
RE: Town of Peshtigo Updates

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To Town of Peshtigo Chair <topchair@townofpeshtigo.org>

Cc Thistle, Jodie M - DNR <jodie.thistle@wisconsin.gov>

Good Morning Jennifer - We have two updates to share:

1. Recommended Groundwater Quality Standards

The DNR recently received the Department of Health Services' (DHS) updated recommendations for groundwater quality standards for six PFAS - [Update On NR 140 Rulemaking For PFAS Substances](#). The DNR is evaluating how these updates affect health advisories for private drinking water in Wisconsin. Additional information and communications will be provided in the coming months.

2. Contaminant Remediation

JCI/Tyco continues to operate the groundwater extraction and treatment system (GETS). JCI/Tyco's [GETS Progress Report #4](#), documents operations through November 2024. The [DNR's Response](#) to this report is now available. The GETS is effective at removing PFAS from the groundwater it captures; however, additional actions will be needed to control contaminant migration and restore the environment to the extent practicable. As a next step, JCI/Tyco plans to add five more extraction wells to the GETS in 2025.

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Tyco Fire Products LP

GETS Short-Term Monitoring Report #4

November 14, 2022 through November 10, 2024

BRRTS# 02-38-580694

December 2024

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November 14, 2022 through November 10, 2024

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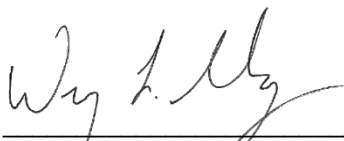
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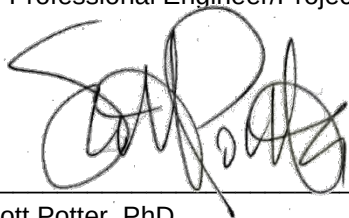
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Acronyms and Abbreviations

Arcadis	Arcadis US, Inc.
GAC	Granular activated carbon
GETS	Groundwater extraction and treatment system
gpm	Gallons per minute
ng/L	Nanograms per liter
PFAS	Per and poly-fluoroalkyl substances
PFOA	Perfluorooctanoic acid
PFOS	Perfluorooctanesulfonic acid
SP1	Sampling port 1
STM	Short-term monitoring
SVOCs	Semi-volatile organic compounds
USACE	U.S. Army Corps of Engineers
VOCs	Volatile organic compounds
WDNR	Wisconsin Department of Natural Resources
WPDES	Wisconsin Pollution Discharge Elimination System

Executive Summary

The original objectives of the GETS from the February 2021 Remedial Action Plan (Arcadis) were to (1) reduce upwelling of PFAS-contaminated groundwater into Ditch B; (2) treat the recovered groundwater to reduce the PFAS concentration in the water; and (3) reduce PFAS-mass flux throughout groundwater plume. After 2 years of continuous operations, the GETS is meeting those objectives. The amount of PFAS-impacted groundwater upwelling to Ditch B has reduced as evidenced by the changes in water elevations within and adjacent to temporary streambed piezometers in the ditch as well as the general reduction in total PFAS concentrations in the ditch. Treated groundwater is being released back into Ditch B with analytical results consistently demonstrating compliance with permitted standards and often below laboratory reporting limits. The GETS has removed over 8.5 kilograms of PFOA plus PFOS from the environment since it began operation.

While the GETS is successfully removing PFAS from the environment, additional optimization activities are ongoing to improve the system's ability to further reduce concentrations of PFAS in Ditch B and to also alleviate potential impacts to the environment near Ditch A.

Concentrations of PFOA plus PFOS have trended downward since the GETS began operations. A new low point in surface water concentrations was observed at the Ditch B treatment system influent on November 4, 2024 when PFOA plus PFOS was measured at 59 ng/L. This is below the Wisconsin Department of Health Services-recommended standard of 95 ng/L for PFOA in surface water but remains slightly above the recommended standard of 8 ng/L for PFOS. Further optimization, as described below, is intended to consistently reduce concentrations in the ditches to below those recommended standards.

1 Introduction

This report is the Short-Term Monitoring (STM) Report representing the fourth monitoring and performance summary of the Groundwater Extraction and Treatment System (GETS) spanning the first 24 months of operation. The additional data requested in the February 2, 2024 and August 5, 2024 correspondence from the Wisconsin Department of Natural Resources (WDNR) are included where available. This report summarizes the performance data, operating data, and system optimization performed from the start of the GETS (November 14, 2022) through November 10, 2024. As detailed in the *Long-Term Monitoring Plan for the Groundwater Extraction and Treatment System* (Arcadis, 2021), the STM phase began following the first 6 months of the GETS operation. The GETS began operating November 14, 2022. The GETS STM began on May 15, 2023 and will continue through April 28, 2025 when it will transition to a future long term monitoring plan that will be prepared under separate cover. Reporting during short term monitoring is every six months. This is the fourth of five planned STM reports.

1.1 Summary of Data

In 24 months of operation, the GETS has removed approximately 8.55 kg of PFOA plus PFOS from groundwater prior to entering Ditch B (See Figure 9 and Table 15). The treatment system is operating as intended to remove PFAS from extracted groundwater and reducing concentrations of PFOA and PFOS in Ditch B. Various system optimization activities have been ongoing since initial startup to increase the treatment capacity of the GETS to treat more water, modify the pretreatment filtration process and filtration media to remove more iron, manganese and organic matter from the water, and the granular activated carbon (GAC) vessels were re-plumbed to enable changing the sequence of the vessels in the treatment train. This last change to the system assures the last vessel closest to the outfall always contains the “freshest” GAC with the least PFAS adsorbed to the media, reduces GAC use and carbon footprint, and provides a higher level of assurance the effluent will meet criteria. Collectively, these initial optimizations have improved the treatment capacity permitting groundwater pumping to increase approximately 20%. Additional optimization activities are further discussed below and will include supplemental wells to extract more groundwater and treatment process upgrades to double the treatment capacity of the GETS.

