



June 12, 2023

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 Semi-Annual Operation, Maintenance, and Optimization Progress Report #7
Ditch B Interim Action Treatment System (July 1, 2022 – December 31, 2022)
JCI/Tyco FTC PFAS, 2700 Industrial Parkway South, Marinette, WI
BRRTS #02-38-580694

Dear Ms. Nelson:

On Apr. 28, 2023, the Wisconsin Department of Natural Resources (DNR) received the *Semi-Annual Operation, Maintenance, and Optimization Progress Report #7* (O&M Progress Report #7) for the Ditch B interim action at 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.

The DNR reviewed JCI/Tyco’s O&M Progress Report #7 and finds that the Ditch B treatment system, as currently maintained, is effective at removing per- and polyfluoroalkyl substances (PFAS) from the water it treats and the residual wastes from treatment are being properly managed. The Ditch B treatment system is documented to reduce the concentration of PFAS in the downstream surface water; however, the DNR finds that JCI/Tyco’s current monitoring program does not adequately characterize the PFAS concentrations downstream of the treatment system. Thus, per Wis. Admin. Code § NR 724.13(4), the DNR requests that JCI/Tyco implement updates to the long-term monitoring program in Operation, Maintenance and Monitoring Plan (OM&M Plan) for the Ditch B treatment system; the recommended updates are described herein.

Background

JCI/Tyco is investigating and responding to the discharge of PFAS to the environment at the JCI/Tyco Fire Technology Center (FTC), located at 2700 Industrial Parkway South in Marinette, Wisconsin. The discharge occurred as the result of training, testing, research and development of PFAS-containing aqueous film forming foams (AFFF) at the Site starting in the early 1960s.

A surface water drainage feature identified as Ditch B begins north of the FTC and flows east toward Pierce Avenue, where it turns and flows southeast and eventually discharges into the Bay of Green Bay in Lake Michigan. Elevated concentrations of PFAS were detected in the surface water of Ditch B – perfluorooctanoic acid (PFOA) up to 3,800 parts per trillion (ppt) and perfluorooctanesulfonic acid (PFOS) up to 190 ppt. In Oct. 2019, JCI/Tyco began an interim action to remove PFAS from the surface water Ditch B.

The interim action includes a treatment system located at 925 Pine Beach Road in Marinette, which is downstream from the FTC property and approximately 1,250 feet upstream from the mouth into Green Bay. The system captures surface water flowing in Ditch B and treats the captured water using suspended solids settling,

bag filtration and granular activated carbon (GAC). The treated water is then discharged back to Ditch B under a Wisconsin Pollutant Discharge Elimination System (WPDES) General Permit (WI-0046566-07-0) and the associated coverage letter, which specifies the effluent criteria and monitoring requirements.

The Ditch B treatment has the capacity to treat up to approximately 700 gallons per minute (gpm); whereas the streamflow in the ditch frequently exceeds this flow rate. During times when the streamflow exceeds the system's operating capacity, a portion of the surface water flowing in Ditch B goes untreated.

In Nov. 2022, JCI/Tyco initiated another interim remedial action at the Site – the Groundwater Extraction and Treatment System (GETS). JCI/Tyco has stated that one of its goals from its operation of the GETS is that the GETS will reduce the PFAS concentrations in Ditch B to the point with operation of the Ditch B treatment system is no longer needed. Surface water monitoring data from Ditch B will be used to make that determination.

NR 205 WPDES Permit

The effluent from the Ditch B treatment system is regulated under WPDES General Permit No. WI-0046566-07-0 and the associated coverage letter (updated Apr. 29, 2021). The DNR's Wastewater Program administers the WPDES permit and reviews the monthly electronic discharge monitoring reports submitted by JCI/Tyco. A review of the permit reporting is not included with this letter.

Summary and DNR Review of O&M Progress Report #7

System Operation and Performance

JCI/Tyco's O&M Progress Report #7 covered the period from Jul. 1 to Dec. 31, 2022. During the reporting period, the flow in Ditch B was continuous, such that the system required continuous operation. The maximum rate of streamflow in the ditch often exceeded the treatment capacity of the system and during these times of high streamflow a portion of the surface water in Ditch B continued downstream untreated. During the reporting period, the system treated over 172 million gallons of surface water from Ditch B and approximately 97 million gallons of surface water in Ditch B went untreated.

