisted of three active wells (each with a sodium hypochlorite disinfection treatment system); one inactive well; two elevated storage tanks; and a distribution system. Well #1 was out of service and no longer connected to the system due to consistent exceedances of Maximum Contaminant Limits ("MCL") for radionuclides. Radionuclides are radioactive isotopes sometimes found in groundwater which, when exceeding certain levels may increase the risk of developing cancer in people who regularly drink the water. While still listed as active for emergency use only, Well #1 had been physically disconnected from the system. The well head was in poor condition with exposed wiring in the cinder block box containing the well head.



Inactive Well #1: exposed wiring and physical disconnection

Well #2 had similarly exceeded MCLs for radionuclides and been listed for emergency use only. The exterior of the cinder block well house was overgrown with vegetation causing damage to the paint and roof of the structure. The interior included a sodium hypochlorite disinfection system located in the same room as the rest of the well equipment with no containment to prevent spills. There was also no ventilation system,

meaning that chlorine fumes could lead to premature deterioration of metal equipment in the well house including the well head and all piping and valving. The lack of ventilation is a DNR violation that is typically cited on facility inspections of water systems using an indoor chlorination system. While this well was labeled as available only for emergency use due to the radionuclide exceedances, there were still indications that Well #2 had regularly been providing water to the system due to reliability issues at Well #3. While the well head and piping at Well #2 exhibited some rust, this well was generally in fair condition.

Vegetation overgrowing the Well #2 well house.

Interior of Well #2 well house.

Well #3 was located near Well #2 and was in a wooden framed well house. As with Well #2, the interior of the well house included a sodium hypochlorite disinfection system located in the same room as the rest of the well equipment with no ventilation system or containments to prevent spills. Thus, chlorine fumes could lead to premature deterioration of metal equipment including the well head and all piping and valving. This represents a violation of DNR regulations. There is a section of flooring where the concrete was broken around a pipe installation which had never been repaired. The well head was in generally good condition with only some rust present on the well head and piping. As mentioned in the discussion of Well #2 above, Well #3 also had reliability issues arising from the fact that the well pump was approaching the end of its useful life. As mentioned previously, when the well pump at Well #3 would go down, Well #2 would be turned on to maintain adequate water production to the system. The reliance on Well #2 is disconcerting given the ongoing issues with radionuclides at Well #2.

Well # 3 Well house

Well # 3 well house interior with damaged floor

Rust on Well #3 well head.

Prior to discussing Well #4, it is important to further explore the issues related to radionuclides in this system and the way the system had operated for much of its history. The MCL limits established by the Safe Drinking Water Act and the EPA/DNR are a health-based standard aimed at reducing potential health risks to those consuming the water. For much of its history, the system operated on Wells 1-3 despite the fact that both Wells #1 and 2 had consistently exceeded radionuclide limits. In an attempt to avoid the problems with radionuclide, previous ownership argued that well #1 was rarely used and that the water from Wells #2 and #3 were combined to the point that the blended water was below the MCL limits for radionuclides. While blending water

sources is an acceptable method of meeting MCL limits in drinking water systems, blending requires tanks to ensure that water is thoroughly mixed before being distributed to customers. Recognizing that the Terre du Lac system never had such a tank, customers that were located proximate to Well #2 were regularly consuming water that exceeded radionuclide limits. Worse still, during periods of maintenance at Well #3, the system relied entirely on Wells #1 and #2. Since both of these wells exceeded radionuclide limits, all customers would be provided drinking water that exceeded radionuclide limits. Given the obvious problems, the DNR initiated an enforcement action against the previous owner. To resolve these issues the owner drilled a new higher production well (Well # 4) near one of the elevated storage tanks, theoretically allowing both Wells #1 and #2 to be removed from service and eliminating the radionuclide issues. While Well #1 was physically disconnected from the system, there were indications that Well #2 was still in regular use despite its status as emergency supply only. The regular reliance on Well #2 resulted from the poor operational performance of the well pump at Well #3 which often required maintenance, sometimes for extended periods of time. To cover the shortfall from Well #3, previous ownership routinely relied on Well #2. This created the same problem described above, in which the average level of radionuclides in the system was below the MCL, the lack of an actual blending tank meant that customers located near to Well #2 were still consuming water which exceeded radionuclide limits.

As discussed above, Well #4 was constructed to resolve the issues with radionuclides in the system. The well is newer (installed in 2016) and is therefore in good condition. The well, constructed adjacent to the larger of the two elevated storage tanks, was a higher yield well as compared to others in the system, did not exhibit the

same issues with radionuclides as Wells #1 and 2, and had a more modern well house. The separate rooms in the well house allowed for separation of controls/valving from disinfection equipment and avoided the problem of deterioration of well equipment resulting from the presence of the chlorination chemicals. As mentioned, well #4 was generally in good condition though it did exhibit some rusting to the piping located in the room where disinfection equipment was located. In such a situation, piping should be constructed from PVC to avoid rusting.

Well #4

Well #4 control room

Well #4 disinfection room with steel rusting

The storage facilities at the Terre du Lac water system consist of two elevated storage tanks: one at the well #1/office site and one at the site of well #4. The two elevated storage tanks are both single pedestal type elevated tanks with a globe tank at the top of the pedestal. The tank near well #1 is a 50,000-gallon tank and the tank near well #4 is a 100,000-gallon tank. The tanks are designed to provide adequate storage for 24 hours of water usage and maintain pressure in the distribution system. The tanks are in fair condition with significant rust on the tank structure being the primary issue that must be addressed to extend the useful lives of the tanks. The interior piping of both tanks shows significant rust and will require repairs sometime in the next several years to avoid leaking inside the tank pedestals.

Base of tank near well #4

Tank near well #4

Interior tank near well #4

Tank near well #1

Q. WHAT IMPROVEMENTS HAS CONFLUENCE RIVERS MADE TO THE TERRE DU LAC DRINKING WATER SYSTEM?

A. Confluence Rivers has begun to make significant improvements to the Terre du Lac drinking water system. The well pumps at wells #3 and #4 have been replaced. Following more thorough well inspections, both pumps were found to be in poor condition. This is not surprising given the historically unreliable nature of the pump at well #3. With these pump replacements Confluence Rivers has not used well #2 at all, eliminating the potentially harmful water from the system. In addition to both of these well pump replacements, VFDs were also installed at both primary wells. As mentioned in the discussion on the Port Perry system, the VFD allows the well pump to slowly ramp up when a well turns on, reducing wear and tear on the pumps and preventing damaging "water-hammer" pressure spikes in the distribution system. Furthermore, the VFDs allow wells to be run at less than full production, reducing power consumption and wear

and tear on the well pumps. The VFD has the effect of extending the useful life of the well pumps and reducing electrical operating expenses.

As with other sites, remote monitoring units have been installed at all well sites as well as the storage tanks. This allows for telemetry between the tanks and water production facilities for greater efficiency in system control. Furthermore, remote monitoring allows operators to check equipment status remotely and become immediately aware of any abnormal operating conditions. In addition to the remote monitoring equipment, accurate flow measurement devices, remote chorine analyzers, and controls for the chemical feed pumps and sodium hypochlorite scales were also installed. Accurate flow measurement enables Confluence Rivers to precisely track water loss in the system and therefore allows for the identification of potential leaks or distribution system issues before they can cause service interruptions, water contamination, or environmental or property damage. The remote chlorine analyzer and connection to the chlorination equipment: (1) allows for real time verification that disinfection efforts are effective; (2) reduces the operational cost of chlorine analysis by eliminating the need for manual testing; and (3) ensures that sodium hypochlorite does not run out at the sites causing a disinfection failure.

Chlorine Analyzer system (well #4)

New Flow Meter at well #4

Well #2 site with vegetation removed

Q. ARE THERE ANY REMAINING DEFICIENCIES AT THE TERRE DU LAC DRINKING WATER SYSTEM THAT CONFLUENCE RIVERS PLANS TO RESOLVE?

A. The primary issues that remain to be resolved at the system consist primarily of basic repairs that were put off by former owners and maintenance of the storage tank infrastructure. While the improvements that Confluence Rivers has made have essentially solved the issues related to the supply of clean drinking water by removing the need to supply water from wells which exceed limits for radionuclides, the older well sites still have significant issues related to deferred maintenance that the Company intends to address. Any damaged or corroded piping at the water production and storage

facilities will either be replaced or sanded and recoated to halt deterioration caused by rust. The insulation and interior finishing at the two older well houses, especially well #3 will be repaired to prevent pipes from freezing and potentially interrupting water supply or damaging equipment in winter months. Other structural damage to the two older well houses will also be repaired to ensure that the water production assets are secure and protected from weather damage which can shorten the useful life of equipment. The elevated storage tanks have been evaluated and are currently undergoing welding repairs, patching, sanding, blasting and recoating repairs to extend the useful lives of the tanks and prevent leaking. Tank leaking must be prevented both to prevent water losses in the system as well as to prevent the potential for contamination of stored treated drinking water. Besides the improvements already discussed, Confluence Rivers will formally retire well #1 as the previous owners had simply disconnected the well from the system without following the proper procedure to close and abandon a well. Additionally, Confluence Rivers will evaluate the distribution system and install additional flushing hydrants so that a proper flushing program can be initiated. Flushing of the distribution system is an important part of maintenance to remove any particulate that builds up in the piping and prevent high water age or contamination issues that can occur without regular flushing.

4. <u>GLENMEADOWS WATER SYSTEM</u>

Q. PLEASE DESCRIBE THE CONDITION OF THE GLENMEADOWS WATER SYSTEM.

A. As indicated, the Commission only recently (December 8, 2022) issued its order authorizing the acquisition of Glenmeadows. As such, Confluence Rivers has very little operational history as of the time this testimony was prepared.

