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February 23, 2021

MR. JEFFREY DANKO
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5757 N. GREEN BAY AVENUE
MILWAUKEE, WI 53209

MR. SCOTT WAHL
TYCO FIRE PRODUCTS LP
1 STANTON STREET
MARINETTE, WI 54143

SUBJECT: Response to Aerial Deposition Evaluation Report
JCI/Tyco FTC PFAS, 2700 Industrial Parkway South, Marinette, WI
DNR BRRTS Activity #: 02-38-580694

Dear Mr. Danko and Mr. Wahl:

On October 12, 2020 the Wisconsin Department of Natural Resources (DNR) received the *Aerial Deposition Evaluation Report* ("Report") for the above-referenced site (the "Site"), dated June 8, 2020, and submitted by Arcadis U.S., Inc. (Arcadis), on behalf of Johnson Controls, Inc. and Tyco Fire Products LP (JCI/Tyco). The Report was accompanied by the appropriate fee of $700, required under Wis. Admin. Code § NR 749.04(1), for formal DNR review and response. On November 6, 2020 JCI/Tyco submitted additional soil sampling results to the DNR. These data were incorporated into DNR's review and response.

Background

On January 17, 2018, Johnson Controls, Inc. on behalf of Tyco Fire Products, LP (JCI/Tyco) reported a discharge of per- and polyfluoroalkyl substances (PFAS) to the environment. The discharge occurred as the result of fire suppressant training, testing, research, and development of PFAS-containing aqueous film forming foams (AFFF) at the JCI/Tyco Ansul Fire Technology Center (FTC), located at 2700 Industrial Parkway in Marinette, Wisconsin.

In accordance with Wis. Admin. Code § NR 716.11(4), JCI/Tyco is required to evaluate all potential pathways for migration of contamination during the site investigation. Airborne migration of PFAS is a potential pathway from the FTC site because of the historical and on-going activities at the Site. These activities include, but are not limited to: fire testing, training and demonstrations of AFFF at the Outdoor Testing Area (OTA) from the early 1960s through 2017; AFFF performance testing at the outdoor Hydraulics Lab from 1985 to 2017; fire testing of AFFF in fire test houses from circa 1970 to present; and small-scale fire testing of AFFF in the Engineering Laboratory building since the 1960s. Airborne migration is and/or was possible due to discharges of PFAS at the outdoor and indoor testing locations. This includes possible migration via smoke exiting the fire test houses through openings in the roof, test fires in the Engineering Lab (air handling and location of the ventilated hood exhaust points not provided), test fires burned at the OTA, and migration of deployed foam as floating masses or blocks.

On February 19, 2020, the DNR directed JCI/Tyco to submit an air pathway site investigation work plan by April 20, 2020. The work plan was to include the Wis. Admin. Code ch. NR 749 fee for DNR's review and response. The work plan was not received by this date, and on May 27, 2020 DNR issued JCI/Tyco a letter of non-

compliance on this and other issues. To date, JCI/Tyco has not submitted an air pathway site investigation work plan to the DNR.

JCI/Tyco's Aerial Deposition Evaluation Report

JCI/Tyco's Report was developed using observations from existing soil and groundwater data and an air dispersion model to estimate deposition distance of airborne AFFF particles from the OTA and Hydraulics Laboratory. The evaluation presented in the Report assumes that historical migration of airborne particles of AFFF was the only potential mechanism for transportation of PFAS through the air migration pathway from the Site. From this, JCI/Tyco concluded that the aerial migration pathway has not transported enough PFAS off the Site to cause PFOS and PFOA concentrations in groundwater above 20 parts per trillion (ppt) and that expansion of the site investigation for purposes of evaluating aerial deposition is not warranted.

On November 6, 2020, JCI/Tyco submitted a sample notification to DNR for 43 samples collected from the upper 2 feet of soil on the FTC property; 10 of which were near the perimeter of the property. JCI/Tyco's transmittal letter stated that the additional soil data demonstrate that PFAS compounds are not being transported by air beyond the FTC property.

DNR Review and Response

The DNR reviewed the Report and the November 2020 data notification and disagrees that the evaluation of the air migration pathway is complete.

The DNR directs JCI/Tyco to submit an air pathway site investigation work plan by April 26, 2021. The work plan must provide supporting information and/or scopes of work to address the data gaps discussed below (Wis. Admin. Code § NR 716.11). Supporting information could include site-specific data, documentation regarding historical and current operations and AFFF handling at the Site, peer-reviewed literature, and/or fundamental scientific principles. Items that cannot currently be addressed in this emerging area of study should be identified as an outstanding data gap. The absence of adequate supporting information does not allow a data gap to be closed out.

Data Gap 1: Insufficient evaluation of other potential aerial discharge mechanisms of PFAS

Transformation of PFAS in AFFF deployed during fires is recognized as an emerging area of research. Science informs that PFAS can absorb to aerosols or particulate matter and that volatile PFAS (e.g., fluorotelomer alcohols) are present in some AFFF. PFAS in AFFF that are volatilized due to the heat, adsorbed to water vapor, or adsorbed to particulate matter in smoke from the fire could become airborne. Once deployed, AFFF also has the potential to move in the air as floating masses or foam blocks (i.e., not just as foam particles). The framework and scope of work in the site investigation work plan must be based on all potential aerial discharge mechanisms from the FTC. The evaluation of potential aerial discharge mechanisms must address historical outdoor activities and past and present operations within structures at the FTC.

