UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

September 30, 2020

Jeffrey Danko
EHS Manager – Environmental Remediation
Johnson Controls
5757 N. Green Bay Ave
Milwaukee, WI 53209

RE: EPA and WDNR Review of Arsenic Migration Pathway Evaluation Report
Tyco Fire Products LP Facility, Marinette, WI, WID 006 125 215
EPA RCRA Administrative Order Docket No. RCRA-05-2009-0007

Dear Mr. Danko:

The EPA and WDNR have reviewed Tyco's Arsenic Migration Pathways Evaluation Report (Report) dated March 2020. The Agencies also approved with conditions the Arsenic Migration Pathway Evaluation Work Plan on July 17, 2019. Review of the Report looked to the Workplan and prior metrics to assess the data and the analysis and conclusions reached from that data.

General Comments:

1. **Summary**: The purpose of the 2019 Work Plan was to identify the potential migration mechanisms which resulted in arsenic concentrations in sediments above the 20 milligram per kilogram (mg/kg) remedial goal identified during the 2018 sampling activities. The June 2019 Work Plan included pore water sampling to assess potential sources and mechanisms for arsenic contamination in sediments.

   Conclusions: Review of the Migration Report indicates that not all proposed activities could be completed, especially as they related to the sediment sampling in the Menominee River. Nevertheless, the Migration Report concludes that "the data collected in 2019 are sufficient for evaluating the arsenic migration pathways, and no further data collection or activities are necessary at this time." **EPA believes this is not an appropriate conclusion and recommends additional sediment sampling be conducted in 2021 to verify the modeling results presented in the Migration Report**. **A revised work plan should be submitted to address the issues detailed in the 2019 Report. This work plan should evaluate the failures of the 2019 sampling event and document how sampling objectives will be achieved with proposed changes to scheduling, procedures and equipment.**

2. **Summary:** The Migration Report concludes that the data collected during the 2019 sampling effort demonstrated that upwelling of groundwater from bedrock through the glacial till is not a primary arsenic migration pathway. The Migration Report suggests that diffusion of arsenic from glacial till to overlying sediment is the primary migration pathway for arsenic since dredging the site.

   The major processes for the presence of arsenic and its movement that were evaluated in the Migration Report consisted of the following:

   - dredge residuals in overlying sediment
   - diffusive flux from high to low concentrations
   - vertical and horizontal advective groundwater transport
   - sedimentation

   Although not all tasks described in the approved Work Plan were conducted, historical data was used along with modeling results to evaluate each of these migration processes. Specifically, field work in 2019 was stopped prior to Work Plan completion for health and safety concerns. In addition, the collection of samples from the dense and thick glacial till layer proved challenging. There are potential data gaps in the conceptual model of arsenic migration pathways in the Menominee River.

   The Work Plan activities that could not be carried out during the 2019 field activities included collection of pore water concentration data from all but one of the planned borings in the glacial till layer; glacial till pore water was only collected from location VP-102. Glacial till pore water was estimated at other locations based on a mathematical relationship using pore water and sediment data from the samples collected at VP-102 in 2019 and historical samples collected from 2010 through 2014.

   Due to the high density of the glacial till, collection of data on hydraulic conductivity was also challenging. As a result, data from 2007 was used along with the limited data from 2019 to calculate hydraulic conductivity. The hydraulic conductivity in glacial till is used to model vertical hydraulic gradients and groundwater transport through the glacial till layer. The modeling found insufficient vertical advectivity to account for movement of arsenic vertically through the glacial till pore water. When coupled with the verification of the CapSim modeling results with 2019 data presented in Section 6.3 of the Migration Report, the lack of 2019 data on hydraulic conductivity in the glacial till throughout the site does not appear to present a major data gap.

   Overall, the analyses presented in the Migration Report support the conclusion that the dominant process affecting glacial till historically and presently appears to be concentration gradient-driven diffusion (in the downward direction pre-dredging, and in the upward direction post-dredging.