The Glenmeadows water system is a drinking water system constructed in approximately 2004 and serving 226 residential connections in the Glenmeadows subdivision south of Troy, MO (Lincoln County). The facility has a single deep water well located at the Northwest corner of the subdivision. At the well site there is a building with three connected 11,500-gallon hydropneumatic storage tanks which maintain pressure in the system. Pressure is maintained via a 2 hp compressor which is connected to the central tank and controlled via a pressure switch installed on the central tank. There is currently no disinfection process installed and no backup power supply; though the power system does have a manual transfer switch and quick connect for connecting an emergency generator in the event of a power outage. While this is better than not having means to connect backup power, an onsite generator with an automatic transfer switch would provide more effective and reliable water supply during power interruptions.

Glenmeadows well

Hydropneumatic storage tank building (note violations associated with dependence on hydropneumatic storage only and use of 2" pvc piping)

While most of the equipment is in fair or good condition, the system has several major issues related to failure to comply with drinking water construction standards. According to Missouri Drinking Water Standards Section 7.4.2 "Sizing hydropneumatic tanks," Part a: "Hydropneumatic storage (conventional tanks or bladder tanks) shall not be used as the only storage facilities for community public water systems serving more than 50 connections or living units." The facility is clearly in violation of these requirements by having only hydropneumatic storage for a system with more than 50 residential connections. In this case, either ground level/elevated storage needs to be added to the existing system, or the existing hydropneumatic tanks need to be converted to ground-level storage. Either of these options would also require booster pumps be installed to maintain pressure in the distribution system. In addition to the violation of storage requirements, the piping in the well house is also non-compliant as it is schedule 80 PVC piping. Missouri drinking water requirements require piping over 2" diameter to be ductile iron piping.

Beyond the issue with storage and piping being noncompliant with drinking water system requirements, the system currently has no form of disinfection installed. While this is not strictly required, best practices are to provide disinfection to prevent harmful pathogens from contaminating drinking water. This can potentially prevent exposures that could cause a customer to become sick or even die. Finally, there is currently no remote monitoring system installed at the plant which could provide live information on equipment status to operators.

In addition to physical issues with the system, the facility has received a number of violations recorded in the Missouri Drinking Water Watch and federal Safe Drinking Water Information System. The system has received 6 state violations for failing to pay required annual fees in 2013, 2014, 2015, 2016, 2017, and 2020. The facility also has 6 safe drinking water act violations for monitoring violations (failure to complete required testing on time) and failure to fulfill consumer confidence reporting requirements. These issues indicate managerial issues with the system under its current ownership.

Q. WHAT IMPROVEMENTS DOES CONFLUENCE RIVERS PLAN TO MAKE TO THE GLENMEADOWS SYSTEM AND WHY ARE THESE NECESSARY?

A. Confluence Rivers plans on making several improvements to address the issues discussed above. A remote monitoring system will be installed. This will allow operators to become immediately aware of any abnormal operating conditions at the facility, letting them address issues quickly before equipment damage or service interruptions can occur. With the remote monitoring installed, a new flow meter will be installed to provide live flow data through the remote monitoring system. Better flow data will also help to identify any water losses in the system through increased flow or

differences in metered sales and water pumped from the well. Various repairs will be made to the well house on both the interior and exterior of the structure to address damage to the building and extend the life of the structure and the equipment protected inside.

As discussed above, the system is currently noncompliant with drinking water system requirements resulting from its sole reliance on hydropneumatic tanks. As a result, the tanks will be converted from hydropneumatic tanks to ground storage tanks. This will also require booster pumps to be installed to pressurize the system. To facilitate the installation of a booster pump skid, additional modifications are also required. The electrical system will be upgraded for the pumps, including the installation of a backup generator so the system does not lose pressure during power outages. The well house structure must also be expanded to facilitate the installation of the booster pump skid. Some piping and valving modifications will also be required for the conversion to ground storage with booster pumps. With these piping modifications, the schedule 80 piping in the well house will also be replaced with ductile iron piping to bring the piping back into compliance with water system requirements.

Some valving and piping repairs will also be made to the distribution system to reduce water losses and to allow for better isolation capabilities to minimize the number of customers impacted by main breaks in the system in the future. Finally, Confluence Rivers is considering installing sodium hypochlorite disinfection on the system. Testing will be performed following closing to determine if this is necessary.

IV. CATEGORIES OF ACQUIRED SYSTEMS, PROBLEMS COMMON IN EACH CATEGORY, AND NECESSARY IMPROVEMENTS

A. INTRODUCTION

Q. DO THE WATER AND WASTEWATER SYSTEMS YOU DESCRIBED CONSTITUTE ALL OF THE CONFLUENCE RIVERS' SYSTEMS IN MISSOURI?

A. No, the water and wastewater systems that I have described constitute a small portion of the systems that Confluence Rivers owns in Missouri. Specifically, these represent only 8 of the 42 total Confluence Rivers wastewater systems and only 4 of the 26 total drinking water systems.[4]

Q. PLEASE IDENTIFY ALL THE CONFLUENCE RIVERS' SYSTEMS.

A. The 42 wastewater facilities Confluence Rivers owns can broadly be broken into three categories based upon the primary treatment processes: (1) discharging aerated and facultative lagoons (14 systems); (2) discharging activated sludge treatment plants (15 systems); and recirculating sand filter systems (13 systems).

Similarly, except for 1 (Margaritaville / State Route KK), the 26 Confluence Rivers drinking water systems are all groundwater which produce their own water. As with the wastewater systems, I will address typical issues and improvements required at these water facilities.

Q. PLEASE LIST THE WASTEWATER TREATMENT SYSTEMS THAT CONFLUENCE RIVERS HAS ACQUIRED?

[4] It is important to recognize that I speak of "systems" from an engineering standpoint. That is, I define a system by entities with distinct NPDES or PDW permits. As a result, the number of systems that I discuss from an engineering standpoint may differ from the number of systems when used to refer to distinct service areas. For instance, while Terre du Lac consists of one service area, Terre du Lac has three distinct NPDES permits. Therefore, I show Terre du Lac as three separate systems.

A. The following table lists the 42 wastewater treatment plants that Confluence Rivers has acquired (or anticipated acquiring before the end of the year), the facility type, and the year of acquisition for each system:

Facility Name	Plant Type Detail	Year of Acquisition
Hillcrest	Wastewater - Aerated Lagoon (w/ MBBR)	2015
Village of Whiteman	Wastewater - Aerated Lagoon (w/ MBBR)	2015
Hunter's Ridge	Wastewater - Extended Aeration	2015
South Walnut Hills	Wastewater - Extended Aeration	2015
Missouri Utilities	Wastewater - Aerated Lagoon (w/ MBBR)	2018
Rainbow Acres	Wastewater - Aerated Lagoon (w/ MBBR)	2018
State Park Village	Wastewater - Extended Aeration (w/ IFAS)	2018
Twin Oaks Estates	Wastewater - Recirculating Sand Filter (w/ MBBR)	2018
Gladlo	Wastewater - Facultative Lagoon (w/ MBBR)	2019
Calvey Brook	Wastewater - Recirculating Media Filter	2019
Willows	Wastewater - Extended Aeration	2019
Villa Ridge	Wastewater - Extended Aeration	2019
Castlereagh	Wastewater - Extended Aeration	2019
Roy L	Wastewater - Facultative Lagoon (w/ MBBR)	2019
Majestic Lakes	Wastewater - SBR - Extended Aeration	2019
Auburn Lakes	Wastewater - Extended Aeration	2019
Lake Virginia	Wastewater - Facultative Lagoon (w/ MBBR)	2019
Chelsea Rose	Wastewater - Extended Aeration	2020
Cedar Glen	Wastewater - Recirculating Sand Filter	2020
Cimarron Bay	Wastewater - Recirculating Sand Filter	2020
Eagle Woods / Rte. KK	Wastewater - Recirculating Sand Filter	2020
Berkshire Glenn	Wastewater - Recirculating Sand Filter	2020
Country Hills Estates	Wastewater - Recirculating Sand Filter	2020
Countryside Meadows	Wastewater - Recirculating Sand Filter	2020
Fox Run	Wastewater - Recirculating Sand Filter	2020
Park Estates	Wastewater - Recirculating Sand Filter	2020
Private Gardens	Wastewater - Recirculating Sand Filter	2020
Wilmar Estates	Wastewater - Recirculating Sand Filter	2020
Port Perry	Wastewater - Facultative Lagoon	2020
Branson Cedars	Wastewater - Recirculating Sand Filter	2021
Freeman Hills	Wastewater - Facultative Lagoon	2021
Deguire	Wastewater - Facultative Lagoon	2021
Terre du Lac (North Lagoon)	Wastewater - Aerated Lagoon	2021
Terre du Lac (South Lagoon)	Wastewater - Facultative Lagoon	2021
Terre du Lac (Oxidation Ditch	Wastewater - Oxidation Ditch	2021
Clemstone	Wastewater - Extended Aeration	2022

Facility Name	Plant Type Detail	Year of Acquisition
The Missing Well	Wastewater - Facultative Lagoon	2022
Prairie Heights (Sullivan)	Wastewater - Recirculating Sand Filter	2022
Cedar Green	Wastewater - Extended Aeration	2022
Prairie Field	Wastewater - Extended Aeration	2022
Deer Run Estates	Wastewater – Aerated Lagoon	2022
Glenmeadows	Wastewater – Extended Aeration	2022

Q. REGARDING THE WASTEWATER SYSTEMS, PLEASE DESCRIBE THE VARIOUS TYPE OF SYSTEMS THAT CONFLUENCE RIVERS OWNS.

A. As the name implies, a discharging system is one in which effluent is discharged into receiving waters (a creek, ditch, river, etc.) also known as a point-source discharge. On the other hand, a non-discharging system is one in which the effluent soaks into the ground via drip field, spray field, infiltration basin, etc. Finally, a collection only system is one in which Confluence Rivers owns a collection system but pays for another wastewater system to treat its wastewater either through a discharging or a non-discharging treatment plant. The discharging and non-discharging facilities typically rely on either lagoon, recirculating sand filter or activated sludge treatment systems to treat the wastewater they receive.