The system was effective at removing PFAS from the surface water it captured and treated. Water coming into the system had concentrations up to 1,900 ppt for PFOA and up to 130 ppt for PFOS. Treated water leaving the system had PFAS concentrations below the WPDES Permit criteria and below the Wis. Admin. Code § NR 102.04 surface water standards of 95 parts ppt for PFOA and 8 ppt for PFOS.

Based on JCI/Tyco's measurements on the volume of water treated and the PFAS concentrations in the system influent and effluent, JCI/Tyco estimated that during the reporting period the Ditch B system removed approximately 1.07 pounds of PFOA and 0.13 pounds of PFOS; and cumulatively, since startup in Oct. 2019, the system has removed approximately 8.75 pounds of PFOA and 0.68 pounds of PFOS from the surface water.

Routine system maintenance during this period included removal of accumulated sediment, replacement of spent bag filters and replacement of spent GAC. The spent bag filters were collected in drums and disposed by End Point Solutions and the spent GAC was shipped to a Cabot Corporation facility in Pryor, Oklahoma to be reactivated and reused in the treatment system. Documentation of the handling of these waste materials was included in Appendix E. The sediment was stockpiled in the soil staging area on the FTC property for future disposal at a solid waste landfill.

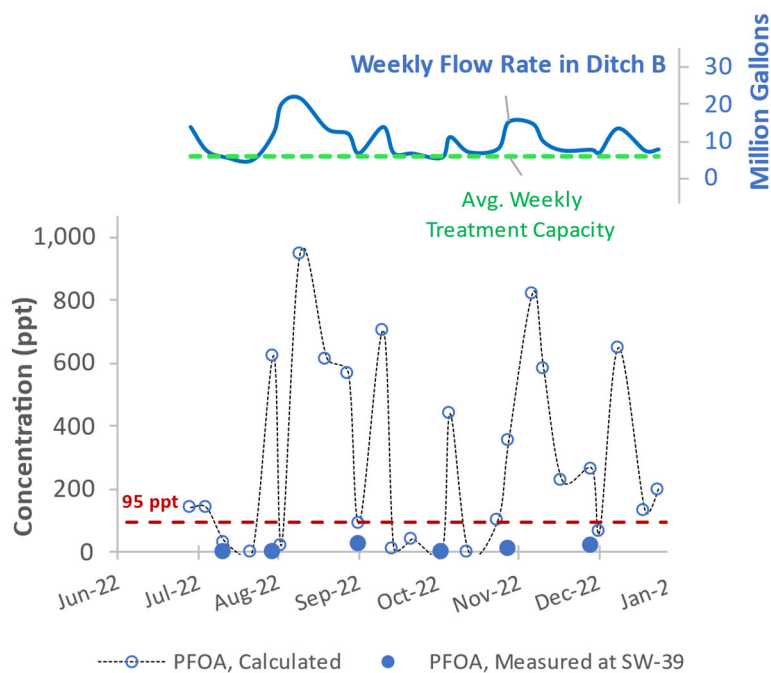
Surface Water Long-Term Monitoring

To evaluate the effect that operation the Ditch B system has on the downstream PFAS concentration of surface water in the ditch, JCI/Tyco collected a surface water sample once per month (6 total samples) at SW-39. The

surface concentrations measured at SW-39 during the reporting period were less than 22 ppt for PFOA and less than 2.2 ppt for PFOS. JCI/Tyco acknowledges in Section 7 of O&M Progress Report #7 that times when a portion of the surface water goes untreated will result in the higher PFAS concentrations.

The DNR finds that JCI/Tyco's monitoring at SW-39 once per month does not adequately characterize the downstream surface water concentrations in Ditch B. SW-39 is immediately downstream of the effluent of the treatment system into Ditch B and is likely too close to the effluent point to allow for mixing of the untreated and treated water and the day that SW-39 was sampled each month often did not align with times of high streamflow.

In prior responses to JCI/Tyco's O&M reports, the DNR provided examples of a mass balance approach that could be used to calculate the downstream concentrations of PFAS in the surface using existing data. This was recommended because it can estimate the concentrations using data already being collected by JCI/Tyco for its approved O&M on the system. The DNR completed a similar evaluation from the data JCI/Tyco submitted for this reporting period (Wis. Admin. Code § NR 724.17(4)(a)) – see attached **Table A.1** and **Figures A.1 and A.2**. The graphic below uses data from this evaluation to show how the PFOA measured at SW-39 once per month does not necessarily reflect the downstream surface water concentrations throughout the reporting period.



