TRC Environmental Corporation
708 Heartland Trail, Suite 3000
Madison, WI 53717

Main 608.826.3600
Fax 608.826.3941

Memorandum

To:	Michael Schmoller – WDNR Ken Zolnierczyk – USEPA
From:	Katherine Vater, P.E. – Project Manager John Rice, P.E., P.H. – Senior Hydrologist Thomas Stolzenburg, Ph.D. – Senior Environmental Chemist
Subject:	Proposed Management Plan – Polychlorinated Biphenyls (PCBs) in Groundwater PCBs Beneath Manufacturing Building Madison-Kipp Corporation, WDNR BRRTS #02-13-578014
Date:	February 14, 2017
CC:	Tony Koblinski – Madison-Kipp Corporation Mark Sheppard – Madison-Kipp Corporation David Crass – Michael Best & Friedrich LLP
Project No.:	269392.0000.0000

As requested by Madison Kipp Corporation (MKC), TRC has reviewed correspondence between MKC, the Wisconsin Department of Natural Resources (WDNR), and the U.S. Environmental Protection Agency (EPA) regarding the presence and possible migration of polychlorinated biphenyls (PCBs) in groundwater at the MKC manufacturing building located at 201 Waubesa Street, Madison, Wisconsin (the site, Figure 1). This site is referred to as WDNR Bureau of Remediation and Redevelopment Tracking System (BRRTS) #02-13-578014. In addition to review of correspondence, TRC participated in a conference call on December 1, 2016 with MKC, WDNR and EPA.

This memorandum summarizes TRC's review of the previous correspondence and a recommended management plan to monitor for PCBs in groundwater at the site and remove PCBs from select locations in the future, in conjunction with other future remediation.

Background

The intermittent analytical detections of dissolved PCBs in three monitoring wells (MW-22S, MW-22D, and MW-23D) beneath the MKC facility footprint are suspected to have been caused by the installation of the wells and not an indication of PCBs migrating in groundwater at the

site. Numerous references conclude that PCBs are not known to migrate readily to groundwater due to the tendency for PCBs to strongly adsorb to soil particles and to their low water solubility. PCBs do not migrate significantly ***to*** groundwater except under extreme conditions (ATSDR, 2000; USGS, 1985; WDHFS, 2001), and, for the same reasons, they do not significantly migrate if ***in*** groundwater (ATSDR, 2000; USGS, 1985; WDHFS, 2001). The groundwater data collected to date at the MKC site, suggest that there is neither widespread, nor migrating PCB contamination in groundwater. Further, if PCB migration were occurring, then it would be evident in samples previously collected in downgradient wells. It is not. For more information, refer to TRC's October 13, 2016 Memorandum and previously published sampling results.

It should be noted that MW-22S, MW-22D, and MW-23D are all within the radius of influence of Groundwater Extraction Well (GWE-1) at the site. In 2014 as part of the design of the Groundwater Extraction and Treatment System (GETS) for the site, Arcadis conducted a series of pump tests at GWE-1. These tests showed that at a pumping rate of 40 gallons per minute (gpm), the radius of influence extended past the southern boundary of the MKC building and possibly past Atwood Avenue. The GETS currently pumps 45 gpm on average from GWE-1. More information on the radius of influence can be found in the Arcadis basis of design report (2014).

Future Removal Action

With the sporadic detections of dissolved PCBs in MW-22S, MW-22D, and MW-23D likely the result of well construction methods, TRC recommends that these wells be removed during future remediation of the PCB-impacted soil beneath the operating facility. While the facility is active, these wells are not accessible for removal. In the future, MKC may propose to over-drill MW-22S, MW-22D, and MW-23 to remove the wells, as well as any material that may have been carried downward during well installation, or MKC may propose another method of stabilizing the suspected contamination, such as grouting the wells and screen materials in place. Any future remediation beneath the operating facility will be subject to WDNR approval, and the final plan for remediation of MW-22S, MW-22D, and MW-23D will be proposed at that time for WDNR's review and approval.