Lagoon systems can also be categorized as either aerated or facultative. In general, the difference between these two types of lagoon wastewater treatment plants is the fact that an aerated facility is one in which mechanical aerators, mixers or blowers are used to increase aeration. In contrast, a facultative lagoon facility does not have mechanical blowers, but instead simply relies upon natural breakdown of the wastewater in a pond environment. At many of the systems already rehabilitated by Confluence Rivers, the Company has installed a MBBR treatment system to allow the facilities to achieve compliance with modern permit limits.

Activated sludge facilities are facilities where vigorous aeration occurs in tanks where water and solids are mixed to facilitate rapid treatment of wastewater prior to clarification and disinfection of the treated wastewater. The activated sludge facilities acquired by Confluence Rivers are all extended aeration or oxidation ditch plants where this process occurs in a simple aeration basin tank.

Recirculating sand systems are systems where wastewater is collected in a septic tank and then flows into a recirculation tank. In the recirculation tank mixing and natural biological treatment take place. Pumps in the recirculation tank deliver the wastewater to the Sand Filter bed in frequent, time-controlled doses. With each dose, the wastewater sifts through the sand and contaminants are removed and broken down by naturally occurring microorganisms living on the sand particles, in an aerobic process with oxygen available to the microorganisms on the sand due to the intervals in between doses of wastewater. The flow then drains back to the recirculating tank or into a second recirculation tank for mixing with incoming wastewater or partially treated wastewater. After a number of passes (recirculations) through the sand filter and recirculation tank the treated wastewater is ready for disinfection and discharge. These systems, however, often struggle to meet more stringent modern limits for ammonia and BOD, therefore, as with the lagoon facilities, at many of the systems already rehabilitated by Confluence Rivers, the Company has installed a MBBR treatment system to enhance treatment.

Q. WHAT DRINKING WATER SYSTEMS HAS CONFLUENCE RIVERS ACQUIRED?

A. The following table lists each of the 26 drinking water systems that Confluence Rivers has acquired (or anticipates acquiring before the end of the year) and the year of acquisition:

System	Year of Acquisition
Hillcrest	2015
Indian Hills	2016
Missouri Utilities	2018
Gladlo	2019
Calvey Brook	2019
Willows	2019
Evergreen	2019
Smithview	2019
Roy L	2019
Eugene	2019
Majestic Lakes	2019
Auburn Lakes	2019
Cedar Glen	2020
Chelsea Rose	2020
Cimarron Bay	2020
Eagle Woods / Rte. KK	2020
Port Perry	2020
Branson Cedars	2021
Prairie Heights	2021
Terre Du Lac	2021
Fawn Lake	2021
Spring Branch	2021
The Missing Well	2022
Cedar Green	2022
Margaritaville – KK Water Supply[5]	2022
Glenmeadows	2022

All of these plants consist of wells, treatment plants, and storage infrastructure supplying treated groundwater to a distribution system.

Q. ARE THERE ANY PHYSICAL IMPROVEMENTS WHICH CONFLUENCE RIVERS MAKES TO ALL SYSTEMS?

A. Yes. An improvement that Confluence Rivers makes to all systems, at both drinking water and wastewater facilities, is the installation of remote monitoring equipment.

[5] I have included Margaritaville – State Road KK on this chart. As indicated in Mr. Thomas' testimony, while Confluence Rivers anticipates closing on this acquisition prior to the end of the year, Confluence Rivers does not propose to include the impacts of Margaritaville in this rate case.

Remote monitoring equipment is typically installed at each drinking water production, treatment, and storage site, each wastewater treatment facility, and each lift station in wastewater collection systems. Few if any of the facilities that Confluence Rivers has acquired have any form of remote monitoring equipment installed at the time of acquisition. Confluence Rivers prioritizes this improvement to enhance the operational excellence, quality of service, and resiliency of the facilities it acquires. As previously discussed, remote monitoring equipment allows operations staff to remotely track the status of water and wastewater equipment as well as to provide an immediate notification to operations staff in the event of any abnormal operating condition. Status tracking includes live and continuously recorded data on the runtime and operational performance of various system components, allowing for increased awareness of the state of repair of equipment over time and allowing equipment to be efficiently maintained or replaced rather than running until failure. This sort of predictive maintenance, which is not possible without accurate equipment data, greatly reduces service interruptions, allows maintenance and equipment replacement to be handled in a non-emergency manner (reducing maintenance costs by lowering cost of labor and cost of rushing parts or components for equipment), and over time provides a greater understanding of the performance and breakdown modes of specific equipment, enhancing the company's ability to efficiently and cost effectively operate and maintain water and wastewater systems.

Remote monitoring system at Prairie Fields

Beyond the advantages for system operations and maintenance, receiving immediate notification of any abnormal operating condition enables operators to quickly respond to emergencies, often intervening before incidents can result in greater impacts to systems. Without immediate notification, some equipment malfunctions or system failures can go on until the operator's next scheduled visit to the site or inspection of a specific piece of equipment. Allowed to continue unaddressed, these types of failures can result in damage to the environment through overflows of sewage from lift stations or treatment plant components, interruption of proper treatment process causing violation of permitted limits or other environmental or health regulatory requirements, damage to equipment, sewage backups that can damage customers property, or service interruptions to customers. Immediate response to these sorts of incidents drastically reduces the impact of emergencies and as a result the cost related to responding to them which would otherwise result in higher operational costs for a facility (and therefore a higher rate).

In addition to advantages in maintenance and emergency response, the remote monitoring equipment allows for the installation of other equipment which can improve the operational efficiency of a facility, thereby reducing operations costs and improving system function. Examples of this include the installation of chlorine analyzers and scales for disinfection chemical. The ability to remotely analyze chorine residual in drinking water eliminates the need for additional trips by operations staff and manual tests, simultaneously reducing the operational cost of running a drinking water system and improving the system resiliency by continuously ensuring safe drinking water is provided to customers. Disinfection chemical scales similarly help to ensure operations staff can continually verify disinfection is occurring in either water or wastewater systems, while also ensuring that they are aware when chemicals need to be stocked at a site.

Chlorine Analyzer at Terre du Lac drinking water system

The most common and perhaps most important piece of equipment typically connected to these remote monitoring systems is accurate and continuous flow measurement devices. This provides extremely useful data for both water and wastewater facilities which allow for more accurate reporting in required regulatory testing, greater ability to monitor facility capacity and performance, and the ability to

accurately quantify water loss in drinking water and I&I in wastewater. All this information enhances the company's ability to operate with excellence, identify issues with a facility, collection, or distribution system, and efficiently design improvements.

Magnetic Flow Meter at Cedar Glen Drinking Water system

Ultrasonic Flow Meter at Cedar Green

B. Discharging Lagoon Wastewater Treatment Plants

Q. PLEASE BRIEFLY DISCUSS THE DISCHARGING LAGOON SYSTEMS THAT CONFLUENCE RIVERS HAS ACQUIRED SINCE ITS LAST RATE CASE.

A. Since its last rate case, Confluence Rivers has acquired 6 lagoon wastewater treatment plants. These plants are Terre du Lac (three-cell lagoon); Terre du Lac (single cell lagoon); Deguire; Freeman Hills; Missing Well, and Port Perry. While each of these plants is a typical lagoon wastewater treatment facility, there can be variation in the

number of treatment cells and the arrangement of each system. These systems can be broadly placed in two categories: aerated lagoons (lagoons with electrically powered aeration equipment) and facultative lagoons (lagoons with no aeration equipment). While I have previously discussed issues associated with the Terre du Lac systems, Freeman Hills, and Port Perry, a more generalized discussion of such systems based upon Confluence Rivers' experience with all of these lagoon systems is helpful to understand the problems with these troubled systems.

Q. WHAT TYPES OF DEFICIENCIES DOES CONFLUENCE RIVERS TYPICALLY ENCOUNTER AT THE LAGOON WASTEWATER TREATMENT PLANTS THAT IT ACQUIRES?

A. Typically, the condition of the lagoon wastewater treatment plants that Confluence Rivers acquires is poor, with many problems impacting the plants' ability to comply with environmental regulations and provide safe and reliable service to customers. In general, the Company found the lagoon facilities to be suffering from the following issues: overgrowth of vegetation and trees around the facility; overgrowth of duckweed on the surface of the lagoon structures; damage to lagoon berms allowing wastewater to escape the facility or flow uncontrolled between lagoon cells; sludge accumulation in lagoon cells; damaged, inoperable, or poorly configured aeration equipment; underperforming or damaged disinfection equipment; and an overall inability to meet permitted limits. Finally, many facilities had no proper way to access the plant and many lacked site security.

Q. PLEASE DESCRIBE THE PROBLEMS RELATED TO OVERGROWTH OF VEGETATION AND TREES AROUND LAGOON WASTEWATER TREATMENT PLANTS.

A. At acquisition, it was apparent that very little operations or maintenance activities had been performed at many of these facilities by previous ownership. One of the most obvious signs was a general condition of overgrowth of trees and vegetation around the facilities, on lagoon berms, and sometimes even growing directly inside lagoon cells. This is a problem for several reasons. First, vegetation around facilities drops limbs, leaves, and other plant matter into lagoon cells, leading to rotting vegetation in the lagoon. Rotting vegetation releases tannins, ammonia, solids, and other material harmful to the treatment process. Second, many of these facilities had severe damage to fencing due to uncontrolled vegetation growth and fallen trees, rendering site security ineffective and potentially allowing members of the public to encounter dangerous treatment equipment or wastewater. Third, excessive growth of vegetation and trees on lagoon berms can lead to berm damage and unlawful release of wastewater from the facility. Finally, many of the facilities had such extreme vegetation overgrowth that there was no way for operators to access the facilities for operations and maintenance activities. Some of the lagoon facilities had such severe overgrowth that operators were not able to locate the lagoon outfalls, meaning that, for an indeterminate period before Confluence Rivers' acquisition, it had been unlikely that the previous owners had been collecting the samples for DNR testing. In every case, Confluence Rivers has taken all steps necessary to clear the areas around lagoons, sometimes requiring specialized forestry mowing equipment, to

curtail the overgrowth of vegetation and trees and to restore operational access to the facilities.