Conclusions:

- The Work Plan activities were conducted as a result of elevated arsenic concentrations identified during 2018 sampling. However, the 2019 sampling results identified a couple of areas where the **detected arsenic concentrations were higher than the 2018 results**. Specifically, VP-103 (11 mg/kg) and VP-106 (350 mg/kg) were higher than the co-located 2018 samples SD-12 (3.2 mg/kg) and SD-18 (210 mg/kg), respectively.

- Surface Weighted Average Concentrations (SWAC) for arsenic were calculated by combining both 2018 and 2019 data. **It is unclear whether this approach is appropriate and whether SWACs should be calculated based on the individual sampling events. It is also unclear the rationale for and impact on the results by using this approach.** Given the differences in arsenic measured in co-located samples from 2018 and 2019 the time trends may not be supportable. A reasonable explanation for the variability is that the sediment is heterogeneous with respect to arsenic concentrations with considerable variability over short distances. The 2019 work plan had a 10-foot radius allowance for sampling in the vicinity of the intended sampling coordinates. This is not an unusual allowance for sampling and measurements in deep water conditions however the allowance does introduce uncertainty in the comparability of samples gathered over time. It is recommended that the 2021 work plan evaluate the change in arsenic by collecting and analyzing samples from 10 feet apart at multiple locations to assess macro scale spatial variability.

- Because not all field activities could be completed, **pore water arsenic concentrations and hydraulic conductivity had to be estimated** by supplementing with historical data. In addition, the data validation report (Appendix A Data Quality Evaluation) noted that the laboratory saw considerable heterogeneity in samples submitted for lab analyses that resulted in data flags for many arsenic and TOC results. The heterogeneity of samples prepared for the lab would appear to be a non-compliance issue with the approved work plan and would suggest improper sample field preparation. The 2021 work plan should offer procedures to ensure that the lab receives samples properly prepared.

- The conceptual site models presented in Figures 2-1 and 6-1 are valuable for presenting environmental features and COC migration pathways. However, both figures assume the till beneath the site is homogeneous and without fractures, coarse lenses, or other preferential pathways. This assumption is a critical premise of the report's conclusions, but work to date has not proven this assumption is valid.

It is noted that additional sampling is planned for 2023 to collect data on the sediment arsenic concentrations and that this data will be used to verify whether concentrations continue to meet the CapSim predictions. However, **the inability to collect the planned porewater and sediment data during 2019 resulted in major uncertainties in the pore**

water arsenic concentrations and hydraulic conductivity values that were used as input to the CapSim modeling.

In particular, the hydraulic conductivity developed from the 2019 data differed substantially from historical values. **Again, in order to reduce these uncertainties, we recommend that the 2023 sampling event be performed in 2021 as well as in 2023.** The 2021 sampling event will provide data on sediment concentrations of arsenic that can be compared with 2019 data and with CapSim modeling output to help ensure that the model, as it is configured with uncertain input values, is not underpredicting future sediment concentrations of arsenic. This approach would result in sediment arsenic data collected in two-year intervals instead of a four-year interval. Furthermore, consideration should be given to calculating SWAC results for the individual sampling event.

Should the CapSim model verification efforts using 2021 and 2023 data continue to show sufficient predictability, the exercises should help reduce the uncertainties in using the limited glacial till pore water arsenic concentration data and hydraulic conductivity values that were estimated in the Migration Report. Verification of the CapSim predictions with 2021 and 2023 data will also help determine whether the inability to collect the full pore water data and hydraulic conductivity data from the glacial till layer during the 2019 sampling effort resulted in major data gaps.

EPA and WDNR expect a response to these comments in 60 days from the date of this letter. Thank you in advance for your compliance. Please contact me at 312-886-1451 or black.christopher@epa.gov should you have any questions.

Sincerely,

9/30/2020

X Christopher Black

Christopher Black
Environmental Scientist
Signed by: CHRISTOPHER BLACK

Ecc: Angela Carey, WDNR
Richard Clarizio, EPA-ORC