Groundwater elevations upgradient of the extraction wells are transient where water levels are generally highest in the late spring due to spring rains and snow melt, gradually declining over the summer through the following winter. There are short term effects from extended precipitation events which cause short term increases in water levels (See Figures 3 through 5). Water levels are also regionally affected by the water surface elevation of Green Bay which fluctuate over 6 feet over decades length cycles (see the modeling report in Appendix D for further discussion). The groundwater plume upgradient of the extraction wells (Figures 10 and 11) has remained consistent with the plumes depicted in the most recent Site Investigation Status report (Arcadis June 2024).

Tables 2 through 15 summarize the available operational data and monitoring activities for this reporting period. Tables 2 through 8 summarize the operational data for the GETS and the extraction wells, while Tables 9 and 10 summarize Ditch B Flow and concentration data. Table 11 summarizes observed groundwater and surface water interaction in Ditch B. Tables 12 through 14 contain the chemistry and water level data from monitoring wells and surface water locations outlined in the *Long-Term Monitoring Plan for the Groundwater Extraction and Treatment System* (July 2021) approved in October 2021. Table 15 summarizes the mass of PFOA and PFOS that have been removed by the GETS during the first 24 months of operations. The data summarized in Table 15 does not

include the removal of the sum of the nine PFAS compounds as requested by the WDNR (WDNR August 2024) because this data is not available as the effluent samples of the GETS are only analyzed for the compounds established in the WPDES permit (WDNR October 2021). The effluent sampling includes PFOA, PFOS, general chemistry, semi-volatile organic compounds (SVOCs), and volatile organic compounds (VOCs). Figure 1 is a local site map near the GETS identifying the treatment plant, the extraction wells and the monitoring network. Table 1 is a summary of each location where data is routinely collected. Figure 2 summarizes flow in Ditch B, concentrations of PFOA plus PFOS in Ditch B, and daily precipitation. Figures 3 through 5 summarize water levels and pumping rates at the extraction wells. Figures 6 and 7 summarize groundwater elevations. Figure 8 summarizes PFOA and PFOS concentrations in Ditch B while Figure 9 summarizes PFOA and PFOS removal by the GETS. Figures 10 through 12 present PFAS concentrations in groundwater.

2 GETS Operational Data

The treatment rates and groundwater pumping varied during the first 8 weeks of GETS operation while final system testing was completed. The GETS has been running continuously since the afternoon of January 11, 2023 except for brief periods for routine maintenance. The average treatment rates each week are summarized in Table 7. The average weekly treatment rates has gradually increased from 190 gallons per minute (gpm) in Week 11 (January 2023) to approximately 260 gpm in Week 104 (November 2024). Please see the note on Table 7 for additional information on the calculations.

2.1 Groundwater Concentrations

Groundwater concentrations in monitoring wells and extraction wells are summarized in Tables 6 and 13. During the twenty-four months of GETS operations, 511 samples were collected from monitoring wells and 217 samples were collected from the extraction wells. Over the 24-month collective data set, the influent concentration of PFOA plus PFOS to the GETS (Table 8; Figure A-3) remained stable, as reflected by the uniform increase in the total mass removed of PFOA plus PFOS (Figure 9). Recent optimization activities have included well redevelopment and increased pumping rates, which resulted in an increase in mass removal over the reporting period.

Per the WDNR request (WDNR 2024), concentration trends and PFAS mixtures in the 9 extraction wells are presented in Appendix A. Figure A-1 presents the data for wells EX-3, EX-4, EX-5, and EX-6 from northwest to southeast along Ditch B. Each graph has two curves of PFAS trends. The lower curve is the sum of PFOA and PFOS, while the upper curve is the sum of 9 compounds (PFHxA, PFOA, PFNA, PFBS, PFHxS, PFOS, 6:2 FTS, 8:2 FTS, FOSA). The bar charts are the mixture of each sample ordered from top to bottom using the color scheme in the legend from left to right. The bar of each sample is normalized to 100% using the total PFAS concentration of the sum of the nine compounds. Over the past 6 months, concentrations and mixtures at each well have stabilized. Concentrations of PFOA plus PFOS range from 3,290 ng/L to 16,800 ng/L while concentrations of the sum of the 9 compounds range from 6,902 ng/L to 22,484 ng/L. Concentrations are highest at EX-6 and lowest at EX-4. The PFAS mixture in each well is unique and varies subtly from north to south. EX-3, EX-4, and EX-5 have more 6:2 FTS while EX-6 has more PFOA.