Scenes typical of the overgrowth of vegetation and trees are depicted in the following photographs:

Overgrowth around Missing Well lagoon

Trees growing and rotting in Port Perry lagoon cells

Lagoon cells cleared of trees after acquisition at Port Perry

Inaccessible outfall at Port Perry lagoon

Fence damage due to overgrowth at Shelton Estates

Q. PLEASE DESCRIBE PROBLEMS RELATED TO THE OVERGROWTH OF DUCKWEED ON THE SURFACE OF LAGOON WASTEWATER TREATMENT PLANTS.

A. Many of the lagoon wastewater treatment plants that Confluence Rivers has acquired have exhibited extreme overgrowth of duckweed on the surface of the lagoon cells. While it is difficult to prevent all duckweed growth, a thick layer of duckweed growth has an adverse effect on wastewater treatment. When grown in a thick layer, duckweed blocks oxygen from dissolving into water, and prevents light from entering the lagoon. This reduces algal growth which naturally adds oxygen to water. The combination of these factors can cause an anoxic or anaerobic environment where regular biological treatment processes cease. In turn, this can lead to elevated levels of BOD and ammonia, reduced dissolved oxygen, and generally poor wastewater treatment. In addition, when duckweed dies it releases ammonia into the water further contributing to pollutants released from the treatment facilities.

Confluence Rivers is doing several things to combat duckweed overgrowth. At many facilities, aerators have been added to or repaired in the lagoon cells, which will directly increase the treatment process by adding oxygen to water. It also will help discourage duckweed growth by agitating the water. In addition, Confluence Rivers will chemically treat duckweed growth where appropriate, which will break down the mat that has formed and prevent further duckweed growth.

The following photographs show how duckweed can cover the entire surface of a lagoon and adversely affect the treatment process:

Duckweed covering surface of Deguire lagoon

Deguire after duckweed remediation

Q. PLEASE DESCRIBE PROBLEMS RELATED TO DAMAGE TO LAGOON BERMS.

A. As I mentioned previously, many of the lagoon wastewater treatment plants that Confluence Rivers acquires have exhibited severe damage to berm structures, both surrounding lagoons and in between lagoon cells. This damage can be caused by erosion, varmint damage, vegetation overgrowth, or poor operational control allowing water levels in the lagoons to rise higher than design criteria. Damage to berms makes treatment activities difficult to complete and can allow partially treated wastewater to

escape from the facility in unlawful discharges or flow between lagoon cells in an uncontrolled manner. When wastewater is allowed to flow between lagoon cells in an uncontrolled manner, the treatment process is compromised, and treatment performance degrades. Confluence Rivers has made efforts to repair lagoon berms at all acquired facilities to ensure the facilities function properly and no wastewater leaves the facility in unlawful discharges.

The following photographs illustrate some of the problems Confluence Rivers has encountered because of damaged berms at the acquired facilities:

Varmint damage at Terre du Lac three-cell lagoon

Berms following repairs and application of rip rap

Q. PLEASE DESCRIBE PROBLEMS RELATED TO SIGNIFICANT SLUDGE ACCUMULATION IN LAGOON WASTEWATER TREATMENT PLANTS.

A. Many of the lagoon treatment facilities Confluence Rivers acquires have significant sludge accumulation in the lagoon cells, which reduces the treatment capacity of the lagoon cells and the volume of the cells themselves. Decreased cell volume reduces the amount of liquid the cell can hold, as well as the time that water is retained in the lagoon which adversely impacts the treatment process. Additionally, if enough sludge accumulates, wastewater can overflow lagoon berms during periods of high flow, and suspended solids levels increase in the wastewater allowed to escape the lagoon. Finally significant sludge accumulation in lagoons can lead to growth of vegetation in the treatment cells. This eventually leads to rotting vegetation in the cells which releases ammonia and organic matter that increases BOD, degrading water quality. Confluence Rivers combats sludge accumulation by removing sludge which improves treatment processes by adding aeration, promoting better breakdown of organic components in sludge which further reduces sludge volume, and by adding enzymatic products which will aid in the breakdown of the organic component of sludge, reducing sludge volume.

Q. PLEASE DESCRIBE PROBLEMS RELATED TO DAMAGED, INOPERABLE, OR POORLY CONFIGURED AERATION EQUIPMENT AT LAGOON WASTEWATER TREATMENT PLANTS.

A. Since its last rate case, Confluence Rivers has only acquired one lagoon system which had an aeration system installed (Terre du Lac Three-Cell Lagoon). That said, it has been the Company's experience that the aerators at the Terre du Lac system are indicative of similar aerated lagoon systems. Specifically, while these systems have aeration

equipment present in the lagoon, the equipment (the aerators or the power/control equipment) is typically not maintained. Therefore, as with the Terre du Lac system, the aerators were either functioning poorly or broken down entirely.

Aeration in a lagoon system dramatically increases the effectiveness of treatment by providing mixing, increasing dissolved oxygen in water, and reducing duckweed growth on the surface of the lagoon. A system which is designed to rely on aeration treatment becomes incapable of meeting limits when that equipment fails.

Failed aerator at Terre du Lac three-cell lagoon

Underperforming surface aerator at Terre du Lac three-cell lagoon

New aeration at Terre du Lac three-cell lagoon

Before and after control/power system replacement at Terre du Lac three-cell lagoon

Q. PLEASE DESCRIBE PROBLEMS RELATED TO UNDERPERFORMING OR DAMAGED DISINFECTION EQUIPMENT AT THE LAGOON WASTEWATER TREATMENT PLANTS.

A. The lagoon systems Confluence Rivers has acquired typically have had issues with disinfection equipment. Upon acquisition, the Company routinely discovers that these plants have no chlorine tablets in the tablet feeders and have been exceeding limits simply because previous owners failed to properly operate the disinfection system. In addition, there is typically sludge accumulation in chlorine contact chambers, which reduces the contact time between effluent and chlorine leading to reduced effectiveness in disinfection. In some cases, tablet feeders were damaged from a lack of maintenance. Confluence Rivers has also found that some of these systems had no disinfection systems installed or lacked disinfection components called for in the permit (dechlorination). In such cases, Confluence Rivers removes sludge from the contact chambers and repairs or replaces missing and damaged disinfection equipment.

Overwhelmed disinfection system at Terre du Lac three-cell lagoon

No disinfection present at Terre du Lac single-cell lagoon

No disinfection present at Freeman Hills

Q. PLEASE DESCRIBE PROBLEMS WITH LAGOON TREATMENT SYSTEMS THAT ARE UNABLE TO MEET PERMITTED LIMITS.

A. While some lagoon treatment systems that Confluence Rivers acquires have adequate treatment capacity to comply with permitted limits once rehabilitative efforts have been undertaken, others cannot adequately treat to permitted limits without significant process improvements. Where such process improvements are needed, an engineer is contracted to design effective improvements. These improvements include the addition of traditional lagoon aeration with floating aerators; installation of baffles dividing existing lagoon cells into multiple treatment cells; and/or the installation of MBBR or other attached growth treatment equipment to improve BOD and ammonia removal. Such

attached growth treatment systems provide ample surface area for biofilm to form on free floating media, resulting in more varied and more dense biological activity to attack nutrients in wastewater, effectively treating nutrients like ammonia. The free-floating media also helps to mechanically breakdown wastewater solids accelerating the biological treatment by making organics more accessible to the microbiology. Confluence Rivers has extensive experience augmenting existing lagoon systems to bring them into compliance with modern permit limits with the installation of additional treatment processes. Below are examples of similar projects already completed on systems Confluence River's has acquired in the past in Missouri.

MBBR system added to Roy-L lagoon

MBBR added to MO Utilities Lagoon

Q. PLEASE DESCRIBE PROBLEMS WITH FACILITY ACCESS AND SECURITY IN THE FACILITIES ACQUIRED BY CONFLUENCE RIVERS.

A. Many lagoon facilities that Confluence Rivers has acquired have little or no access to reach either specific portions of the treatment system or even the plant entirely. Some of these issues were simply the result of previous ownership failing to maintain roads to access the facility and allowing them to become overgrown as previously discussed. In other cases, facilities either had no proper access easement or had no way to reach the facility through the legal easement. Where this was the case Confluence Rivers has negotiated easements and built roads or built roads into the existing easement to reach the facility for operations activities. All weather access to a facility is a regulatory requirement and is essential to ensuring safe a reliable wastewater service.

As with access another issue not explicitly related to the treatment performance of the facilities but important nonetheless was a lack of site security at many plants. Without fencing, there is nothing to prevent members of the public from trespassing on the site, potentially causing damage to treatment equipment and exposing them to dangerous equipment or untreated wastewater. Confluence Rivers routinely installs fencing and gates to secure sites.

C. Activated Sludge Wastewater Treatment Plants

Q. PLEASE BRIEFLY DISCUSS THE ACTIVATED SLUDGE SYSTEMS THAT CONFLUENCE RIVERS HAS ACQUIRED SINCE ITS LAST RATE CASE.

A. Since its last rate case, Confluence Rivers has acquired 5 activated sludge wastewater treatment plants. These plants are Chelsea Rose; Cedar Green; Prairie Field; Clemstone

Sewer[6]; and Terre du Lac (Oxidation Ditch). Most of these facilities are typical of a package style, activated sludge treatment plants, although there is some variety in the number of treatment units and the detailed arrangement of each system. One of these plants, at the Terre du Lac facility is an oxidation ditch treatment plant. In addition, the Prairie Field treatment facility was acquired immediately after construction and therefore was not troubled by the typical issues described in the following section.

Q. WHAT TYPES OF DEFICIENCIES WERE ENCOUNTERED AT THE ACTIVATED SLUDGE WASTEWATER TREATMENT PLANTS THAT CONFLUENCE RIVERS ACQUIRED?

A. The typical condition of the activated sludge treatment plants that Confluence Rivers acquired was poor as there were many issues impeding their ability to comply with environmental regulations and provide safe and reliable service to customers. The general types of issues encountered included: sludge accumulation in treatment tankage; missing, undersized, or damaged blowers; underperforming or damaged piping and aeration equipment; underperforming or damaged clarifier equipment; underperforming or damaged disinfection equipment; underperforming or damaged influent lift stations; inadequate or damaged power and control systems; deterioration of tank structures; and other general plant issues.