Since the active operation of MKC's facility prevents removal of the MW-22S, MW-22D, and MW-23D wells at this time, TRC proposes to continue to monitor these three wells and additional downgradient wells for PCBs as described below.

Proposed Groundwater Monitoring Plan

In order to monitor the potential presence of and migration of PCBs in groundwater at the site, TRC proposes the following groundwater monitoring plan. This plan would be in effect as described below until the future removal action (described above) can take place or until otherwise agreed upon with the WDNR. The plan has been developed based on prior

correspondence from the agencies and industry standards for establishing a groundwater monitoring program.

Objective

The WDNR and EPA have requested MKC monitor for the potential migration of PCBs ***to and in*** groundwater at the site. Although there have been detections of PCBs intermittently at three monitoring wells, there is no evidence that PCBs are migrating in groundwater at the site. This proposed groundwater monitoring plan will continue to monitor the three wells with intermittent detections and will determine if there is evidence of migration of PCBs in the groundwater at the site by sampling downgradient wells.

As mentioned in the October 13, 2016 memorandum, several wells were installed through fill/soils containing PCBs, some of which could have been dragged down the borehole during drilling and/or well installation activities. As PCBs are relatively insoluble and are associated with particulate matter, these wells have, and could continue to experience intermittent and on-going low-level detections of PCBs in groundwater, due to the presence of residual impacted solids in the bottom of the well casing or even in the borehole/filterpack around the screened zone. MW-22S, MW-22D, and MW-23D show these intermittent, low-level detections of PCBs consistent with drag-down of impacted soil. As such, the detections at MW-22S, MW-22D, and MW-23D would not represent PCBs migrating ***in*** groundwater. To establish whether or not migration in the aquifer is occurring, either from these three wells or from other PCB-impacted soils/fill at the site, monitoring wells downgradient of the three wells will also be monitored.

Sample Collection Method

Groundwater samples analyzed for PCBs to date have been collected using low-flow sampling techniques and have been sent for laboratory analysis using EPA SW-846 Method 8082. TRC recommends continuing to use this established procedure for the groundwater monitoring program.

Currently, turbidity, pumping rate, and drawdown data are being collected in the field, and samples to be analyzed for PCBs are being field filtered and sent for laboratory analysis. As the EPA has expressed concern about losses of dissolved PCBs by adsorption to the filter, TRC proposes that moving forward, samples collected for PCB analysis will be unfiltered. Total Suspended Solids (TSS) and Total Dissolved Solids (TDS) data will also be collected and used to help evaluate the in-situ conditions present during the time of sample collection, i.e., whether conditions at the time of sampling may be inadvertently causing re-suspension and collection of PCB-impacted residual solids in the screened zone, which may be biasing the PCB concentration.

TRC proposes to use Pace Analytical Laboratories in Minneapolis, MN because they use a dedicated instrument which can achieve consistently low Reporting Limits.

Sampling Frequency

The PCB detections in groundwater at this site do not represent a new source or rapidly-changing conditions, so an appropriate sampling frequency in the downgradient compliance wells is semi-annually. We suggest conducting semi-annual sampling for two years, followed by a review of the sampling program by WDNR and EPA to determine if the frequency of sampling can be reduced or discontinued.

Samples for PCBs will be collected concurrent to the other groundwater sampling activities in April and October at the site.

If in the period of the sampling program, there are modifications to the cap system at the site, including modification to the building or its basements, the groundwater monitoring program will be re-evaluated to reflect potential change to the soil-to-groundwater pathway.

If at any time there are detections of PCBs in groundwater at the downgradient wells, MKC will notify WDNR and will discuss an appropriate response. Continuing intermittent detections of PCBs in MW-22S, MW-22D, and MW-23D are anticipated, but detections of PCBs in the downgradient wells are not anticipated and would represent a changed condition.