Figure A-2 presents the data for wells EX-1, EX-2, EX-8, and EX-7 from west to east. EX-1 and EX-2 are near the GETS treatment building while EX-8 and EX-7 are aligned with Edwin St. Over the past 6 months, concentrations and mixtures at each well have stabilized. Concentrations of PFOA plus PFOS range from 2,570 ng/L (EX-2) to

16,120 ng/L (EX-7) while concentrations of the sum of the 9 compounds range from 12,468 ng/L (EX-2) to 96,275 ng/L (EX-1). The PFAS mixture in each well is unique and varies between wells. EX-1 and EX-2 have more 6:2 FTS than the other extraction wells

Figure A-3 presents the PFAS data in the blended flows from all the extraction wells and EX-9. The blended flow was collected from sampling port 1 (SP1) at the GETS. It is noted that while SP1 is sampled weekly, only the sample collected the week of the extraction well sampling is presented¹. Influent concentrations on November 6, 2024, for PFOA plus PFOS and the sum of the 9 compounds were 10,250 ng/L and 21,117 ng/L, respectively. These values are approximately the same as the averages for the first 104 weeks of GETS operations, 10,414 ng/L and 20,912 ng/L, respectively. EX-9 is only operated for sampling as PFAS concentrations are low in this area, therefore this well does not need to be used for extraction at this time. The last PFOA plus PFOS sample is 18.30 ng/L and the sum of the 9 was 21.94 ng/L. Concentrations have steadily declined at EX-9 since the GETS operations began using the other wells.

As a result of the GETS pumping activities, there have also been small changes in plume concentrations near and upgradient of the extraction wells over the reporting period. Figures 10 and 11 present the shallow and deep overburden groundwater concentrations of PFOA plus PFOS. The postings of PFOA plus PFOS and the sum of the 9 compounds are the most recent sample results while the plume was drawn using these data and the data presented in the June 2024 Site Investigation Status report (Arcadis 2024).

Per the WDNR request (WDNR 2024), concentration trends and PFAS mixtures in 19 monitoring wells are presented in Appendix C. The data is organized by the depth and location of the wells. Figures C-1 and C-2 present the data from shallow overburden monitoring wells (less than 18 feet deep). Figures C-3 through C-5 present the data from deep overburden monitoring wells (deeper than 18 feet deep). Figure C-6 presents data from monitoring wells in the shallow weathered bedrock in the bedrock plume. The data are presented similar to the extraction wells using two curves with the PFAS mixture in the samples. This approach allows presentation of the data with less variation in axis limits and permits comparison of the PFAS mixtures between wells. Generally, the plots reflect the typical variability in plume concentrations seen during active remediation. The PFAS mixtures in wells at higher concentrations look similar to the extraction wells, while wells at lower concentrations are more variable. Figure C-3 presents monitoring wells upgradient of extraction wells. Well PZ-16D upgradient of extraction well EX-1 had an increase in 6:2 FTS as the PFAS plume is drawn into the extraction system. Well PZ-58-50 continues to trend downward as the PFAS plume moves northward toward extraction well EX-7. The PFAS mixture in monitoring wells screened in the weathered bedrock (Figure C-6) is predominately three compounds PFHxA, PFOA, and 6:2 FTS.

2.2 Surface Water & Stream Bed Piezometer Data

PFAS Concentrations in surface water are monitored at multiple locations in Ditch B between Industrial Parkway and Location L-03 downstream of the Ditch B surface water treatment system (See Figure 1). These data are summarized in Table 10 and Table 14. Table 10 summarizes the weekly samples at the influent to the Ditch B treatment system and are shown on Figure 2. These data continue to show PFAS concentrations decreased in the ditch after the GETS became operational. The lowest concentration of PFOA plus PFOS collected during the reporting period at the influent to the Ditch B treatment system (data from sampling port SC-203B) was 59 ng/L November 4 (Week 104). Nine synoptic rounds of samples were collected from Ditch B upgradient of the Ditch B

¹ Complete data set for SP1 is summarized in Table 8

treatment system between September 2022 and October 2024. These data show a gradual decrease in PFAS concentrations over this period. Appendix B presents trend charts and mixtures of the nine PFAS compounds of each sampling events. Surface water samples collected down gradient of the Ditch B treatment system at SW-L03 since September 2023 have been generally been low; however, as a result of the unexpected period of precipitation from May through July, the flow in Ditch B was greater than the treatment capacity of Ditch B. Concentrations of PFOA plus PFOS at L-03 ranged from a high of 205 ng/L on Jun 17 and a low of 16.5 ng/L on October 1. See Table 14 for additional sample results.

As stated above, one of the objectives of the GETS is to prevent impacted groundwater from upwelling into surface water. Streambed piezometers placed at 7 locations, L-09, M-01, M-04, M-07, M-09, U-03, and U-10 were used to measure water levels. The water levels inside and adjacent to each piezometer are summarized in Table 11. The data in column 'delta' at each location show the transition of Ditch B from "gaining" (positive) to "losing" (negative). October 2024 conditions show reduced positive gradients compared to the previous reporting period as the zone of influence of the extraction wells has reestablished after recent GETS optimization and that the GETS is successfully reducing the upwelling of impacted groundwater into Ditch B. Currently Ditch B is losing water or there are neutral gradients from M-01 thru U-03. Water leaving the ditch within these areas is within the zone of capture for the GETS and will be treated and recirculated back into the ditch. Upward gradients are observed upstream of the PFAS plume at U-10, and downstream at L-09. The upward gradients observed at U-10 support the additional increased pumping capacity (from 300 gpm to 600 gpm) being added to the GETS as part of the current optimization efforts. Optimization efforts also include the addition of five new extraction wells, for a total of 14 wells connected to the GETS (note that as discussed above, EX-9 is not currently pumping as the concentrations are low therefore it is not needed). Collectively, with the new and existing extraction wells (14 extraction wells in total), the upward gradients will be reduced along Ditch B, from U-10 to L-09. Additional details on the optimization efforts are below and in Appendix D.