Q. PLEASE DESCRIBE THE PROBLEMS RELATED TO EXCESSIVE SLUDGE ACCUMULATION IN TREATMENT TANKAGE AT ACTIVATED SLUDGE WASTEWATER TREATMENT PLANTS.

[6] This facility has characteristics of both a recirculating media filter plant and an activated sludge plant and has been included here because most of the issues encountered resemble the issues with activated sludge facilities.

A. Nearly all activated sludge facilities were found to have significant sludge accumulation in treatment components, including influent lift stations, aeration chambers, clarifiers, and contact chambers. Excessive sludge accumulation indicates operational neglect by the previous owners.

In aeration chambers, sludge buildup typically indicates that proper mixing is not occurring due to underperforming aeration systems or that sludge is not being hauled from the facility frequently enough. Accumulation of sludge in aeration chambers can lead to reduced treatment volume and poor biology in treatment as the ratio of organic to inorganic materials in the suspended sludge decreases thus compromising the plant's ability to meet permitted limits. In clarifiers, sludge accumulation indicates that sludge returns and skimmers are not properly returning sludge to the aeration chamber. This can ultimately compromise clarifier function by reducing liquid volume for settling (and with that settling time) or by preventing equipment from properly functioning. Either of these issues can cause exceedances of TSS limits. Sludge accumulation in disinfection contact chambers indicates that the clarifier is not properly preventing solids from passing through with effluent. Accumulated solids in a contact chamber can reduce contact time by reducing the volume of the chamber and/or can cause higher levels of bacteria to be present in the disinfection process. Either of these situations can cause exceedances of *E.coli* or fecal coliform limits. To address the accumulated solids, Confluence Rivers initially hauls sludge from facilities, but then analyzes the cause of the sludge accumulation to identify system improvement needs.

While difficult to photograph since problematic sludge accumulation is often underwater at the bottom of a tank, the following photographs show some of the sludge

accumulation problems in activated sludge systems that Confluence Rivers has encountered in Missouri:

Completely full and overflowing digester at Chelsea Rose

Clarifier at Cedar Green filling with pin floc sludge, indicating failed skimmers

Sludge accumulation in receiving waters at Clemstone due to infrequent hauling of sludge from facility

Q. PLEASE DESCRIBE PROBLEMS RELATED TO MISSING, UNDERSIZED, OR DAMAGED BLOWERS AT ACTIVATED SLUDGE WASTEWATER TREATMENT PLANTS.

A. The most significant deficiencies in activated sludge wastewater treatment plants relate to problems with the primary treatment process: the aeration system. At several facilities, blowers were found to be missing, damaged, nonfunctional, or undersized. Most aeration facilities are designed to run on a minimum of two blowers (though some require more) so that there is equipment redundancy that ensures that one blower breaking down will not cause a failure in the treatment process. Blowers are responsible for operating not only the aeration process, but also any air lifts, as well as sludge returns and skimmers in clarifiers. Without effective, properly sized blowers, activated sludge facilities do not provide effective wastewater treatment, and without redundant blowers, any equipment problem will interrupt proper treatment.

Confluence Rivers replaces missing, damaged, and undersized blowers, beginning with facilities that are not effectively treating wastewater. Following initial improvements, every facility which does not already have redundant blowers will be outfitted with additional blowers sufficient to ensure that the treatment process is not interrupted by a blower failure. The following photographs illustrate blower-related problems in activated sludge systems that Confluence Rivers has encountered:

No functioning aeration present at Cedar Green and single failed blower

Failed brush aerator at Terre du Lac Oxidation Ditch

New blowers at the Chelsea Rose facility which had no functional blowers at acquisition

Q. PLEASE DESCRIBE PROBLEMS RELATED TO UNDERPERFORMING OR DAMAGED PIPING AND AERATION EQUIPMENT AT ACTIVATED SLUDGE WASTEWATER TREATMENT PLANTS.

A. The prior owners of most facilities that Confluence Rivers has acquired have made little or no investment in facility maintenance. As a result of this neglect, significant deterioration of treatment equipment in the aeration systems is common. At most facilities, much of the steel equipment showed significant rust and deterioration in the air headers, aeration distribution piping, valves, drop pipes, diffusers, and sludge returns. Damage to this type of equipment significantly compromises the effectiveness of the treatment process by reducing the amount and pressure of air distributed to the drop pipes and diffusers. This results in lower levels of biological process and reduced treatment.

Additionally, many facilities had damaged steel piping that had been replaced with PVC piping. While PVC piping may have been appropriately sized in some cases, PVC deteriorates in sunlight (UV light) and, without appropriate coatings, is not an appropriate material for exposed, above ground piping. Breakdown of PVC drop pipes and diffusers disrupts the aeration pattern of the plant as the aeration basin may not properly aerated due to air being released as large bubbles rather than diffused as fine bubbles. Large bubbles allow most of the air supplied to the basin to simply rise to the surface and be released without contributing to the biological processes. Aeration diffusers are designed to produce fine bubbles, which result in more oxygen being dissolved into water and more surface area on bubbles to allow biological processes to absorb oxygen. To ensure proper function and effective treatment, Confluence Rivers is evaluating each of the systems purchased and replacing any aeration equipment that is underperforming, damaged, or has reached the end of its useful life.

The following photograph illustrates the poor quality of aeration systems in many systems of the activated sludge systems that Confluence Rivers has acquired:

Rusting aeration piping partially replaced with PVC at Chelsea Rose, no functioning aeration and degraded diffusers present.

Q. PLEASE DESCRIBE PROBLEMS RELATED TO UNDERPERFORMING OR DAMAGED CLARIFIER EQUIPMENT AT ACTIVATED SLUDGE WASTEWATER TREATMENT PLANTS.

A. Many of the activated sludge wastewater treatment plants that Confluence Rivers has acquired have had issues with clarifiers and clarification equipment. Sludge return lines and skimmers are used to lift solids from the clarifier and return sludge to the treatment basin to maintain the biological process and prevent solids from leaving the plant in effluent. In many of the activated sludge systems, sludge returns and skimmers were deteriorated and not functioning properly leading to a buildup of solids in the clarifier and release of solids in the effluent. In addition, many facilities had damaged weir troughs which allows solids to pass through the clarifier. Confluence Rivers has begun to repair and replace defective clarifier equipment to ensure these problems are addressed. Appropriate maintenance processes and procedures have been implemented to ensure similar problems do not recur.

The following photographs show some of the clarifier problems that Confluence Rivers has found at activated sludge systems it has acquired:

Pin-floc sludge overwhelming clarifier at Cedar Green system due to failed skimmer.

Poor condition of clarifier at Chelsea Rose

Mechanical failure at Terre du Lac Oxidation Ditch clarifier

Q. PLEASE DESCRIBE PROBLEMS RELATED TO UNDERPERFORMING OR DAMAGED DISINFECTION EQUIPMENT AT ACTIVATED SLUDGE WASTEWATER TREATMENT PLANTS.

A. Some of the activated sludge treatment plants that Confluence Rivers has acquired have had a history of violating fecal coliform and *E.coli* limits. Upon acquisition it is often discovered that many of these plants simply had no chlorine tablets in the tablet feeders and had been violating permitted limits due to the previous owner's failure to properly operate the system. In these cases, Confluence Rivers simply begins to stock chlorine tablets. In other cases, as was mentioned previously, Confluence Rivers discovers significant sludge accumulation in chlorine contact chambers, which reduces the contact time between effluent and chlorine and reduces the effectiveness of disinfection. In these cases Confluence Rivers removes sludge from the contact chambers and improves operational oversight going forward to prevent future sludge buildup. In the case of the Terre du Lac Oxidation Ditch it was also discovered that, although the permit required it, the owner had never installed the necessary dechlorination at the facility.

Dechlorination not installed at Terre du Lac Oxidation ditch

Q. PLEASE DESCRIBE PROBLEMS RELATED TO UNDERPERFORMING OR DAMAGED INFLUENT LIFT STATIONS AT ACTIVATED SLUDGE WASTEWATER TREATMENT PLANTS.

A. Some activated sludge wastewater treatment plants that Confluence Rivers has acquired have had influent lift stations that were in poor condition. A common problem was damaged or missing pumps in the lift stations. Lift stations typically are designed to have two functioning pumps so if one pump fails the redundant pump is available to keep the lift station operable. With one pump out of service or missing, a single pump failure can cause overflows and backups into the collection system. In addition to missing pumps, some influent lift stations had damaged pump rails, hoisting chains, control panels and structures; and no remote monitoring systems.

Confluence Rivers has begun efforts to overhaul and repair lift stations by replacing damaged or underperforming equipment and installing remote monitoring equipment, which can immediately inform operators of abnormal operating conditions. In addition to equipment and control system overhaul, nearly every lift station had significant sludge accumulation in the wet well, which reduces the capacity of the lift stations and contributes to equipment breakdown.

Q. PLEASE DESCRIBE PROBLEMS RELATED TO INADEQUATE OR DAMAGED POWER AND CONTROL SYSTEMS AT ACTIVATED SLUDGE WASTEWATER TREATMENT PLANTS.

A. Obsolete, damaged, and inadequate power and control systems was a common problem with many of the activated sludge plants that Confluence Rivers has acquired. With poor control systems, even an attentive operator does not have the operational control

necessary for optimal performance of a treatment plant. Some plants had broken control panels that either shut equipment down or gave the operator no control other than shutting equipment off or on. The plants typically had no telemetry between plant components and no ability to remotely monitor equipment status. Additionally, many control panels had exposed wiring with no proper face plating inside circuit boxes. Beyond providing inadequate control, this represents an electrical hazard to operators or anyone accessing the control box. Some control boxes were damaged such that they allowed water to infiltrate controls, shorting out treatment equipment. An example of how this sort of damage to controls effects treatment is the Chelsea Rose facility where the blower control box experienced water infiltration. As a result, the system blowers were not providing normal aeration, and the only aeration activity was the designated blower for sludge returns turning on for less than a minute per hour.

