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ENVIRONMENT

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Subject:
Implementation Summary and Recommendations -- In-Situ Chemical Oxidation Groundwater Pilot Test, Madison-Kipp Corporation Site, 201 Waubesa Street, Madison, Wisconsin. Facility ID No. 113125320, BRRTS No. 02-13-001569

Date:
February 15, 2013

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Our ref:
WI001283.0010

Dear Mr. Schmoller:

On behalf of Madison-Kipp Corporation, ARCADIS has initiated the In-Situ Chemical Oxidation (ISCO) groundwater pilot test at the Madison-Kipp site located at 201 Waubesa Street in Madison, Wisconsin (Site, Figure 1). This letter provides a preliminary summary of the ISCO groundwater pilot test activities performed from November 2012 through January 2013 and preliminary recommendations. A complete summary of the ISCO pilot test will be presented as an update or addendum to this report upon completion of the post-injection monitoring activities scheduled for completion in February 2013.

Pilot Test Objectives

ISCO pilot test activities were completed per the approved *In-Situ Chemical Oxidation Groundwater Pilot Test Work Plan* (Work Plan) dated October 17, 2012. Pilot activities were conducted to support evaluation of potential full-scale deployment of the ISCO technology to treat chlorinated volatile organic compounds (VOCs) in groundwater at the Site. The work plan identified three key components for development of a successful ISCO groundwater remedial strategy and included the following:

1) Determine the extent of VOC mass that resides in both bedrock fracture pore water and within the bedrock matrix within the source areas

2) Define the orientation and hydraulic connection of the bedrock fracture network

3) Define the direction and velocity of bedrock groundwater to address and control contaminant mass flux in groundwater.

The objectives of the pilot study were to gain information sufficient to define the conditions noted above and to support a more thorough evaluation of the injectability (e.g., achievable flow rates and necessary injection pressures) and permanence of VOC treatment using the ISCO remedial approach to enable remedial design.

Pilot Test Design

The pilot test design was developed based on ARCADIS' understanding of contaminant mass distribution in bedrock and groundwater at the Site. The injection area was selected to target the area of highest historical VOC concentrations within both the unconsolidated and bedrock lithologies. The following presents a brief description of the activities conducted as part of the approved pilot test design presented in the Work Plan:

- The pilot test injection and monitoring well network was installed in the vicinity of the Monitoring Well MW-3 nest, as shown on Figure 2. The pilot test well network consists of the following: Two new injection wells, three new monitoring wells, one new injection dose response well, and one existing monitoring well.

- Injection wells were constructed to allow targeted delivery in three separate intervals (one interval in the unconsolidated unit and two intervals in the bedrock unit).

- The injection wells were used to deliver a combined solution of a known volume and concentration of sodium permanganate and non-reactive hydraulic tracers within the subsurface. A different tracer was used for each of the three injection intervals to clearly monitor subsurface tracer distribution within the monitoring network.

- Prior to initiation of the injection event, baseline water levels and groundwater monitoring was conducted from a combination of new and existing monitoring wells in the injection area.

- During the injection event, dose response and monitoring wells were monitored to evaluate for potential breakthrough of sodium permanganate and the respective tracers.

- Following completion of the injection event, a post-injection performance monitoring program was implemented and included weekly sampling for 3 weeks, followed by bi-weekly sampling for two additional months following the injection event.

The data presented in this letter includes results from the well installation, baseline sampling, pilot test injection, and preliminary post-injection monitoring events. As described in the sections below, performance monitoring is currently ongoing to further evaluate the longevity of the sodium permanganate and its impact on VOC concentrations within the monitoring network.

Pilot Test Activities

Well Installation

Prior to beginning the well installation, pilot test well locations were cleared for utilities using a ground penetrating radar survey. Pilot test wells were advanced, installed, and developed consistent with the Work Plan.

Six wells were installed using hollow stem auger and mud rotary drilling methods for use as injection wells (IW-1S, IW-2D/2D2) and monitoring wells (MW-18S, MW-19D/19D2, MW-20D/20D2, MW-21D/21D2, Figure 2). The wells were constructed to the following specifications:

- Two shallow soil wells were constructed using 4-inch Schedule 80 polyvinyl chloride (PVC) riser pipe with 10-slot, vee-wire wrapped PVC screens. One well was utilized as an injection well, IW-1S (screened from 16 to 20 feet below ground surface (feet bgs), and one well was utilized as a monitoring well, MW-18S (screened from 20 to 30 feet bgs).

- One bedrock well was constructed using 6-inch Schedule 80 PVC riser pipe with 10-slot, vee-wire wrapped PVC screens at two intervals from approximately 60 to 90 feet bgs and 110 to 140 feet bgs. A permanent packer was installed to separate the two screen intervals. This well was utilized as injection wells, IW-2D/2D2.

- Two bedrock wells were constructed of 2-inch Schedule 80 PVC riser pipe with 10-slot, vee-wire wrapped PVC screens. The screens are installed in two independent intervals within a single borehole from approximately 60 to 90 feet bgs (MW-19D and MW-20D) and 110 to 140 feet bgs (MW-19D2 and MW-20D2). One well was utilized as monitoring wells, MW-19D/19D2, and one well was utilized as injection dose response wells, MW-20D/20D2.