Groundwater samples were collected at 5 locations, M-01, M-04, M-07, M-09 and U-03 during the reporting period. Groundwater concentrations in streambed piezometers were highest in the center of the monitoring network near M07 and M09 (Figure 11). A review of surface water concentrations with streambed piezometer data indicates the area near M09 contributes the majority of the PFOA and PFOS to Ditch B. This area is consistent with the observation above related to the observed increases in groundwater to the east-northeast of the immediate center of the plume, further supporting potential for capturing more water within this area. New extraction wells have been placed in this area to increase pumping and associated hydraulic capture, which will further mitigate potential upwelling in this area. More information on the optimization efforts is included below and in Appendix D.

As part of the ongoing optimization evaluations, supplemental surface water samples continue to be collected from Ditch B near the intersection with Pierce Avenue (location M09). On April 22, 2024, during the previous reporting period, supplemental surface water samples evaluated the tributary (called the northern tributary) to Ditch B that flows from the City of Marinette. Previous monitoring of the northern tributary was performed upstream of the confluence of the tributary and Ditch B at the intersection of Cleveland Avenue (SW-32) in 2018 and 2019. PFOA and PFOS concentrations were detected at concentrations below current applicable surface water standards during those sampling events. The northern tributary was sampled at a different location during the supplemental sampling event, at Pierce Avenue near the confluence of the tributary and Ditch B. The data from the northern tributary as it entered the main Ditch B waters contained 3,300 ng/L PFOA and 240 ng/L PFOS. Confirmation samples were collected on May 1, 2024 and those results indicated 820 ng/L PFOA and 52 ng/L PFOS was present within the northern tributary water at that location. Additional samples were collected along the

northern tributary on May 8, 2024 moving upstream from Pierce Avenue towards and beyond Cleveland Avenue. Concentrations of PFOA and PFOS were below applicable surface water standards at and upstream of Cleveland Avenue, similar to the 2018 and 2019 results. PFOA and PFOS were above applicable surface water standards in the northern tributary between Cleveland Avenue and Pierce Avenue. These findings are consistent with the latest plume contours developed using the most recent GETS monitoring data (Figure 13), and the data coupled with the above observations were used to locate placement of the additional extraction wells mentioned above as part of the ongoing optimization activities. In addition, three surface water sampling locations along the northern tributary were added to the ongoing GETS surface water monitoring activities (upgradient, midpoint and confluence; sample locations SW-P5, SW-P4, and SW-P1 on Figure 10).

Samples at location SW-P5, SW-P4, and SW-P1 were collected on July 30, 2024 and October 9, 2024. The PFOA plus PFOS during the July sampling was 36 ng/L, 6,820 ng/L, and 6,000 ng/L, at SW-P5, SW-P4 and SW-P1, respectively, consistent with the Spring event. There are only results for SW-P5 for the October sampling (41 ng/L) as the tributary was dry at location SW-P4 and SW-P1.

2.3 Extraction Well Data

Water level data were periodically downloaded from the transducers installed in the monitoring wells adjacent to the extraction wells. These data are shown on Figures 3, 4, and 5. The changes in water levels on the figures coincide with changes in pumping rates of the extraction wells, precipitation events, and snow melt. The graphs on the figures are organized based on location relative to Ditch B. Figures 3 and 4 summarize water levels near the 6 extraction wells along Ditch B organized from north to south. Prior to continuous operations, water levels were highest at MW-EX-3 (592 feet) in the north, decreasing to 590 feet PZ-52-41 (EX-7), and increasing to 591.5 feet at PZ-53-40 (EX-9). This u-shaped pattern of water levels forms a trough in the water table, focusing groundwater eastward. This u-shaped pattern has remained unchanged during continuous operations with water levels declining near the extraction wells. Figure 5 presents graphs of the three extraction wells farther upgradient of Ditch B. Figures 3, 4 and 5 show a temporary increase in water levels from significant rainfall events during the months of May, June, and July. Water levels are declining this Fall as precipitation return to typical conditions. The average weekly water levels near each extraction well are summarized in Table 4. Optimization activities that are currently underway include additional wells, enhanced pumping, and an increased treatment capacity (from 300 gpm to 600 gpm) will enable the GETS to achieve the objectives of removing PFAS from the environment and preventing upwelling of PFAS-impacted water to Ditch B even through seasonal and periodic increases in groundwater elevations.

2.4 Summary of Cumulative Data

At the request of WDNR, Table 11 presents groundwater and surface water elevations since GETS startup. Figures 6 and 7 present groundwater elevations for the reporting period. Figure 6 presents July 2024 groundwater elevations while Figure 7 presents October 2024 water levels. A comparison of the figures shows the excess precipitation the summary of 2024 increased water levels more typical of spring conditions. Since August 2024, water levels have been declining as precipitation has trended lower, more typical summer and fall. As discussed in the modeling report and presented on Figure D-1, there has been more than a 2-foot decrease in water levels observed in all monitoring wells across the investigation area. This broad decline in water levels outside of the GETS network is attributed to a decline in water levels in Green Bay, not groundwater pumping associated with

the GETS. As discussed above, the GETS optimization activities are being implemented to enable management of seasonal and periodic increases in groundwater elevations.