As mentioned, Confluence Rivers is installing remote monitoring and flow metering equipment at each facility to allow operators to access live data from anywhere to be alerted to equipment failures before they become an issue for customers. In addition, Confluence Rivers is replacing equipment control panels to offer greater operational control, and therefore better performance, at its activated sludge facilities. The following photographs show examples of control box problems:

Damaged control system at Cedar Green facility

Failed control and power systems at Chelsea Rose facility

Q. PLEASE DESCRIBE PROBLEMS RELATED TO DETERIORATING TANK STRUCTURES AT ACTIVATED SLUDGE WASTEWATER TREATMENT PLANTS.

A. Some of the activated sludge facilities Confluence Rivers acquired have exhibited significant damage to tank structures and the surrounding walkways. Many of these plants have significant corrosion, section loss and, sometimes, even holes in the tank structures. Such holes can result (and in some instances already have resulted) in partially treated waste leaking out of steel tanks in unlawful discharges and creating unsafe conditions for operators. At facilities with concrete tanks, the Company has found significant structural cracks in the tanks themselves that can also lead to leaking

wastewater. Any wastewater allowed to leak from a plant at a location other than the permitted discharge point is unlawful. For steel structures, Confluence Rivers sands, spot welds or welds entire plates, and paints. In concrete structures, Confluence Rivers patches and crack fills the structure to extend the useful lives and prevent further leaking. Damaged walkways and handrails are repaired or replaced to ensure operator safety.

The following photographs are representative of structural problems Confluence Rivers has discovered at many of the activated sludge systems it has acquired:

Crack in concrete tank at Chelsea Rose facility with signs of leaking

Damage to oxidation ditch track tanks at Terre du Lac

Q. PLEASE DESCRIBE OTHER PLANT ISSUES TYPICALLY ENCOUNTED AT THE ACTIVATED SLUDGE WASTEWATER TREATMENT PLANTS ACQUIRED BY CONFLUENCE RIVERS.

A. Apart from the previously discussed issues, the facilities Confluence Rivers acquired consistently exhibited several other problems. Several of the facilities were impacted by nuisance solids (wet wipes, rags, other trash and debris) which interfere with treatment equipment and clog portions of the plant. Similarly, previous operators would often leave piles of such debris on the plant grating to drain, but never follow through in removing such extraneous material. Among other things, Confluence Rivers addresses this issue by installing improved screening at the beginning of the treatment process allowing for easier removal of such debris.

Additionally, several facilities had poor site security resulting from missing or damaged fencing making it possible for the public to enter the sites and become exposed to wastewater and wastewater treatment equipment. Immediately upon acquisition Confluence Rivers takes steps to secure each site with adequate fencing and signage.

D. <u>Recirculating Sand Filter Wastewater Treatment Plants</u>

Q. PLEASE BRIEFLY DISCUSS THE RECIRCULATING SAND FILTER SYSTEMS THAT CONFLUENCE RIVERS HAS ACQUIRED SINCE ITS LAST RATE CASE.

A. Since its last rate case, Confluence Rivers has acquired 12 recirculating sand filter wastewater treatment plants. These plants are Branson Cedar; Berkshire Glenn; Country Hill Estates; Countryside Meadows; Fox Run; Park Estates; Private Gardens; Wilmar Estates; Cedar Glen; Cimarron Bay; Eagle Woods; and Prairie Heights. While there can be variations in the number of filter beds and the arrangement of the systems, each of these plants is a typical recirculating sand filter facility. My earlier testimony regarding

the Cedar Glen and the Cimarron Bay wastewater treatment plants provides more specific examples of these types of wastewater treatment facilities.

Q. WHAT TYPES OF DEFICIENCIES DOES CONFLUENCE RIVERS TYPICALLY ENCOUNTER AT THE RECIRCULATING SAND FILTER WASTEWATER TREATMENT PLANTS THAT IT ACQUIRES?

A. Typically, the condition of the recirculating sand filter wastewater treatment plants Confluence Rivers acquired was poor to fair, with many problems impacting the plants' ability to comply with environmental regulations and provide safe and reliable service to customers. In general, the Company found the recirculating sand filter facilities to be suffering from the following common issues: overgrowth of vegetation and debris on the surface of filter beds; sludge accumulation in the filter beds, septic tanks, and recirculation tanks; damaged or failed distribution piping, distribution pumps, or distribution power and control systems; damaged filter bed structures allowing the release of partially or untreated wastewater; underperforming or damaged disinfection equipment; poor site upkeep, access, and security; and an overall inability to meet permitted limits.

Q. PLEASE DESCRIBE THE PROBLEMS RELATED TO OVERGROWTH OF VEGETATION AND DEBRIS ON THE SURFACE OF FILTER BEDS.

A. Upon acquisition, many of the recirculating sand filter facilities exhibited growth of vegetation in filter beds, or debris from overhanging vegetation strewn over the surface of filter beds. Not only is this condition indicative of general operational neglect, it also negatively affects the treatment in the plant. Left unaddressed, treatment capacity is reduced, and, in some cases, portions of the filter bed can become impermeable leading

to overflows of wastewater from the facility in an illegal SSO. Similarly, debris left on the surface of a filter bed will begin to rot and seep into the filter bed causing blockages with problems similar to those caused by sludge deposits. Additionally, rotting material releases byproducts that degrade the quality of treated wastewater and negatively affects the biology in the facility. As with vegetation growth in the facility, operations staff must be attentive in the way they run the facility and remove this sort of debris before it can adversely affect the treatment process.

When Confluence Rivers acquires facilities with these issues, it quickly works to clear the filter media and, where necessary, removes and replaces media that is over impacted by vegetation and debris. Additionally, any overhanging trees or vegetation are trimmed or removed to prevent further debris from falling into the filter beds.

Vegetation growing on surface of Cedar Glen filter beds.

Vegetation debris on surface of Cimarron Bay filter beds.

Q. PLEASE DESCRIBE PROBLEMS RELATED TO SLUDGE ACCUMULATION IN THE FILTER BEDS.

A. Many of the recirculating sand filters acquired by Confluence Rivers have exhibited portions of the filter bed with partial or complete blockage of flow by sludge accumulation. Sand filter beds work by trickling the liquid phase of wastewater through a sand or gravel filter media. As the wastewater trickles through the filter, the water is aerated enhancing biological processes and breaking down pollutants in the wastewater. It is very important therefore, for the water to be able to easily flow down through the media. To prevent impediments to this process, wastewater should be given time to settle, and pumps arranged in the initial septic tank in such a way that solids can settle out so that only the liquid phase of the wastewater is pumped through the filter bed. When inadequate settling time is provided, sludge is not sufficiently removed in the septic tank. In this instance, or where pumps are poorly configured, sludge/wastewater solids can end up being pumped into the filter beds, and over time accumulate causing portions of the filter bed to become impacted and clogged with solids. This accumulation disrupts the flow of wastewater, reduces the capacity of the filter bed, allows vegetation growth in the filter bed, and results in overflows of untreated wastewater from the system. Over time this issue will also lead to significant overaccumulation of solids in the septic and recirculation tanks of the facility as well.

Confluence Rivers does several things to resolve these issues where they are discovered and take steps to prevent this sort of sludge accumulation from recurring. First, where sludge has clogged filter media, the media is raked out to break up sludge blocks; sludge is removed from the septic and recirculation tanks; and in some cases

where sludge impact is too severe, portions of the media are hauled off and replaced. Should issues be identified with pump configuration pulling sludge from the bottom of the septic tank, pumps are reconfigured to reduce solids flow. The final and perhaps most significant improvement that reduces these issues and prevents recurrence are improved process improvements including either the installation of an MBBR alongside the facility or installation of drop in micro MBBR units in the facility recirculation tanks. While the primary purpose of these improvements is to allow facility to meet permit limits (especially ammonia limits), a secondary effect is generally improved microbiology in the facility improving the breakdown of the organic components in wastewater solids and reducing sludge volume. The reduced volume is more easily washed out of the filters becoming less likely to accumulate again in the future.

Visible sludge breaking the surface of the Cedar Glen sand filter beds.

Sludge accumulation causing ponding on Cimarron Bay sand filter bed

SSO at Berkshire Glenn (in background) due to sludge clogging filter bed

Q. PLEASE DESCRIBE PROBLEMS RELATED TO DAMAGED OR FAILED DISTRIBUTION PIPING, DISTRIBUTION PUMPS, OR DISTRIBUTION POWER AND CONTROL SYSTEMS IN THE FILTER BED SYSTEM.

A. Many of the sand filter systems acquired by Confluence Rivers have had portions of the wastewater distribution systems that have failed, reducing the effectiveness of the treatment process. Sand filter beds work by trickling the liquid phase of wastewater through a sand/gravel filter media to provide air for biological processes to break down

pollutants in the water. This is accomplished by pumping from the septic and recirculation tanks into a system of distribution pipes on the filter beds. The distribution pipes have drip orifices throughout the filter bed to evenly distribute the liquid phase of the wastewater across the filter bed.

In many of the systems, portion of this distribution system were damaged or had failed. In some cases, there were breaks or leaks in the distribution piping. This allows the wastewater to excessively leak into one portion of the filter bed rather than being evenly distributed across the bed. As a result, the treatment capacity of the system is severely limited. Some portions of the bed are overused with inadequate drainage time through the media and other portions of the bed receive little or no flow. Where this issue is identified, Confluence Rivers repairs the distribution piping to ensure an even distribution of the wastewater liquid phase across the sand filter. The pumping systems at these recirculating sand filter plants have a series of pumps in the septic and recirculation tanks which pump from the tanks to the distribution piping.

Another distribution problem experienced by Confluence Rivers is that portions of distribution pumping system were nonfunctional at the time of acquisition. As a result, portions of the system were bypassed or non-functional. Further investigation showed that in some cases, this was the result of failed pumps that had not been replaced by previous ownership, and in other cases it was found that the power or control systems had failed or were poorly configured/controlled. In these cases, Confluence Rivers replaces the failed pumps, controls, and power systems, or makes improvements to control systems where they were not properly programmed or configured. With these systems

restored along with the distribution piping, an even distribution of the wastewater was ensured across the sand bed restoring the full treatment capacity to the filter basins.