Well Network

Groundwater from various site monitoring wells has been analyzed for PCBs since 2013. Wells MW-22S, MW-22D, and MW-23D are the only wells that have had intermittent detections of PCBs.

Well MW-22S is screened from 25- to 35-feet below ground surface (bgs) in the unconsolidated aquifer. Wells MW-22D and MW-23D are both screened from 45- to 50-feet bgs in the Lone Rock Formation, which is present at the site beginning approximately 35-feet bgs. There is known shallow PCB contaminated soil present in the area of MW-22S and MW-23S. With the objective of monitoring whether known or suspected PCB-impacted soil is causing PCBs to migrate in groundwater, the following well network is proposed for monitoring. The Well Locations Map for the Site is attached as Figure 2.

To monitor the unconsolidated aquifer at and downgradient of MW-22S and the shallow soil impacts, groundwater samples will be collected from MW-22S, MW-11S (screened 24- to 34-feet bgs), MW-23S (screened 25- to 35-feet bgs), and MW-28 (screened 28- to 38-feet

bgs). Groundwater samples from MW-11S have not been analyzed previously for PCBs. Groundwater samples from MW-23S were analyzed for total PCBs four times between 2013 and 2014 and no detections were reported (highest detection limit was 0.2 μg/L). Groundwater from MW-23S was also analyzed for dissolved PCBs six times between 2013 and 2015. No detections were reported (detection limit ranged from 0.063 to 0.19 μg/L). Groundwater samples from MW-28 were analyzed for dissolved PCBs three times in 2015 and no detections were reported (detection limit ranged from 0.062 to 0.20 μg/L).

To monitor the Lone Rock Formation at and downgradient of MW-22D and MW-23D, groundwater samples will be collected from MW-22D, MW-23D, MW-4S (screened from 35- to 50-feet bgs), MW-4D (screened from 65- to 70-feet bgs), MW-6S (screened from 31- to 41-feet bgs), and MW-24 (screened from 30- to 40-feet bgs). One groundwater sample from MW-4S was analyzed for total PCBs in 2013 and no detection was reported (detection limit was 0.17 μg/L). One groundwater sample from MW-4D was analyzed for total PCBs in 2013 and no detection was reported (detection limit was 0.17 μg/L). One groundwater sample from MW-6S was analyzed for total PCBs in 2013 and no detection was reported (detection limit was 0.17 μg/L). Groundwater samples from MW-24 have not been analyzed for PCBs.

Reporting

Going forward, the PCB sample collection and analysis results will be reported in the semi-annual Operations, Monitoring, and Maintenance Reports for the MKC Groundwater and Soil Vapor Extraction and Treatment Systems.

Summary of the PCB Groundwater Monitoring Plan

WELL NUMBER	SCREEN INTERVAL	FORMATION	SAMPLING AND REPORTING FREQUENCY
MW-22S	25-35 ft bgs	Unconsolidated	Semi-annual
MW-11S	24-34 ft bgs	Unconsolidated	Semi-annual
MW-23S	25-35 ft bgs	Unconsolidated	Semi-annual
MW-28	28-38 ft bgs	Unconsolidated	Semi-annual
MW-22D	45-50 ft bgs	Lone Rock	Semi-annual
MW-23D	45-50 ft bgs	Lone Rock	Semi-annual
MW-4S	35-50 ft bgs	Lone Rock	Semi-annual
MW-4D	65-70 ft bgs	Lone Rock	Semi-annual
MW-6S	31-41 ft bgs	Lone Rock	Semi-annual
MW-24	30-40 ft bgs	Lone Rock	Semi-annual

Discussion of Passive Sampling

Passive sampling has been suggested as a method for collecting groundwater samples for dissolved PCB analysis at the site. Methods for sampling and laboratory analysis of passive diffusion sampling devices (PDBs) have been established for water soluble analytes in groundwater; however, based on discussions with commercial laboratories and PDB experts, these methods have been developed exclusively for VOCs.