3 GETS Optimization

The objective of the GETS is to prevent PFAS present in groundwater from entering Ditch B and to ultimately replace the Ditch B system as a long-term solution. As such, optimization of the GETS began in July 2023 and included:

- Increased pumping in key wells to enhance capture of PFAS.
- Infrastructure improvements to enable routine maintenance related to ongoing biological growth within the wells and conveyance lines and restoration of pumping capacity (EX-3 and EX-4).
- Installation of supplemental extraction wells EX-1S and EX-2S near the existing EX-1 and EX-2 wells. The new wells were needed due to diminishing pumping capacity as result of biofouling of the wells, pumps and pipes to the GETS building. The new wells are larger in diameter (8-inch vs 6-inch) and larger vaults permit easier access for periodic rehabilitation to address future biological accumulation in the conveyance piping.
- Improvements within the GETS building to increase treatment capacity.

The outcome of this phase of optimization allowed the treatment capacity to increase from 225 gpm to 275 gpm and for pumping rates of the extraction wells to increase from 225 gpm to 260 gpm. These changes increased PFAS recovery by approximately 15%.

Additional optimizations are currently being implemented as follows:

- GETS system upgrades to increase treatment capacity from 275 gpm to 600 gpm:
 - Parallel treatment train operation
 - Optimized solids removal
- Extraction well expansion at three locations:
 - Ditch B to address the recently identified PFAS in the small tributary to Ditch B in the City of Marinette near the bridge on Pierce Ave and more generally to address the continued presence of PFOA and PFOS in the ditch above the remedial targets of 95 ng/L and 8 ng/L, respectively.
 - Ditch A to address the periodic presence of PFOA and PFOS above remedial targets.
 - Weathered bedrock to address the presence of PFOA and PFOS above remedial targets.

The groundwater model was used to evaluate placement and construction of new extraction wells to address each of these issues.

- **Ditch B** – Locations were evaluated near the bridge on Pierce Ave crossing in Ditch B. The objective these extraction points is to stop the PFAS plume from upwelling into the small tributary flowing from the City of Marinette and Ditch B west of Pierce Ave. Two additional wells are being constructed (EX-12 and EX-14) to operate at 25 gpm each to enhance groundwater capture and further reduce upwelling near existing extraction wells EX-3 and EX-4.
- **Ditch A** – Locations were evaluated along Ditch A south of the outdoor testing area (OTA). The objective these extraction points is to mitigate the PFAS plume from upwelling in Ditch A during seasonal water table increases and to prevent the portion of PFAS plume beneath Ditch A from flowing to the southeast. Two additional wells (EX-10 and EX-11) pumping at 25 gpm each were added to capture shallow

groundwater and prevent potential groundwater upwelling into Ditch A. The model assumes an average pumping rate of 25 gpm from each well.

- **Bedrock** – The PFAS plume in the weathered bedrock (the first 10 feet of encountered bedrock) flows southwest to northeast from the FTC toward the Menominee River (generally toward Stanton Street). The bedrock monitoring well PZ-64-67 located in the center of the PFAS plume in bedrock and produces sufficient water to capture the contaminated GW migrating from the FTC in bedrock. The well was assessed with a short-term pumping test to confirm well yield, and the modeling determined that one well (EX-14) pumping at approximately 50 gpm can capture contaminated groundwater migrating from the FTC in weathered bedrock.

The modeling estimates that operation of the new extraction wells at the proposed rates will increase mass recovery by 18%, and lower water levels a minimum of 12 inches within the core of the plume where 95% of the PFOA and PFOS are present. The lowering of water levels and recovery of additional mass are predicted to further reduce concentrations of PFOA and PFOS in Ditch B.

The additional groundwater pumping has necessitated modification of the GETS treatment train to double the treatment capacity to 600 gpm. This increase in the treatment capacity was achieved by replumbing the GETS facility to operate 2 treatment trains simultaneously.

The permits and approvals from the WDNR and the US Army Corp of Engineers (USACE) for the GETS optimization plans are in place. It is anticipated that construction will be completed and expanded operation will be operational in Spring 2025. An optimization completion report will be submitted 60-days after the expanded GETS is operational. These supplemental optimization activities are shown on Figure 1.

4 Sustainability Summary

The GETS has a net zero impact on water in operations by design. All groundwater removed by the system is filtered and returned to the environment via discharge to Ditch B. Approximately 8.7 million gallons of water are treated per month as a result of GETS operations. 213 million gallons of water have been treated as of November 10, 2024.

Granular Activated Carbon (GAC) and resin are the primary filtration media employed by the GETS. System operations through November 10, 2024 required 208,000 pounds of virgin GAC while also using 372,000 pounds of regenerated GAC. As of November 2023, all spent GAC is sent for regeneration and reuse utilizing one carbon pool from the Site. 36,000 pounds of resin media has been employed by the GETS to date, with 24,000 pounds disposed offsite.

As of November 13, 2024, 1,064,327 kilowatt hours (kWh) of energy had been consumed by the GETS building and its ancillary power drop locations for the extraction wells since the start of operations.

The GETS is powered by electricity and does not generate air pollutants in the form of particulate matter or greenhouse gas emissions.