During the period of high streamflow that occurred during the reporting period, the calculated downstream concentrations for PFOA and PFOS, although reduced and improved from the upstream concentrations, often exceeded their respective Wis. Admin. Code § NR 102.04 surface water standards. These higher concentrations in the downstream water were not reflected in the monthly samples collected from SW-39.

Next Steps

Per Wis. Admin. Code § NR 724.13(4), the DNR requests that JCI/Tyco update Table 4-1 and Section 7.4 of the OM&M Plan for Ditch B to improve the characterization of PFAS in surface water downstream of the Ditch B treatment system. This could include a mass balance approach like the one discussed above, collection of monthly or more frequent surface water samples at SW-15 (or another point farther downstream from the treatment

system) or other alternative approach proposed by JCI/Tyco. Submit the updated Sections of the OM&M plan to the DNR within **45 days** of date of this letter and begin implementing these changes to the long-term surface water monitoring program for Ditch B. (If JCI/Tyco includes the recommendations included herein, then a fee for additional DNR review and response is not required.)

The DNR understands that one of JCI/Tyco's goals from its operation of the GETS is that the GETS will reduce the PFAS concentrations in Ditch B to the point that operation of the Ditch B treatment system is no longer needed. Results from continued monitoring of surface water in Ditch B will be used to make that determination. Because the concentrations of PFOA and PFOS in the surface water in Ditch B currently remain above the Wis. Admin. Code § NR 102.04 surface water standards, the DNR recommends that JCI/Tyco continue to operate the Ditch B treatment system as an interim remedial action at the Site. If the PFAS concentrations in surface water downstream of the Ditch B treatment system are found to be greater than the Wis. Admin. Code § NR 102.04 surface water standards, then JCI/Tyco must evaluate and report on the cause and significance per Wis. Admin. Code § NR 724.17(3m)(f) and may need to evaluate if modification or additional interim remedial actions are needed.

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 about this letter, please contact me, the DNR Project Manager, at (608) 622-8606 or Alyssa.Sellwood@wisconsin.gov.

Sincerely,



Alyssa Sellwood, PE
Complex Sites Project Manager
Remediation & Redevelopment Program

Attachments Table A.1 – Mass Balance Approach to Estimated Downstream Surface Water Concentrations
 Figure A.1 – Ditch B Downstream Surface Water Concentrations: PFOA
 Figure A.2 – Ditch B Downstream Surface Water Concentrations: PFOS

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

Table A.1
Ditch B Interim Action - Mass Balance Approach to Estimate Downstream Surface Water Concentrations
Calculations by the DNR Using Data JCI/Tyco Reported in O&M Progress Report #7