Failed distribution pump at Berkshire Glenn

Failed power and control system at Fox Run

Damaged distribution piping at Cimarron Bay

Q. PLEASE DESCRIBE PROBLEMS RELATED TO DAMAGED FILTER BED STRUCTURES.

A. Many of the recirculating sand filter beds acquired by Confluence Rivers have had some form of damage to the filter bed structure. The filter beds must have an impermeable structure around the sand media in order to prevent wastewater from leaking out of the filter beds in unauthorized/illegal SSOs. In some cases, these beds are simply earthen basins with some form of liner to contain the media and wastewater. In other cases the bed is a hollow concrete structure filled with sand media. Finally, in some cases, the beds were wooden structures with a liner attached and filled with the media.

Confluence Rivers found that, upon acquiring such systems, many of these structures had some form of damage which was allowing wastewater to overflow or leak from the system. Where there was damage to earthen basin plants, leaks were identified and either the liner was repaired, or the leak dug out and soil replaced with impermeable clay. Where concrete structures have been found to be leaking Confluence Rivers has patched cracks to stop leaks from occurring. Finally, some of the wooden structures have

been found to be leaking or otherwise failing. For example, as was discussed, the Cimarron Bay facility had failing wooden walls which were allowing leaks from the filter bed, spilling media and wastewater.

Failing wood structure at Cimarron Bay

Evidence of leaks in earthen face of sand filter at Berkshire Glenn

Q. PLEASE DESCRIBE PROBLEMS RELATED TO UNDERPERFORMING OR DAMAGED DISINFECTION EQUIPMENT.

A. As with the lagoon and activated sludge plants, many of the recirculating sand filter systems that Confluence Rivers has acquired have had issues with disinfection equipment. At acquisition, the Company discovered several of these plants had no chlorine tablets in the tablet feeders and had been exceeding limits simply because previous owners failed to properly operate the system. In addition, in many of these plants, there was significant sludge accumulation in chlorine contact chambers, which

reduces the contact time between effluent and chlorine which reduces the effectiveness of disinfection. In some cases, tablet feeders were damaged from a lack of maintenance and in need of replacement for proper chlorine dosing. Some of these systems had no disinfection systems installed or lacked components of the system listed in the permit (dechlorination). In such cases, Confluence Rivers stocks the chlorine feeders with tablets; removes sludge from the contact chambers; and/or replaces missing and damaged disinfection equipment

Damaged tablet chlorinator at Fox Run

Sludge filled contact chamber with significant vegetation growth at Eagle Woods

Q. PLEASE DESCRIBE PROBLEMS RELATED TO POOR SITE UPKEEP, ACCESS, AND SECURITY AT THE RECIRCULATING SAND FILTER PLANTS.

A. While this issue is not unique to the sand filter plants, Confluence Rivers has encountered many issues with the general site conditions at this group of facilities. Some sites lacked any fencing (for example the Cimarron Bay facility) or exhibited significant damage to site fencing. These sorts of failures in site security can allow members of the public to trespass on wastewater treatment sites, potentially exposing them to dangerous wastewater or wastewater treatment equipment, and potentially leading to damage to treatment facilities. In such cases, Confluence Rivers has repaired/installed fencing. Several of these facilities have also lacked adequate access roads. All weather access roads are essential so that operations staff can reach the facility in any condition both for regular maintenance activities and to respond to any emergency situations at a treatment facility. Additionally, several of these facilities had piles of damaged materials and equipment that were simply dumped on site rather than being properly disposed. This is evidence of general neglect in the operations and maintenance of the facilities and in some cases would qualify as illegal dumping or disposal of material. In such cases, Confluence Rivers immediately seeks to remove any trash and debris from the utility sites. Finally, some facilities have had issues related to untended vegetation around the site. This can cause a number of issues including damage to fencing; debris falling onto filter beds; adverse effects on the treatment process; portions of the facility being rendered inaccessible for regular operations and maintenance activities.

Piles of trash and debris on the Eagle Woods site

No fencing present at the Cimarron Bay treatment plant

Outfall inaccessible at Country Hill Estates due to vegetation overgrowth.

Q. PLEASE DESCRIBE PROBLEMS WITH RECIRCULATING SAND FILTER TREATMENT SYSTEMS THAT ARE UNABLE TO MEET PERMITTED LIMITS.

A. It has been Confluence Rivers' experience that, even when returned to good working condition, many recirculating sand filter systems are incapable of meeting modern permit limits - especially with regard to ammonia limits. These facilities were usually designed and built at a time when NPDES permit limits were less stringent and did not include some of the nutrient limits that are now common. Therefore, treatment processes were not designed to achieve these future permit requirements. When confronted with the more stringent permit limits, many utilities replaced the entire facility. In contrast, Confluence Rivers has sought innovative ways to modify existing facilities by adding attached growth treatment processes to enhance the provided treatment. This results in a more cost-effective way to achieve regulatory compliance.

The primary method that Confluence Rivers uses to enhance recirculating sand filter plants involves MBBR attached growth treatment systems. As previously discussed in greater detail, MBBR systems increase surface area for biofilm formation resulting in more varied and dense biological activity to attack nutrients like ammonia. In cases where systems fall significantly short of achieving compliance with permitted limits, a side-stream MBBR is installed (typically in new tankage) where ammonia removal can take place in the more efficient treatment process. On the other hand, where current operations are closer to meeting permitted limits, Confluence Rivers has sought to avoid the cost of additional tankage and installed micro MBBR units in the existing recirculation tanks in place of a more typical mixer/aerator in the tanks. This provides effective attached growth MBBR treatment without additional tankage and using smaller, quieter, less expensive blowers than a more typical MBBR.

Example of side-stream MBBR at Twin Oaks Recirculating Sand Filter

Drop in Micro MBBR and small blower at Cedar Glen facility.

Q. PLEASE DESCRIBE PROBLEMS WITH FACILITY ACCESS AND SECURITY IN THE FACILITIES ACQUIRED BY CONFLUENCE RIVERS.

A. Many facilities had little or no access to the plant in general or to specific portions of the treatment system. Some of these issues were simply the result of previous ownership failing to maintain roads to access the facility and allowing them to become overgrown as discussed in a previous question. Other facilities, however, had no access easement or

had no way to reach the facility through the legal easement. In such cases, Confluence Rivers negotiates easements or builds access roads into the existing easement.

Another issue not explicitly related to the treatment performance was a lack of site security at many plants. Without fencing, there is nothing to prevent members of the public from trespassing on the site, potentially causing damage to treatment equipment and exposing them to dangerous equipment or untreated wastewater. In such cases, Confluence Rivers immediately seeks to secure facilities by installing fencing and gates.

E. Wastewater Collection Systems

Q. PLEASE DESCRIBE TYPICAL ISSUES ENCOUNTERED IN THE WASTEWATER COLLECTION SYSTEMS THAT CONFLUENCE RIVERS ACQUIRES.

A. The collection systems associated with the wastewater systems that Confluence Rivers acquires typically consist of low-pressure sewers, gravity sewers, and sometimes a combination of both. For the most part, the low-pressure systems are in good working condition. When failures occur in a low-pressure sewer system, waste leaks under pressure and becomes quickly observable. Given the obvious nature of such a failure, even owners who were not reinvesting in or maintaining their systems have made repairs to address such an apparent problem.

The only significant exception regarding the condition of low-pressure collection is not associated with the utility's collection mains but is related to the customer's grinder pump/septic tank. As sludge accumulates in the customer's septic tank, it must be pumped and hauled away. When sludge is not removed, excessive volumes of sludge can be conveyed through the low-pressure collection system to the treatment plant, adversely

affecting the treatment process. In such situations, Confluence Rivers works to encourage homeowners to remain attentive to their maintenance obligations.

Unlike the low-pressure collection systems, many of the gravity collection systems that Confluence Rivers has acquired have been damaged to the point of allowing I&I of stormwater/groundwater into the sewer pipes. Such infiltration increases system loading and flow to the facility. Infiltrating water can enter a collection system not only through damaged lines, but also damaged manhole structures and from manholes that are set so low at to allow runoff water to drain into a collection system, etc. These issues can be addressed by either: (1) identifying and repairing damaged sections of the collection system or (2) expanding the treatment facility capacity to enable the treatment facility to handle the additional flow from I&I flows. Confluence Rivers will typically make repairs, where practical, to the collection systems, install surge flow capacity at some plants, and expand treatment capacity at others. The most dramatic example of I&I issues was encountered at the Terre du Lac three-cell lagoon, where water from a neighboring lake is continuously infiltrating into the collections system causing constant high flow at the treatment plant. As discussed in the individual section on the Terre du Lac three cell system, Confluence Rivers has begun repairing the collection system structures (manholes and cleanouts), and lining both the structures and sewer mains.

Extremely high I&I flows in discharge rate at Terre du Lac three-cell lagoon

The other significant problem that consistently needs attention in collection systems is degraded lift stations usually caused by damaged or missing pumps. Lift stations should contain at least 2 pumps for redundancy to prevent service interruptions and backups which could occur if a pump goes down. Given this, Confluence Rivers routinely repairs and replaces lift station pumps. In doing so, Confluence Rivers routinely finds that many lift stations lack proper infrastructure for pump maintenance as well. Repairs in this regard typically take the form of replacement/installation of rails or chains used to raise pumps out of lift stations for maintenance.

Many lift stations also exhibit aging or broken control systems, power supplies, and wires/cables which require repair or replacement. Moreover, lift stations often have accumulated significant amounts of sludge and nuisance solids which are cleaned out to restore the storage capacity of wet wells and allow for proper equipment maintenance. Further, some lift stations have damage to the wet well structure or lids which require repair/replacement. In some areas, the lift station lids are on grade where flooding and/or stormwater can flow into lift stations. Where this is an issue, the top rings of the lift station are raised to prevent I&I of stormwater.