The GETS was designed to avoid and minimize wetland disturbance to the extent practicable. The original layout estimated approximately 0.01 acres of temporary wetland impacts and 0.94 acres of permanent wetland conversion. The wetland conversion was permitted through the Wisconsin Department of Natural Resources and the U.S. Army Corps of Engineers, and offset by a wetland mitigation payment made through Wisconsin's in-lieu fee program. After the initial construction and some additional permitted construction activities, it is estimated that the Project has actually resulted in less impact than originally proposed, due to continual avoidance and

minimization efforts. To date, it is estimated that the permitted Project has resulted in 0.06 acres of temporary wetland disturbance and 0.84 acres of permanent wetland fill, which remains less than the original permitted wetland loss of 0.94 acres. All temporary wetland disturbances will be restored to pre-Project conditions.

As described above, all GAC is reused after reactivation to minimize consumption of raw materials. Tyco is also planning to reduce waste during construction of optimization activities described above by reusing excavated soils in their original locations whenever permitted by WDNR.

5 Conclusion

The original objectives of the GETS were to:

1. Reduce upwelling of PFAS-contaminated groundwater into Ditch B;
2. Treat the recovered groundwater to reduce the PFAS concentration in the water; and
3. Reduce PFAS-mass flux throughout groundwater plume.

After 2 years of continuous operations, the GETS is meeting those objectives. The amount of PFAS-impacted groundwater upwelling to Ditch B has come down. Treated groundwater is being released back into Ditch B with analytical results consistently demonstrating compliance with permitted standards and often below laboratory reporting limits. The GETS has removed over 8.5 kilograms of PFOA plus PFOS from the environment since it began operation.

While the GETS is successfully removing PFAS from the environment, additional optimization activities are ongoing to improve the system's ability to further reduce concentrations of PFAS in Ditch B and to also alleviate potential impacts to the environment near Ditch A.

Some analytical data collected the first weeks of November are not available for reporting this period and will be included in the next semi-annual report. The next GETS Monitoring Report will summarize the first 2.5 years of operation; from November 14, 2022 to May 11, 2025. GETS Short Term Monitoring Report #5 will be provided June 13, 2024.



February 6, 2025

MS. DENICE NELSON
JOHNSON CONTROLS, INC
5757 N. GREEN BAY AVENUE
MILWAUKEE, WI 53209

Via Email Only to denice.karen.nelson@jci.com

SUBJECT: Response to *GETS Progress Report #4 (Nov. 13, 2023 – Nov. 10, 2024)*
JCI/Tyco FTC PFAS, 2700 Industrial Parkway South, Marinette, WI
BRRTS #02-38-580694

Dear Ms. Nelson:

On Dec. 20, 2024, the Wisconsin Department of Natural Resources (DNR) received the GETS¹ Semi-Annual Monitoring Report ("GETS Progress Report #4") for the above-referenced site (the "Site"). The report was submitted by Arcadis U.S., Inc. (Arcadis) on behalf of Johnson Controls, Inc. and Tyco Fire Products LP (JCI/Tyco) and was accompanied by the fee required under Wisconsin Administrative Code (Wis. Admin. Code) § NR 749.04(1) for DNR review and response.

JCI/Tyco conducts monitoring to evaluate the effectiveness of the GETS in restoring the environment; the monitoring results and summaries of the GETS's operations and maintenance are reported in semi-annual progress reports to the DNR (Wis. Admin. Code § NR 724.13(3)). GETS Progress Report #4 demonstrates that the GETS interim action is effectively treating the captured groundwater and is reducing the amount of per- and polyfluoroalkyl substances (PFAS) in the environment. However, modifications to the GETS, and/or additional remedial actions, may be needed to restore the environment to the extent practicable and further control contaminant migration at the Site (Wis. Stat. § 292.11(3)).

JCI/Tyco plans to modify the GETS and submit an updated long-term monitoring plan in 2025. The DNR's review of the current conditions and recommendations for long-term monitoring are presented herein.

Background

JCI/Tyco is investigating and responding to the discharge of PFAS to the environment at the JCI/Tyco Ansul Fire Technology Center (FTC), located at 2700 Industrial Parkway South in Marinette, Wisconsin.

A significant groundwater contaminant plume of PFAS is present at the Site; the concentrations of perfluorooctanoic acid (PFOA) in groundwater on the FTC property and to the east are on the order of 10,000 – 100,000 parts per trillion (ppt). The contaminated groundwater upwells into the surface water in Ditch B, which contributes to PFAS migrating into the Bay of Green Bay.

In Nov. 2022, JCI/Tyco began an interim remedial action – the GETS – with goals to (1) reduce upwelling of PFAS-contaminated groundwater into Ditch B; (2) treat the recovered groundwater to reduce the PFAS concentration in the water; and (3) reduce PFAS-mass flux throughout groundwater plume.

Currently, the GETS includes nine vertical groundwater extraction wells to pump and convey contaminated groundwater through buried pipes to a treatment building on the FTC property. Treatment includes oxidation,

¹ GETS = Groundwater Extraction and Treatment System

filtration, granular activated carbon (GAC) and ion exchange resins to remove PFAS from the groundwater. The treated water is discharged back to Ditch B surface water downstream of where the ditch crosses Pierce Avenue².

In 2025, JCI/Tyco has plans to upgrade the treatment capacity and install five new extraction wells for the GETS. The new extraction wells include two near existing extraction wells EX-3 and EX-4 along Ditch B, one new well in the weathered bedrock northeast of the FTC and two new wells near Ditch A on the southern portion of the FTC property. These modifications were described in GETS Progress Report #3 and JCI/Tyco's Oct. 3, 2024, response to comments. JCI/Tyco is currently working to obtain the necessary permits for the proposed changes.

