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WISCONSIN
DEPT. OF NATURAL RESOURCES

July 14, 2017

Mr. Michael Slenska
Beazer East, Inc.
c/o Three Rivers Management, Inc.
One Oxford Center, Suite 3000
Pittsburgh, PA 15219

Mr. Michael Kellogg
Connell Aluminum Properties, LLC
One International Place
Boston, MA 02110

Subject: Supplemental Information for Review of Remedial Action Options Report

Former Koppers Tar Plant and Wabash Alloys Site
9100 S. 5th Avenue, Oak Creek, WI
BRRTS # 02-41-553761, FID # 241379050
Connell VPLE BRRTS # 06-41-560058
Beazer VPLE BRRTS # 06-41-561509

City of Oak Creek Utility Corridor, Lot 1
9170 S. 5th Avenue, Oak Creek, WI
BRRTS # 02-41-561425, FID # 341074470
Beazer VPLE BRRTS # 06-41-561426

Dear Mr. Slenska and Mr. Kellogg:

On March 30, 2017, the Wisconsin Department of Natural Resources (DNR) received a letter submitted by Tetra Tech, Inc. on behalf of Beazer East, Inc. (Beazer), with comments to the DNR's review of the "Remedial Action Options Report" (RAOR), dated December 30, 2014. In Tetra Tech's recent letter, a meeting was proposed with the DNR to discuss adjustments to the remediation approach outlined in the RAOR. While a meeting with the DNR and Beazer is in the process of being scheduled, the DNR has reviewed the RAOR in greater technical detail and provides the following supplemental information regarding the inadequacies of the proposed remedial actions presented in the RAOR and shortcomings regarding aspects of the site investigation.

Vapor Intrusion in Future Construction

Vapor intrusion (VI) risk to future building structures presents a likely exposure concern due to the presence of potent, dense non-aqueous phase liquid (DNAPL) source material (i.e., coal tar contained mostly in clay soil fractures) and its associated shallow groundwater contamination. While the RAOR indicates residential construction would be prohibited through site-wide institutional controls, commercial construction would likely also be impacted adversely. Existing evidence confirms that the DNAPL tar is more mobile than previously represented and appears to periodically migrate upward. The groundwater contamination, which can be as shallow as 0-1 foot below ground surface (bgs) across the extensive area of the source material (5-6 acres), contains elevated contaminant levels likely indicative for vapor intrusion (specifically benzene and naphthalene

at and in excess of 1,000 ug/L). Data from several groundwater sampling points confirm little reduction in contaminant concentrations has occurred since the contaminant release over more than 80 years ago. Mobile DNAPL tar and highly contaminated groundwater have potential to migrate toward building sub-structures and/or vapor intrusion mitigation systems and could permeate building materials or system components rendering them contaminated and/or unusable.

The suggested remedies in the RAOR are either inappropriate (cover only) or inadequate (limited excavation). Regarding covers, upwardly migrating DNAPL appears to be related to the existing fill, foundations, and covers. Consequently, new construction, fill, and covers could exacerbate or redirect mobile DNAPL to new seep locations or to building sub-structures. The impermeable membranes suggested in the RAOR would be either inconsequential in regards to infiltration (limited coverage and shallow groundwater) or would become permeated themselves with upwardly migrating DNAPL tar. Limited excavations removing the surficial 4 feet of material, would not address significant remaining source material that continues to be very potent. This limited shallow excavation would likely allow significant shallow groundwater contaminants to remain at elevated levels that would be problematic for vapor intrusion. Deeper excavation in areas where DNAPL tar is present to remove most of the source material will be necessary to reduce vapor intrusion risk to future building structures. Excavations to approximately 10-20 feet bgs are practical. To reduce disposal costs, on-site treatment technologies could be employed. NR 726.05(8) requires remediation to the extent practical to reduce the mass of volatile compounds associated with vapor intrusion sources; mitigation alone is not considered a remedial action.

Mobility of DNAPL Tar

Site evidence indicates the DNAPL tar is more mobile than previously reported. Mobile DNAPL is demonstrated by surface seeps and accumulations in wells, storm water catch basins, and utility corridors. While migration rates are acknowledged to be slow as measured in wells, the widespread presence of the DNAPL identified near building sub-structures and utility corridors (and their associated preferential pathways) confirm that even slow rates are problematic. Since the Wabash facility fill is not likely a source of the DNAPL tar, the seep along the southeast parking lot area seems to reflect upwardly migrating DNAPL. This is counterintuitive since the dense nature of these fluids tends to cause them to sink – in this case to the bottom of the clay fractures – and vertical hydraulic gradients at the site are strongly downward.