Passive sampling devices consisting of a solid sorbent have also been deployed for sampling pore water in sediments. The solid sorbent device is more suited to SVOCs, including PCBs. Although this application is a conceptual fit to address PCBs in groundwater, when TRC contacted commercial and specialty laboratories, EPA and private firm researchers (including the inventor of passive sampling) all of whom are actively working with this technology, none could identify (i) a laboratory that could provide a device containing the sorbent impregnated with PRC (performance reference compounds), (ii) a recommended deployment method, and (iii) the requisite analytical and data processing. Any attempt to perform passive sampling for PCBs at the site would first require well-by-well research of equilibration times.

More fundamentally, the idea of using passive sampling for PCBs at the site does not provide any additional information regarding the cause of the intermittent PCB detections in MW-22S, MW-22D, and MW-23D. For these reasons TRC does not recommend the use of passive sampling for PCB sampling/analysis at the site.

On the other hand, the combined approach of the future removal action at MW-22S, MW-22D, and MW-23D, along with low-flow downgradient groundwater monitoring until the future removal action occurs, addresses both removal of the PCBs and interim monitoring for migration until removal.

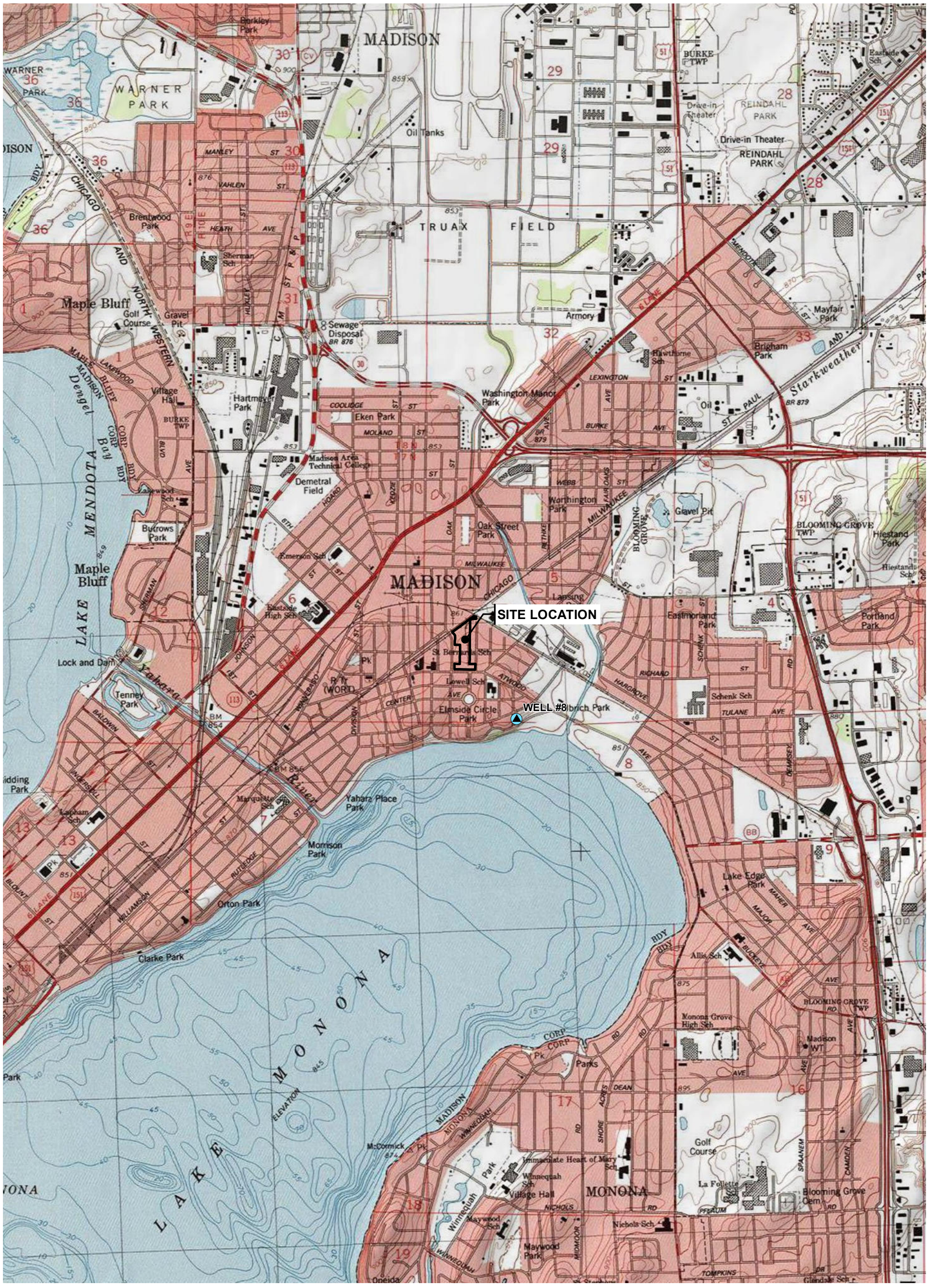
References

Arcadis. 2014. "Madison-Kipp Corporation – Basis of Design for Proposed Groundwater Extraction and Treatment System." Prepared for Madison-Kipp Corporation, Madison, Wisconsin. April.

ATSDR. 2000. "Toxicological Profile for Polychlorinated Biphenyls (PCBs)." November.
Perron, MM, RM Burgess, EM Suuberg, MG Cantwell, KG Pennell. 2013. Performance of passive samplers for monitoring estuarine water column concentrations: 1. Contaminants of concern. Environ Toxicol Chem 32(10): 2182-9.

USGS. 1985. "Distribution of Polychlorinated Biphenyls in the Housatonic River and Adjacent Aquifer, Massachusetts." F.B. Gay and M.H. Frimpter. USGS Water-Supply Paper 2266.

WDHFS. 2001. "Public Health Assessment for PCB Contaminated Sediment in the Lower Fox River and Green Bay." December 5.



LEGEND

SITE PROPERTY BOUNDARY

MUNICIPAL SUPPLY WELL

BASE MAP FROM USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE SERIES, "USA TOPO MAPS" WEB BASEMAP SERVICE LAYER.

