MEMO

ARCADIS Design & Consultancy for natural and built assets

To:
Alina Satkoski
Madison-Kipp Corporation

Copies:
David Crass
Michael Best & Friedrich LLP

Arcadis U.S., Inc.
126 North Jefferson Street
Suite 400
Milwaukee
Wisconsin 53202
Tel 414 276 7742
Fax 414 276 7603

From:
Christopher Kubacki, Jennine Trask

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Subject:
Polychlorinated Biphenyls (PCBs) in Groundwater

The following summary related to PCBs in groundwater was prepared for the Madison-Kipp Corporation (MKC) facility located at 201 Waubesa Street, Madison, Wisconsin (site). Environmental investigation and remediation activities have been ongoing at the site since 1994. Activities have included the investigation and remediation of on-site and off-site soil, groundwater, and vapor.

BACKGROUND

This memo focuses on the investigation of PCBs in groundwater and provides a summary of the groundwater evaluation performed to date. As summarized in the *Technical Justification – Polychlorinated Biphenyl (PCB)-Impacted Soils Beneath the Main Manufacturing Building* (Technical Justification) report dated October 22, 2014 and submitted to the Wisconsin Department of Natural Resources (WDNR) and the United States Environmental Protection Agency (U.S. EPA), PCBs in soil beneath the building do not pose any current risks to receptors via a groundwater migration pathway or direct contact. Further, soil beneath the building that would remain in place as part of a site-wide remedial action will not pose future risks to receptors via a groundwater migration pathway or direct contact (cap in place). As such, the Technical Justification report concluded that an engineering control remedy is appropriate for PCBs in soils beneath the building. Therefore, the iterative approach outlined below to both confirm the engineering control remedy is sufficient and confirm that the groundwater pathway has no risk to human health and the environment is technically justified.

The current draft *Stipulation and Order for Judgment* (Stipulation) between MKC and the State of Wisconsin contains language regarding certain triggers that would cause MKC to remove PCB-impacted soils from beneath the manufacturing facility. The draft Stipulation states that "Excavation is selected as

the remedial action under Wis. Admin. Code NR 722 after all of the following events have occurred, in this order:

- Madison-Kipp Corporation has taken annual samples from MW-22S and MW-23S and there has been a finding that PCBs have dissolved into and impacted the groundwater by the detection of two successive rounds of reliable groundwater sampling (conducted pursuant to the WDNR approved monitoring plan) that confirms impacts above enforcement standards in filtered groundwater samples collected from MW-22S and MW-23S.
- Quarterly sampling of MW-22D, MW-23D, MW-24 and MW-28 indicate three successive rounds of reliable groundwater sampling that confirms impacts above enforcement standards in filtered groundwater samples.
- Madison-Kipp prepares and submits to the Department a remedial action options analysis that evaluates excavation under the Facility as one alternative.
- Excavation is selected as the remedy to address PCB-impacted groundwater."

This memo analyzes the current draft Stipulation language as it relates to the PCB data collected at the site, the mobility of PCBs, and the planned approach to confirm the risk of PCBs potentially migrating to groundwater.

PCBs have been detected at concentrations above risk-based screening levels in soil samples collected beneath the MKC manufacturing building. The highest concentrations of PCBs were detected in soil samples collected directly beneath the building's concrete-lined center aisle, which historically contained a central piping trench running south to north through the center of the facility. The center aisle was reportedly constructed to house piping for natural gas, vacuum, hydraulic oil, and cooling water for die-casting. These sub-surface PCB concentrations, which are isolated from precipitation infiltration due to the building's roof and floor slab, are believed to have been vertically transported historically as a result of the presence of hydraulic oils in the trench which produced a downward force allowing migration. However, this condition was addressed when, some time prior to 1990, liquid wastes were collected and removed from the base of the trench, and the trench was backfilled with clean sand and capped with concrete, abandoning the trench and former piping in place. Since the 1990s, this removed the vertical hydraulic force and, therefore, the sub-surface PCBs were no longer subject to vertical downward transport through the vadose zone. Additionally, complete trench removal was completed via excavation in 2014. Specifically, 54 tons of concrete and 279 tons of mixed concrete, soil, and subsurface piping were excavated in and beneath the center aisle. Following removal of the trench, the area was backfilled with clean fill and finished with concrete.

A site-wide groundwater monitoring event was conducted in January 2013 and consisted of sampling on-site and off-site monitoring wells for laboratory analysis of volatile organic compounds by U.S. EPA Method 8260B and PCBs by U.S. EPA Method 8082. No PCBs were detected in on-site or off-site wells with the exception of three monitoring wells within the MKC facility building (MW-22S, MW-22D, and MW-23D). This sampling indicated that PCBs are not wide-spread at the site and additional monitoring was necessary to confirm the presence of PCBs in groundwater beneath the building.