Most of the lift stations acquired by Confluence Rivers do not have backup power or bypass piping to allow emergency operation during power outages. Where there is not adequate storage capacity, or many customers are served, Confluence Rivers either installs bypass piping as well as a quick connect to connect a mobile emergency generator, or a stationary emergency generator. Finally, most lift stations in the collection systems acquired by Confluence Rivers lack remote monitoring. Remote monitoring provides immediate notification to operators of any abnormal operating

condition or service interruption. This allows operators to respond before issues can result in lift stations backing up into customers' homes, damaging the environment by overflowing raw sewage onto the ground, or equipment damage can occur.

Besides these more typical issues which are observed at most lift stations, the three lift stations at the Terre du Lac wastewater systems presented a unique problem. Specifically, each lift station had an earthen surge basin (essentially an unpermitted lagoon cell) for holding wastewater during high flow periods which were built without DNR permission. The DNR has since declared that such basins are not approved and are unacceptable. Confluence Rivers is working to reconfigure and repair these lift stations and remove these surge basins from service.

Example of Terre du Lac lift station with unapproved surge basin

Lift station at Park Estates, missing redundant pump

F. Regulatory Compliance Issues

Q. APART FROM PHYSICAL PLANT ISSUES, WHAT GENERAL REGULATORY NONCOMPLIANCE ISSUES WERE ENCOUNTERED AT THE WASTEWATER FACILITIES THAT CONFLUENCE RIVERS ACQUIRES?

A. The primary regulatory issues encountered with acquired wastewater facilities has been the failure to comply with permit limits. This testimony has discussed the variety of steps that Confluence Rivers routinely takes to bring such facilities into regulatory compliance. Beyond such physical improvements Confluence Rivers maintains a high standard for its contract operators to ensure that facilities are operated properly and will not fall short of permit limits due to operational neglect or lack of expertise.

Another common type of regulatory noncompliance is a simple failure to undertake required testing and submit discharge monitoring reports ("DMR"). Failure to complete required testing represents a failure in the operation and management of a facility. This typically occurs either due to general neglect, or because an operator,

realizing that a facility will not meet permit requirements, simply chooses not to test to avoid submitting reports documenting exceedances. Confluence Rivers has implemented a robust computerized maintenance management system ("CMMS") which issues work orders to operators for all required testing to ensure that testing is completed, and reports are submitted.

Some of the acquired facilities have had issues with facility permits – either associated with expired permits or permits where renewal was imminent and necessary paperwork should have already been submitted to DNR. Where permits were expired or renewal paperwork was overdue, Confluence Rivers immediately submitted renewals to ensure that facilities are properly authorized. In the case of the Missing Well system, the lagoon had never been permitted by DNR. Even before closing on that system, Confluence Rivers began the permit application process, including detailed environmental assessments (and antidegradation study), to secure a discharge permit as soon as possible.

Some wastewater systems had a history of violations for issues such as: (1) repeated unreported SSOs; (2) failure to properly maintain facilities; and/or (3) failure to include treatment processes listed in the permit. The best example of such a shortcoming is the Terre du Lac treatment facilities which had been subject to ongoing enforcement action by DNR for over twenty years that had been forwarded to the Attorney General for prosecution.

As indicated at the beginning of this testimony, as part of its commitment to maintaining compliance with environmental regulation, Confluence Rivers negotiates compliance agreements with DNR for all wastewater facilities which acknowledge the

regulatory issues with the facilities, express the Company's commitment to reaching compliance for such systems, and establish schedules for attaining such compliance. Through this process, Confluence Rivers has established a history in Missouri for taking systems from long-term noncompliance to safe, reliable, compliant wastewater service.

G. Public Drinking Water Systems

Q. PLEASE BRIEFLY DISCUSS THE DRINKING WATER SYSTEMS THAT CONFLUENCE RIVERS HAS ACQUIRED SINCE ITS LAST RATE CASE.

A. Since its last rate case, Confluence Rivers has acquired 12 drinking water systems: Branson Cedar; Cedar Green; Fawn Lake; Missing Well; Cedar Glen; Chelsea Rose; Cimarron Bay; Eagle Woods; Port Perry; Prairie Heights; Spring Branch; and Terre du Lac. All 12 of these systems consist of groundwater systems which treat water from their own wells.

Q. PLEASE DESCRIBE TYPICAL ISSUES ENCOUNTERED IN THE DRINKING WATER SYSTEMS CONFLUENCE RIVERS.

A. Most, if not all, of all of the drinking water systems that Confluence Rivers has acquired have suffered from common problems including: corroded equipment on the well heads and failing coatings and paint on the well equipment; exposed wiring rather than proper installation in conduit; poor condition well houses; and well pumps at the end of their useful lives.

Failing insulation at Fawn Lake Well house, damaged interior

Rusting on well head at Cedar Green Well house.

Confluence Rivers routinely overhauls and repairs wells as necessary, installs proper wiring, paints well equipment, and replaces piping as needed. Additionally, the Company installs remote monitoring equipment on its wells which allows an operator to monitor water production and receive automatic alerts of any abnormal operating conditions.

Where present, the disinfection systems at acquired systems were often in poor condition. Where the condition of dosing pumps and other disinfection equipment at these facilities was poor or even failing, Confluence Rivers will replace or repair such equipment to ensure safe and proper disinfection. Where systems lack disinfection,

Confluence Rivers installs disinfection equipment to ensure that the facility can provide safe a reliable drinking water.

At many sites, the water storage equipment is in similar condition because of: (1) failing paint and coating material which allows rust to form on the tanks; (2) tank age, or (3) tanks that have been located next to disinfection chemicals leading to deterioration. Confluence Rivers evaluates each tank to identify and repair leaks and to determine whether the tank needs to be repainted. Tanks that lack required equipment (e.g., overflow pipes, pressure relief valving, etc.), are repaired to provide such necessary equipment. Where storage is inadequate or has failed, Confluence Rivers replaces tanks or installs additional storage to meet system capacity demands.

Significant rust at base of Branson Cedars standpipe tank

Deteriorating abandoned storage tanks at Fawn Lake (removed by Confluence Rivers)

Rusting bladder tank at Missing Well system

Nearly all of the water systems that Confluence Rivers has acquired have had issues with their control systems; lacked remote monitoring; and/or had problems with their power supply. Confluence Rivers routinely installs proper control systems and remote monitoring equipment at well sites to allow water production data to be continually reported such that operators are immediately and automatically alerted to any abnormal conditions. Confluence Rivers inspects backup generators and repairs or replaces as necessary to ensure they remain in good working order. At sites lacking emergency backup generators, Confluence Rivers installs quick connects and manual transfer switches that allow generators to be connected in the event of power outages.

Damaged power panel, exposed wiring at Cedar Glen. Panel repaired and remote monitoring installed.

Some water systems that Confluence Rivers acquires have water distribution system issues including a lack of proper isolation valve infrastructure and dead ends without flushing infrastructure. In such cases, Confluence Rivers installs flushing valves and hydrants and implements a regular flushing program.

In addition to these physical issues, many of the drinking water systems had regulatory issues. These issues fall primarily into managerial/reporting issues and health-based violations. Managerial/reporting violations can be resolved simply by improving the managerial and operational practices of the facilities rather than by making physical improvements to the systems. Many of these systems had monitoring and testing violations in their recent history consisting of either a failure to complete required testing all together or the failure to complete testing consistent with the prescribed sampling schedule. Similarly, a number of these facilities have received violations for failure to provide public notice of violations, or failure to complete and make available Consumer Confidence Reports. Again, these issues represent failures in managerial and operational practices under previous ownership.

Health based violations are violations that could affect the drinking water quality. The only recent health violation in this group of systems was *E.coli* exceedances at the Cedar Green system in 2020, which have since been resolved. While no other recent health violations were observed in the drinking water systems recently acquired, shortcomings experienced elsewhere can generally be categorized as a "failure to address deficiency". Such issues generally indicate areas in which facilities: (1) fall short of design standards prescribed by the State (usually noted in a facility inspection) or (2) fail to remedy the issue in the time prescribed by the State.

The other health-based violations noted in the compliance histories are based on the repeated failure of systems to complete required testing for parameters that could affect the health of customers. This usually consists of parameters that are on a less frequent testing schedule than typical bacteriological and residual chlorine testing. Such monitoring violations are more reflective of managerial and operational deficiencies than physical shortcomings in the system or its treatment.

The final area in which health-based violations occur are instances where contaminants exceed the MCL (maximum contaminant level) for a specific contaminant. These are the most critical violations as MCL exceedances can result in negative health outcomes for customers. The 2020 violation would fall into this category and either indicates a deficiency in the disinfection system that has since been addressed, or contamination of the testing sample which was cleared up in the follow up sample. Where a MCL violation results from an inadequacy in the treatment process, Confluence Rivers makes treatment improvements to ensure the system can provide safe drinking water.

Q. DOES THIS COMPLETE YOUR DIRECT TESTIMONY?

A. Yes, it does.

BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF MISSOURI

In the Matter of Confluence Rivers Utility Operating Company, Inc.'s Request for Authority to Implement a General Rate Increase for Water Service and Sewer Service Provided in Missouri Service Areas.	)))))	**File No. WR-2023-0006** **File No. SR-2023-0007**

AFFIDAVIT OF JACOB FREEMAN

STATE OF MISSOURI)
) **ss**
COUNTY OF ST. LOUIS)

Jacob Freeman, of lawful age and being first duly sworn, deposes and states:

1. My name is Jacob Freeman. I am the Director of Engineering for CSWR, LLC.

2. Attached hereto and made a part hereof for all purposes is my direct testimony.

3. I hereby swear and affirm that my statements contained in the attached testimony are true and correct to the best of my knowledge and belief.

Jacob Freeman

Subscribed and sworn to me this 16 day of December, 2022

Notary Public

My commission expires 5/4/24.

DANIEL RYAN JANOWIAK
Notary Public, Notary Seal
State of Missouri
St. Charles County
Commission # 20374795
My Commission Expires 05-04-2024