Source		Ditch B Flow Volume (gallons)		
		JCI/Tyco Table 5	JCI/Tyco Table 5	DNR Calculated ⁽¹⁾
Week Start Date	Week End Date	Estimated Stream Flow (V _{stream})	Treated Discharge (V _{treated})	Estimated Untreated Flow (V _{untreated})
Sunday, July 3, 2022	Saturday, July 9, 2022	13,869,000	6,808,600	7,060,400
Sunday, July 10, 2022	Saturday, July 16, 2022	7,436,400	6,480,300	956,100
Sunday, July 17, 2022	Saturday, July 23, 2022	5,639,900	5,448,300	191,600
Sunday, July 24, 2022	Saturday, July 30, 2022	4,817,900	4,815,500	2,400
Sunday, July 31, 2022	Saturday, August 6, 2022	12,151,900	6,320,200	5,831,700
Sunday, August 7, 2022	Saturday, August 13, 2022	20,160,900	6,541,100	13,619,800
Sunday, August 14, 2022	Saturday, August 20, 2022	21,666,400	6,965,200	14,701,200
Sunday, August 21, 2022	Saturday, August 27, 2022	13,380,900	6,522,000	6,858,900
Sunday, August 28, 2022	Saturday, September 3, 2022	12,011,200	7,134,700	4,876,500
Sunday, September 4, 2022	Saturday, September 10, 2022	6,722,400	6,386,400	336,000
Sunday, September 11, 2022	Saturday, September 17, 2022	13,891,700	6,910,800	6,980,900
Sunday, September 18, 2022	Saturday, September 24, 2022	6,724,500	6,724,500	0
Sunday, September 25, 2022	Saturday, October 1, 2022	6,652,800	6,339,400	313,400
Sunday, October 2, 2022	Saturday, October 8, 2022	5,531,000	5,531,000	0
Sunday, October 9, 2022	Saturday, October 15, 2022	11,131,100	6,091,400	5,039,700
Sunday, October 16, 2022	Saturday, October 22, 2022	7,064,400	7,064,400	0
Sunday, October 23, 2022	Saturday, October 29, 2022	7,927,700	7,053,400	874,300
Sunday, October 30, 2022	Saturday, November 5, 2022	15,262,800	6,908,800	8,354,000
Sunday, November 6, 2022	Saturday, November 12, 2022	14,748,000	6,665,300	8,082,700
Sunday, November 13, 2022	Saturday, November 19, 2022	9,867,900	6,541,200	3,326,700
Sunday, November 20, 2022	Saturday, November 26, 2022	7,487,700	6,726,900	760,800
Sunday, November 27, 2022	Saturday, December 3, 2022	7,673,200	6,560,600	1,112,600
Sunday, December 4, 2022	Saturday, December 10, 2022	6,875,800	6,875,800	0
Sunday, December 11, 2022	Saturday, December 17, 2022	13,500,500	6,772,400	6,728,100
Sunday, December 18, 2022	Saturday, December 24, 2022	7,434,900	6,868,700	566,200
Sunday, December 25, 2022	Saturday, December 31, 2022	7,787,800	6,890,900	896,900
Total (gallons)		267,418,700	169,947,800	97,470,900
Total (million gallons)		267	170	97

Notes:

⁽¹⁾ V_{untreated} = V_{stream} - V_{treated}

Sample Date	PFOS Concentrations (ppt)				PFOA Concentration (ppt)			
	JCI/Tyco Table 4	JCI/Tyco Table 4	JCI/Tyco Table 7	DNR Calculated ⁽²⁾	JCI/Tyco Table 4	JCI/Tyco Table 4	JCI/Tyco Table 7	DNR Calculated ⁽²⁾
	System Influent (Surface Water Pre-treatment)	Effluent (Treated Discharge)	Surface Water Sample (SW-39) Post-Treatment	Estimated Surface Water Post-Treatment	System Influent (Surface Water Pre-treatment)	Effluent (Treated Discharge)	Surface Water Sample (SW-39) Post-Treatment	Estimated Surface Water Post-Treatment
7/5/2022	44	0.81		26	280	< 0.51		143
7/11/2022	120	< 0.72		15	1,100	< 0.46		141
7/18/2022	100	< 0.76	<1.9	3	960	< 0.48	<1.9	33
7/28/2022	94	< 0.78		< 0.78	870	< 0.5		< 0.5
8/5/2022	110	< 0.5	<1.9	53	1,300	< 0.78	<1.9	624
8/8/2022	26	< 0.47		18	36	1.1		25
8/15/2022	100	< 0.48		68	1,400	< 0.76		950
8/25/2022	130	< 0.48		67	1,200	< 0.75		615
9/2/2022	120	< 0.45		49	1,400	< 0.71		568
9/6/2022	120	< 0.48	1.8	6	1,700	6.8	27	91
9/15/2022	100	< 0.46		50	1,400	< 0.73		704
9/19/2022	90	< 0.46		< 0.46	1,300	13		13
9/26/2022	83	< 0.48		4	860	2.7		43
10/7/2022	90	< 0.49	<2.0	< 0.49	940	< 0.77	<2.0	< 0.77
10/10/2022	84	< 0.49		38	970	1.2		440
10/17/2022	97	< 0.48		< 0.48	1,100	2.9		3
10/28/2022	90	< 0.48		10	940	< 0.75		104
11/1/2022	63	< 0.48	<2.2	34	640	10	11	355
11/10/2022	120	< 0.48		66	1,500	2.2		823
11/14/2022	99	1.7		35	1,600	70		586
11/21/2022	120	1.2		13	1,900	39		228
12/2/2022	100	1.1	0.79	15	1,700	24	22	267
12/5/2022	100	1.8		2	1,600	68		68
12/12/2022	86	< 0.48		43	1,300	2.3		649
12/22/2022	82	< 0.48		6	1,700	2.6		132
12/27/2022	81	1.2		10	1,300	58		201
Surface Water Criteria = 8 ppt					Surface Water Criteria = 95 ppt			