Due to the results of the January 2013 monitoring event, monitoring wells located within the MKC facility building (MW-22S, MW-22D, MW-23S, MW-23D, and MW-28 [installed in 2015]) have been analyzed for total and/or dissolved PCBs during subsequent monitoring events. Monitoring the dissolved phase is representative of groundwater conditions as these samples are filtered to remove potential sediments present in the groundwater column, which can bias the groundwater results high (or appear to indicate

PCBs are dissolved in groundwater when the results really only indicate suspended solids remain in the sample). The results of the monitoring events have shown these interior building monitoring wells have been non-detect for dissolved phase PCBs with the exception of three detections at MW-22S (ranging from 0.28 to 1.9 micrograms per liter) and one detection at MW-22D (4.8 micrograms per liter) over the course of eight to ten monitoring events.

Arcadis conducted a fate and transport evaluation in 2014 to assess both current risks associated with the presence of PCBs in soil beneath the building, and potential future risks that may be associated with a remedial action that involves leaving these PCB-containing soils in place and restricting direct contact (i.e. cap-in-place as a final remedy). The primary exposure route considered in the evaluation was potential transport of PCBs via groundwater migration. The results of the evaluation were presented in the Technical Justification dated October 22, 2014 and submitted to the WDNR and U.S. EPA.

As presented in the Technical Justification, results of the evaluation demonstrated that PCBs detected in soil samples beneath the building, though elevated in some locations and residing potentially near the water table, are strongly adsorbed to naturally-occurring organic matter in the soils and are immobile in groundwater, and there is no current or future risk of exposure via groundwater migration. Samples collected from monitoring wells outside of the building footprint confirm that PCBs have not migrated beyond the footprint of the building over the last 3 to 4 decades.

The building's roof and slab function as engineering controls in that they prevent both direct contact as well as water infiltration through the vadose zone. However, in the unlikely event that PCBs reach the water table or that the water table rises up within the PCB-containing soil zone, it is theoretically possible for PCBs to be transported horizontally at or below the water table along with the regional hydraulic gradient. To address this theoretical risk, the Technical Justification provided an analysis of the PCB migration rate and it was determined that it would require approximately 170 years for PCBs to migrate one foot in groundwater, assuming the PCBs are not only present in groundwater but are present in groundwater at consistent amounts. The negligible horizontal PCB migration rate in groundwater at or below the water table reflects the fact that PCBs are very highly sorptive in natural soils, and this adsorption mechanism functions as a significant resisting force to migration.

Based on these results, it can be concluded that PCBs in soils beneath the building do not pose any current risks to receptors via a groundwater migration pathway or direct contact (cap in place). Furthermore, it can be concluded that leaving the PCBs in place as part of a site-wide remedial action will not pose future risks to receptors via a groundwater migration pathway or direct contact. Therefore, an engineering control remedy is appropriate for PCBs in soils beneath the building. The recommendation in the Technical Justification included evaluating the appropriateness of the cap-in-place final remedy through continued performance groundwater monitoring and the iterative approach in the Stipulation does achieve that purpose.

APPROACH

As part of the draft Stipulation, the WDNR has included triggers that would require immediate response to address the PCBs beneath the MKC facility. As described above, a modified version of the Stipulation is being proposed by MKC to include a groundwater monitoring component. The intent of the monitoring program is to confirm the appropriateness of the trigger(s) to require immediate remedial action related to the PCBs beneath the MKC facility. In the draft Stipulation, MKC proposes to collect annual groundwater samples for dissolved PCB analysis by U.S. EPA Method 8082 from monitoring Wells MW-22S and MW-23S. Should there be detections of dissolved PCBs above the WDNR's enforcement standard in

groundwater at these two wells for two consecutive rounds, additional monitoring will be performed to evaluate potential PCB migration both vertically in the aquifer and horizontally downgradient. The additional monitoring would confirm the presence of PCBs in the groundwater, provide delineation of the impacts, and allow for evaluation of the groundwater migration pathway. The potential for PCB migration will be evaluated through increased (quarterly) sampling of monitoring Wells MW-22D, MW-23D, MW-24 and MW-28 for dissolved PCBs via U.S. EPA Method 8082. If three successive rounds of reliable groundwater sampling at these additional monitoring wells confirms impacts above enforcement standards in filtered groundwater samples, MKC will prepare and submit to the WDNR a remedial action options analysis that evaluates excavation under the facility as one remedial alternative. This approach is consistent with the Technical Justification report and confirms the appropriateness of a cap-in-place final remedy through continued performance groundwater monitoring by providing a programmatic plan to evaluate the potential for PCB impacts in groundwater and evaluate the groundwater migration pathway risk to human health and the environment.