0 2,000 4,000 FEET

1 " = 2,000 '
1:24,000

N

TRC
708 Heartland Trail
Suite 3000
Madison, WI 53717
Phone: 608.826.3600

PROJECT:
MADISON-KIPP CORPORATION
201 WAUBESA STREET
MADISON, WISCONSIN

TITLE:
SITE LOCATION MAP

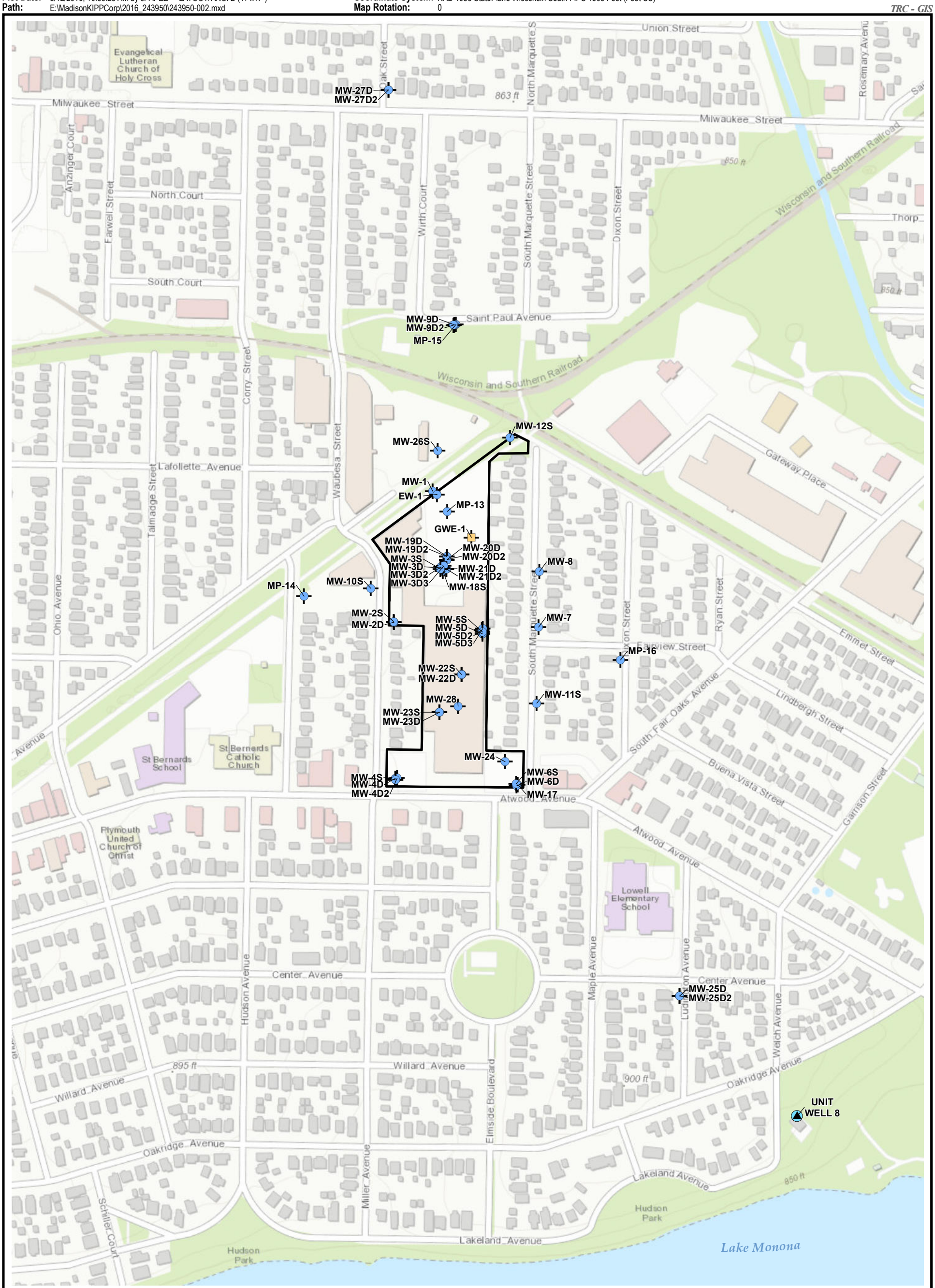
DRAWN BY:	J PAPEZ
CHECKED BY:	A STEHN
APPROVED BY:	J RICE
DATE:	AUGUST 2016
PROJ. NO.:	243950
FILE:	243950-001.mxd

FIGURE 1

Plot Date: 8/12/2016, 10:35:23 AM by JPAPEZ -- LAYOUT: ANSI B (11"x17")
Path: E:\MadisonKIPPCorp\2016_243950\243950-002.mxd

Coordinate System: NAD 1983 StatePlane Wisconsin South FIPS 4803 Feet (Foot US)
Map Rotation: 0

TRC - GIS



LEGEND

- SITE PROPERTY BOUNDARY
- GROUNDWATER EXTRACTION WELL
- MONITORING WELL
- MUNICIPAL SUPPLY WELL

BASE MAP FROM ESRI, "WORLD TOPOGRAPHIC MAP" WEB BASEMAP SERVICE LAYER.

0 300 600 FEET

1 " = 300 '
1:3,600

N

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PROJECT:
MADISON-KIPP CORPORATION
201 WAUBESA STREET
MADISON, WISCONSIN

TITLE:
WELL LOCATIONS MAP

DRAWN BY:	J PAPEZ
CHECKED BY:	A STEHN
APPROVED BY:	J RICE
DATE:	AUGUST 2016
PROJ. NO.:	243950
FILE:	243950-002.mxd

FIGURE 2