⁽²⁾ Estimated Surface Water Concentration = [(V_{untreated} * Influent Concentration) + (V_{treated} * Effluent Concentration)] / V_{stream}

BOLD = Surface water concentration greater than surface water criteria

ppt = parts per trillion or nanograms per liter

Figure A.1

Ditch B Downstream Surface Water Concentrations: PFOA

(Compare to Figure 6 in Progress Report #7)

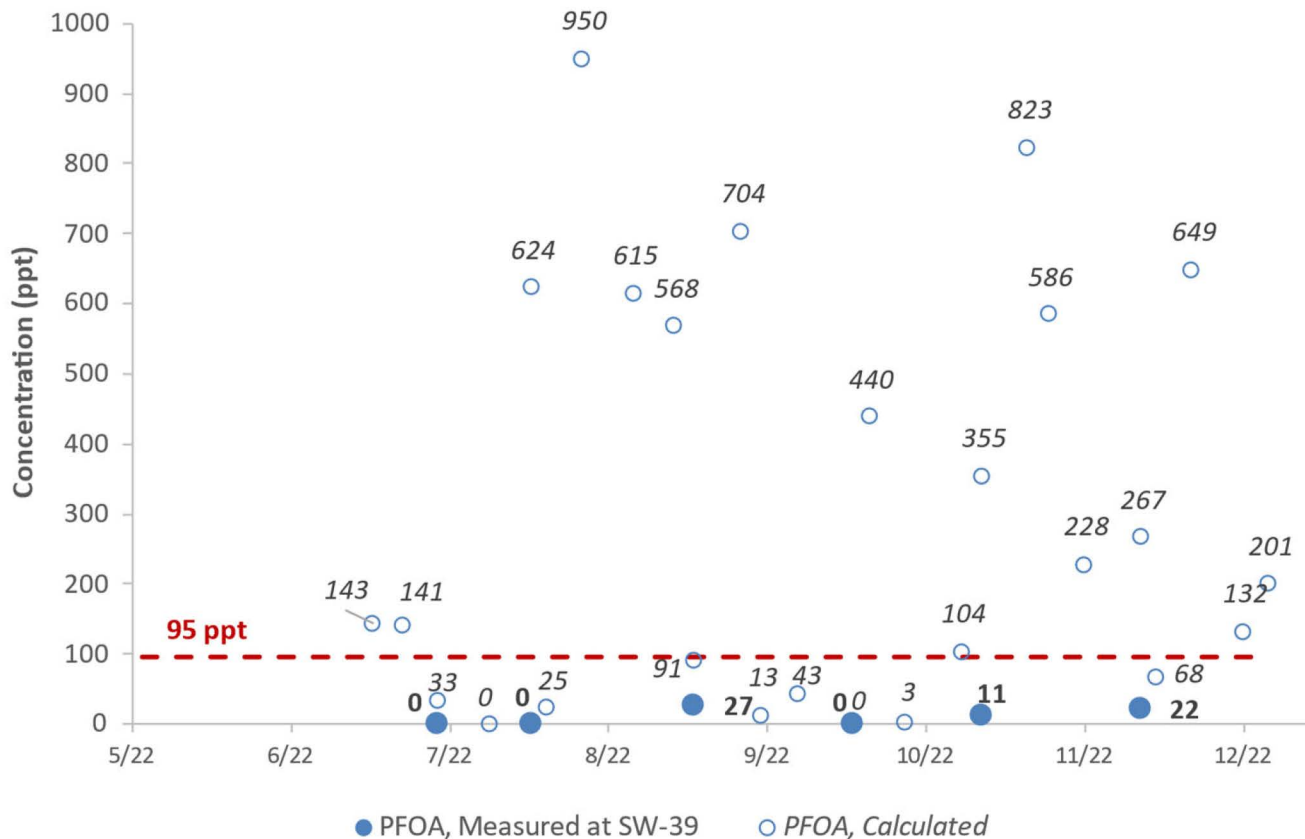


Figure A.2

Ditch B Downstream Surface Water Concentrations: PFOS

(Compare to Figure 6 in Progress Report #7)