Summary and DNR Review of GETS Progress Report #4

The GETS began operating in Nov. 2022. This is the fourth semi-annual progress report submitted under the current-approved monitoring program (Wis. Admin. Code § NR 724.13(3)). JCI/Tyco plans to submit an updated long-term monitoring plan for approval after its next semi-annual progress report.

GETS Operations:

The following is the DNR's understanding of the GETS operations from Nov. 14, 2022, through Nov. 10, 2024.

- A total of 1,064,327 kilowatt hours (kWh) have been used to extract and treat approximately 219 million gallons of contaminated groundwater (Table 7).
- Approximately 36,000 pounds of ion exchange resin, 208,000 pounds of virgin granular activate carbon (GAC) and 372,000 pounds of regenerated GAC has been used to treat the extracted groundwater.
- All treated groundwater was discharged to surface water in Ditch B near monitoring point SW-M09.
- The GETS is effective at removing PFOA and perfluorooctanesulfonic acid (PFOS) from the groundwater it treats:
 - The average combined influent concentrations from all the extraction wells are approximately 10,000 ng/L for PFOA and 700 ng/L for PFOS (Table 15 and Figure A-3).
 - All the samples of treated effluent had concentrations below the Wis. Admin. Code § NR 102.04 surface water standards for PFOA and PFOS (Table 8).
- The groundwater extraction rates vary between the eight operating extraction wells from approximately 10 to 40 gallons per minute (gpm). The ninth extraction well (EX-9) remains off, except for sampling because it was found to be outside the desired capture area of the plume. The lowest pumping rates are observed in extraction well EX-2, which experiences frequent biofouling (Table 2).
- System modifications and maintenance to address biofouling have improved the overall pumping rates that can be sustained by the GETS. Currently, the collective rate of groundwater extraction of the GETS is approximately 260 gpm, which is an overall increase since startup (Table 7).
- The concentration and mixture of PFAS varies in the groundwater captured by each extraction well:
 - PFOA is the dominant compound to the east; extraction wells EX-6, EX-7 and EX-8 generally capture the highest concentrations of PFOA (Table 6).
 - To the north, extraction well EX-1 captures the highest concentration of total PFAS; the dominant compound being 6:2 fluorotelomer sulfonate (FTS) (Figure A-2).

GETS Performance Evaluation:

The following is an evaluation of the effectiveness of the GETS relative the performance parameters established in Table 4 of the July 12, 2021, *GETS Long-Term Monitoring Plan*.

² The discharge of treated water to Ditch B is done under a Wisconsin Pollutant Discharge Elimination System (WPDES) General Permit No. WI-0046566-07-0 and the associated coverage letter dated Oct. 15, 2021. The DNR's Wastewater Program administers the WPDES permit.

From Nov. 14, 2022 (startup) through Nov. 10, 2024:

- The GETS removed approximately 18 pounds of perfluorooctanoic acid (PFOA) and 1.3 pounds of perfluorooctanesulfonic acid (PFOS) from the environment (Table 15). *(How this compares to the total amount of PFAS remaining in the source area has not been determined. Wis. Admin. Code § NR 716.11(3)(d) requires that JCI/Tyco estimate the mass of PFAS in the source area. The amount of PFAS removed by the GETS and expected remedial time frame can then be evaluated relative to this estimate.)*
- The GETS reduced, but did not prevent, the upwelling of groundwater into Ditch B (Table 11, Figures 6 and 7 and Appendix B). Contaminated groundwater continues to enter the northern segment of Ditch B between surface water monitoring points SW-U10 and SW-M09 and the northeastern branch of Ditch B between surface water monitoring points SW-P4B and SW-M09. The upwelling conditions extend farther downstream to surface water monitoring point SW-M04 in the spring.
- The concentrations of PFAS measured in the surface water in Ditch B has decreased; however, the concentrations still frequently exceed the Wis. Admin. Code § NR 102.04 surface water standards for PFOA and PFOS downstream of surface water monitoring point SW-U10 (Figure 8 and Table 14).
- As expected, seasonal and regional changes and short-term precipitation events (i.e., not the GETS) were the strongest influence on shallow groundwater levels and stream flows near the Site (Figures 2 -5); however, an observable capture zone has been established in the shallow groundwater near Ditch B between extraction wells EX-5 to EX-7 (Figure 6-7).
- As expected, the concentrations of PFAS in the groundwater migrating from the FTC toward Ditch B have not changed significantly in the 2 years of GETS operation (Table 13, Figures 10 and 11 and Appendix C). The concentrations and mixture of PFAS in the combined influent of groundwater captured by the GETS have been stable following startup (Appendix A).
- The concentrations of PFOA and 6:2 FTS have shown increasing trends in the groundwater at monitoring well PZ-29-43 following startup of the GETS (Appendix C). Monitoring well PZ-29-43 is downgradient of Ditch B to the northeast and is outside the capture zone of the GETS (Figure 11).

Modifications to the GETS operations, and/or other remedial actions, may be needed to achieve surface water standards in Ditch B and control the migration of PFAS in groundwater northeast of Ditch B.

GETS Proposed Updates and Groundwater Flow Model

A groundwater flow model was previously developed for the Site by Arcadis on behalf of JCI/Tyco. The groundwater flow model was updated to assess the placement of the five new extraction wells and the results of the modeling were included in Appendix D of GETS Progress Report #4. The conclusion is that the addition of the five new wells will enhance groundwater capture, particularly in areas where capture was weaker (along Ditch A and the northern portion of Ditch B).