To rule out a potential aerial discharge mechanism in the work planning phase will require a robust technical argument paired with past and present details on site operations and AFFF formulations. Site operation details that would be beneficial include, but are not limited to the following:

- Records on the date, quantity, frequency, and duration of fire testing at the OTA and indoor buildings, and corresponding information on the wind speed and direction.

- Activities/processes in each of the buildings and structures where PFAS products are used, including locations of all potential exit points for airborne discharges and details of the operating parameters and air handling systems for each building.
- Any records of complaints about airborne foam or particulate matter on offsite properties (e.g., photos, documented discussion with neighbors, locations, frequency, dates).
- Volume and concentration of AFFF used during testing at both the OTA and Hydraulics Laboratory.

Data Gap 2: Insufficient evaluation of variability in PFAS fingerprint

Observed variations in PFAS composition in soil and water samples are not necessarily an indication of sources other than the FTC. Variability is expected from different AFFF formulations and from chemical and physical processes affecting the transport, transformation and degradation of PFAS in the environment. With respect to potential air migration, the processes controlling which PFAS become airborne will influence the fingerprint signature of PFAS deposited at a distance from the source and may result in fingerprints that differ from the source AFFF. The limited PFAS analyte list in earlier samples collected at the Site also makes it difficult to discriminate PFAS related to different possible AFFF products considering the likely extent of precursor oxidation. The fingerprint evaluation needs to consider all AFFF formulations[1] used at the Site since testing started in the 1960s, and how partitioning, transformation and degradation processes may influence the PFAS fingerprint over space and time. Use of a consistent analyte list that includes the 36 PFAS that JCI/Tyco is required to report will allow better evaluation of the relationship between sample results and sources from the FTC.

Data Gap 3: Insufficient soil sampling to evaluate potential airborne deposition of PFAS

Surficial soil sampling is an adequate approach to inform on potential impacts from aerial deposition, if the sampling program is designed to meet this objective. JCI/Tyco's current conclusions are based on results from soil samples collected on the FTC property for the primary purpose of delineating soil impacts near the foam discharge areas at OTA. JCI/Tyco has not presented soil data from locations outside the FTC property and has not addressed how historical excavations and grading of soil on the FTC property may have affected the distribution of PFAS in these soils. Because the air discharges from the FTC were intermittent and weather conditions are highly variable, potential PFAS impacts to soil from air deposition are expected be irregular (i.e., variable areas, concentrations, and fingerprints). To support claims made in the Report, surficial soil samples must be collected at locations on and off the FTC property where other PFAS migration pathways are incomplete and where deposition from airborne migration is most likely to have occurred. To the extent practicable, the locations should include undisturbed areas where development or erosion has not altered the depositional environment. The DNR is available to discuss ideas for sample locations that meet these criteria.

Data Gap 4: Insufficient groundwater data to support conclusions in Report

Groundwater data from upgradient and/or locations not connected via surface water can be used to support conclusions about potential aerial deposition contributions to groundwater impacts. JCI/Tyco's current conclusions are based on a small number of samples collected from temporary points with a limited PFAS analyte list. Definitive conclusions regarding impacts to groundwater from aerial deposition cannot be made with the small upgradient data set and limited analyte list. In addition, the conclusions drawn from this data are flawed;

[1] This includes foams manufactured/disturbed by JCI/Tyco and its affiliate companies (e.g., Ansul) and foams manufactured/disturbed by non-affiliated companies that were used/tested at the FTC.

PFAS were detected in groundwater hydraulically upgradient from the Site (e.g., PFOA was detected at 15 ppt in groundwater collected from VAP-22). In the absence of groundwater or surface water connectivity, additional information/data is required to rule out aerial deposition as a potential migration pathway to this location. To support claims in the Report, JCI/Tyco must collect groundwater samples from NR 141 compliant monitoring wells installed hydraulically upgradient from the Site and analyze the samples for the 36 PFAS JCI/Tyco is required to report. The DNR is available to discuss ideas for sample locations that meet these criteria.

Data Gap 5: Insufficient information provided to evaluate/confirm air modeling in Report

Air modeling is a reasonable approach to predict air deposition patterns from a source. Evaluation of results and conclusions from JCI/Tyco's current air deposition model will require that additional information be provided on mode option; input parameters for the model (e.g., particle inputs; volume source parameters; and locations, extent, and spacing of receptors); and how the Site operations were used in the model. To determine the extent of PFAS deposition, the analysis should consider the worst-case operating schedule and all potential air discharges (aerosols, particulates in smoke, foam blocks, etc.). In addition, the evaluation should include an annual wind rose for a 5-year period, since outdoor testing at the Hydraulics Laboratory and indoor testing occurred year-round.

Conclusion

Further evaluation of the potential air transport of PFAS from the Site is needed to close data gaps and define the degree and extent of contamination, as required under Wis. Stat. § 292.11(3) and Wis. Admin. Code chs. NR 700-799. Within **60 days of the date of this letter** and pursuant to Wis. Admin. Code ch. NR 716, JCI/Tyco **is directed to submit an air pathway site investigation work plan that addresses the data gaps identified in this letter.** The work plan can be a standalone document or incorporated into a broader site investigation work plan JCI/Tyco submits for the Site.

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.

The DNR appreciates your efforts to investigate and remediate this Site. 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

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