The DNAPL migration mechanism is important to understand to effectively evaluate remedial strategies, especially covers that may cause or redirect the upward flow. It appears the surface seepage is episodic, documented during discharges in 2006, and also more recently during 2014/15. Periodic upwardly mobile DNAPL does not appear to be limited to only the southeast parking lot seep area. The presence of DNAPL source material in the Wabash facility fill suggests upwardly mobile DNAPL over a majority of the DNAPL source accumulations across the western portion of the site. For the southeast parking lot seeps, the hydraulic mechanism for upward DNAPL migration appears to be temporary variations in the horizontal component of shallow groundwater flow. It varies because of differential infiltration caused by the existing Wabash facility foundation and covers. As such, the horizontal flow variability may cause subtle changes in the compressive stress acting on the vertical DNAPL tar-filled fractures (i.e., squeezing the DNAPL upward). Additional evaluation beyond the single water table flow map provided in the January 2014 Site Investigation Report (Figure 10) is required showing the horizontal flow variability that is present. Along the eastern portion of the site (wetland areas), mobile DNAPL has been reflected in tar seepage to the former catch basins/conduits and along the nearby ravine slope, and in well accumulations. DNAPL in borings downgradient of the clay cut-off wall (i.e., B-110, B-113, and B-114) suggest DNAPL has potentially migrated around the wall. A significant hydraulic head differential exists across the clay wall, which seems a likely force for lateral DNAPL migration. The remedy suggested for the wetland areas is excavation to 4 feet bgs; excavation to 10-12 feet in these areas would remove most, and in some instances, all of the source material.

The continued characterization that the DNAPL is only *potentially* mobile is misleading and inaccurate given the ongoing nature of the surface seep discharges. There are indications of upward DNAPL migration in the accumulations across the western portion of the site and the appearance that differential infiltration caused by existing foundations and covers is driving episodic upward tar migration. The DNAPL and the mechanics controlling migration must be adequately assessed and addressed to avoid problems for future buildings and covers (i.e., vapor intrusion risk). The subtle compressive mechanism suggested above implies the DNAPL saturation in the fractures is far higher than previously reported. The DNAPL saturations in the clay fractures may be at levels similar to those present when the DNAPL was released 80-100 years ago. The clay soil fractures limit lateral migration and the overlying clay fill tends to confine thereby limiting the ability of the DNAPL to dissipate saturations over time (as it would in a more permeable soil) and significantly limits natural source zone depletion mechanisms.

Potency of DNAPL Tar

The contaminant concentrations in the DNAPL source material are still potent. With the exception of the utility corridors, it is acknowledged that groundwater contaminants have only migrated a short distance from the DNAPL sources in more than 80 years. However, contaminant levels remain high over the extensive area where source materials are found; some remain near or in excess of saturation values. Sampling data shows that water level variations influence contaminant concentrations in some wells, and trend analyses have not fully considered these effects. In many cases, water level measurements were not contemporaneous with the analytical sampling. Although NR 726.05 (6) (b) allows natural attenuation for reducing contaminants, elevated, persistent groundwater contamination levels present after a contaminant release that occurred over 80 years ago is contrary to the reasonable period of time requirement specified in NR 726.05 (6)(b), especially considering the vapor intrusion potential discussed above.

Incomplete Site Investigation

Several aspects of the site investigation are not complete. Within the utility corridor, the downgradient extent of groundwater contamination has not been defined. Presently, the most downgradient well is MW-134, and it is coincident with a significant hydraulic sink. It appears either the wells closer to Lake Michigan did not sample the lower portion of the utility corridor (i.e., larger diameter storm sewer), which appears to control groundwater flow in the corridor, or the trench itself intersects permeable native soils in the area of the sink. Consequently, the efficacy of the suggested clay plug remedy (i.e., placement downgradient of impacted groundwater) is premature. Additional characterization to fully assess the hydrogeologic conditions and migration pathways is required as indicated in NR 716.11(5).

In addition, some DNAPL source areas require further definition. The shallow borings at B-32, B-35, and B–36 were not completed deep enough to determine whether the nearby DNAPL accumulations are separate or contiguous. Also, some borings within the DNAPL accumulations were not completed to a depth adequate to determine the vertical extent. These include B-81, MW-122, and SB-713 near the former Tar Barrel Platform, B74 and B05 (poorly documented) near the former naphthalene ASTs, B92 near the former Pitch Bay, and the separate DNAPL accumulation defined by SB-724.

Due to these shortcomings and the apparent mischaracterization of DNAPL mobility in a potential migration pathway that has not been adequately evaluated, the DNR is rescinding its former approval of the site investigation. Completion of the site investigation within the utility corridor is anticipated to require assessment of groundwater flow trends and will likely take more time than other assessment work required, in particular completion of the additional soil borings needed to fully define the DNAPL accumulations. Consequently, the

timeframe for completing the additional soil borings and assessing the DNAPL results should be prioritized and reported in advance of the full assessment of the utility corridor. Furthermore, all future groundwater analytical sampling, including any sampling conducted after completion of the site investigation, require contemporaneous water level measurements and analyses of trends that account for water level variation influences, per NR 716.13 (15).

Additional Comments

Following completion of the site investigation, the RAOR must be revised to present a more comprehensive understanding of the DNAPL tar migration and its persistent contaminant potency, especially in the context of vapor intrusion risk for future development. Using covers to address the DNAPL source material is not feasible, since the existing fill, foundations, and covers appear to cause periodic upward DNAPL tar migration. Partial excavation remedies should be expanded to remove most/all of the DNAPL source material, since it is not depleting or naturally attenuating on its own.

The DNR proposes to discuss the above comments during a future meeting to be scheduled. If you have any questions regarding this site or this letter, please contact the DNR Project Manager, Eric Amadi, at 414.263.8639 or eric.amadi@wisconsin.gov.

Sincerely,

Eric Amadi

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Hydrogeologist
Remediation & Redevelopment Program
SER-Milwaukee Service Center

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