The general conclusion is reasonable and supported by the model; however, it remains uncertain from the DNR's review of this report if the new extraction wells will prevent upwelling of contaminated water to the degree necessary to achieve surface water standards and reduce migration of PFAS in groundwater northeast of Ditch B.

Although the water levels predicted by the model are calibrated relative to the regional model domain, the model does not appear to be well calibrated or discretized sufficiently in the focused area of interest (i.e., between the FTC and Ditch B to the north and northeast). For example, the model consistently underpredicts water levels in the northern portion of the FTC property by 3 to 7 feet. As a result, it appears that the groundwater upwelling measured in Ditch B to the north and northeast of the FTC (Figure 6 and Figure 7) is not reflected in current conditions predicted by the model (Figure D-6). In addition, use of a steady-state model (as done here) has the tendency to over-predict drawdown and capture of pumping wells.

Thus, it is possible that the model overpredicts the capture area efficiency of the new extraction well, such that contaminated groundwater could continue to upwell into Ditch B to the north and migrate downgradient to the northeast. These conditions are apparent in the site monitoring data collected for the GETS. If these conditions continue, the surface water concentration of PFOA and PFOS may continue to exceed standards in Ditch B and increasing concentrations in groundwater may continue near monitoring well PZ-29-43.

These general comments about the model do not prevent JCI/Tyco from moving forward with its proposed updates to the GETS. However, the updated long-term monitoring plan for the GETS should evaluate the hydraulic and contaminant conditions of surface water in Ditch B and the groundwater downgradient from the GETS to assess if the new pumping wells are achieving the intended effect predicted by the model (Wis. Admin. Code § NR 724.13(2)).

Next Steps

In accordance with the approved July 12, 2021, *GETS Long-Term Monitoring Plan*:

- Submit the GETS Progress Report #5 by **June 25, 2025**.
- Submit updates to the GETS long-term monitoring plan on about the same time as GETS Progress Report #5. The update can be a standalone plan or addendum to the July 12, 2021 monitoring plan. Recommendations to consider in these updates are summarized in Attachment A.
- Submit an addendum to the GETS Construction Documentation Report **within 60 days** after the new construction and treatment modifications to the GETS are complete (Wis. Admin. Code § NR 724.15). Include revisions to applicable portions of the operations and maintenance plan as needed to reflect the design changes (Wis. Admin. Code § NR 724.13(4)).

As a reminder, this Site is subject to an enforcement action and therefore all submittals to the DNR under Wis. Admin. Code chs. NR 700-799 and submittals directed by the DNR must be accompanied by an Wis. Admin. Code ch. NR 749 fee per Wis. Stat. § 292.94. These fees are not pro-ratable or refundable per Wis. Admin. Code § NR 749.04(1). If you have any questions about whether to include a fee with a submittal, please contact DNR staff prior to submitting a document without a fee.

If you have any questions, please contact me at Alyssa.Sellwood@wisconsin.gov or (608) 622-8606.

Sincerely,



Alyssa Sellwood, PE
Water Resources Engineer
Remediation & Redevelopment Program

Attachment A: Recommendations for the Updates to the Long-Term Monitoring Plan

cc: Jodie Thistle, DNR (via email: jodie.thistle@wisconsin.gov)

Attachment A

Recommendations for the Updates to the GETS Long-Term Monitoring Plan

- Wis. Admin. Code § 716.11(3)(d) requires that JCI/Tyco estimate the total mass of contamination in the source area. A conservative approach to mass is recommended to account for precursors and complex fate and transport processes of PFAS. While it is recognized that the WPDES permit only requires the GETS effluent be sampled for PFOA and PFOS, other PFAS (e.g., 6:2 FTS) may need to be monitored occasionally in pre- and post-treatment. Compare the amount of certain PFAS removed by the GETS to the estimated mass in the source area. This will put the mass removed by the GETS into context and assist in assessing the remedial time frame and potential need for other remedial actions.
- Because groundwater conditions are expected to change slowly, JCI/Tyco may want to consider merging the GETS groundwater monitoring components into the interim long-term groundwater monitoring and reporting for the Site. (Relevant figures and concentration trend plots can be pulled from the site-wide groundwater monitoring reports, as needed, to evaluate the influence and impact of the GETS in the GETS Progress Reports. Figures similar to the concentration trends plot and PFAS mixture plots (Appendices A,B and C in GETS Progress Report #4) are recommended for the GETS reporting.
- Future monitoring should continue to include measurements that evaluate hydraulic gradients in the streambed piezometers in Ditch B and that can confirm that lower PFAS concentrations in surface water in Ditch B are not just a dilution effect from the additional treated groundwater that will occur following the proposed system updates (Wis. Admin. Code § NR 724.13(2)). The addition of another piezometer and surface water monitoring location between SW-U10 and SW-03 and a piezometer to measure hydraulic gradients in the streambed of the eastern branch to Ditch B are recommended in the updates.
- Certain data summaries could be consolidated in the semi-annual progress reports for the GETS. (For example, use of visual aids like Figure 3-6 and trend plots in the appendices included in GETS Progress Report #4 could be used instead of detailed summary tables for the GETS reporting.)
- Include monitoring, as needed, to evaluate how of the groundwater and surface water are responding to the planned updates to the GETS.