- One bedrock well was constructed of 2-inch Schedule 80 PVC riser pipe with 10-slot, vee-wire wrapped PVC screens at two intervals from approximately 60 to 90 feet bgs and 110 to 170 feet bgs. This well was utilized as monitoring wells, MW-21D/21D2.

Injection and monitoring wells were completed at the surface with flushmount well compartments set in concrete. Each borehole was brushed and over-pumped to remove the mud from drilling and developed using air lifting techniques to produce water free of sediment. A summary of well construction and development logs will be submitted with the Site Investigation Report.

All investigative-derived waste including soil and rock cuttings, drilling mud, and water from drilling, sampling, and decontaminating equipment was disposed of as non-hazardous waste at a licensed disposal facility. Soil and water disposal documentation will be submitted with the comprehensive Site Investigation Report.

A Wisconsin-licensed surveyor was contracted to locate the horizontal well locations to Wisconsin state plane coordinates and the vertical elevation for each newly installed well.

Permitting

Due to the injection of remedial material into the waters of the State, a temporary exemption pursuant to Chapter NR 140.28(5) and a Wisconsin Pollutant Discharge Elimination System (WPDES) permit were required to complete the pilot test activities.

WPDES Permit WI-0046566-6 and the Temporary Exemption for the Injection of a Remedial Material Groundwater under Chapter NR 140, Wisconsin Administrative Code (Wis. Adm. Code) were issued December 7, 2012.

Baseline Monitoring

Baseline groundwater monitoring activities were completed from November 27 through December 6, 2012 in accordance with the Work Plan. Baseline groundwater elevations are included in Table 1. Baseline groundwater concentrations are presented in Table 2. Groundwater concentrations reported in the baseline monitoring event were similar to historic concentrations reported in this area of the Site.

Pilot Test Injection Event

Injection activities were initiated on Monday, December 10, 2012, with the collection of baseline conductivity readings and equipment setup at the injection and monitoring well network. A combination of In-Situ Rugged Troll water quality monitors and CT2X submersible smart sensors were used at each of the monitoring wells for the duration of the pilot test to monitor conductivity, temperature, and water level. Conductivity was continuously logged during and following the injection event and

was used as a field indicator of injection solution arrival and to measure changes in vertical conductivity profiles within the dose response well network. A vertical profile of the screen interval was conducted at a minimum of once per day throughout the injection event to characterize changes in conductivity, water level, and temperature. Independent readings were collected every 2 feet in IW-1S, MW-3S, and MW-18S, and every 5 feet in IW-2D, IW-2D2, MW-19D, MW-19D2, MW-20D, MW-20D2, MW-21D, and MW-21D2.

When not in use for vertical profiling, the probes remained at the screen interval at which the highest conductivity measurement was observed and readings were collected every 5 minutes at all monitoring wells for the duration of the injection event. Probes were placed in the injection wells overnight after the completion of injection activities for the day and removed before the injection activities resumed the following morning. In addition to the continuous monitoring of the highest conductivity interval, instantaneous vertical profile readings were collected at a minimum of once per day, with additional profiling events completed more frequently based on field observations and when breakthrough was observed during the injection event. Baseline readings were collected every morning during the injection event, with afternoon readings collected after the conclusion of injection activities each day. Complete conductivity logs and vertical profiling data will be included as part of the comprehensive Site Investigation Report.

Once baseline conductivity measurements were recorded, preparation for ISCO injection began. A certified clean frac-tank was used to store potable water for the injection event. When additional potable water was required for injection activities, potable water was plumbed from the Madison Kipp Facility using a dedicated hose. All injection chemical and mixing equipment was stored within a spill containment unit. Sodium permanganate was delivered in eight 3,000 pound totes and eight 57 pound jerricans. The 5 percent (%) sodium permanganate solution was mixed in temporary polyethylene batch tanks. For each of the unique injection intervals, tracer compounds including deuterated water, potassium bromide, and sodium chloride were added to respective mix tank batches before the initiation of the injection solution to the appropriate injection interval.

One grab sample was collected per day to confirm the tracer concentrations within the batch tank. The batch tracer concentrations were used to define percent breakthrough of each of the independent injection solutions. Batch colormetric readings were collected from each mix tank volume to estimate the sodium permanganate concentration of each batch. The colormetric test procedure is included as Attachment A. Batch colorimetric results were used in combination with monitoring well sample colorimetric results to calculate percent breakthrough of the sodium permanganate solution. Finally, conductivity readings were collected from

each mix tank batch to serve as a qualitative indication of the injection solution for comparison to conductivity readings collected within the monitoring well network.

A total of 18,350 gallons of 5% sodium permanganate solution was injected into the three injection intervals during the pilot test from December 11 through December 17, 2012. The mixed sodium permanganate and tracer solutions were delivered to injection wells through above-grade piping manifolds under gravity-feed conditions. The injection sequence started with the shallow bedrock injection interval (IW-2D), followed by the deep injection interval (IW-2D2), and concluded with the shallow unconsolidated injection interval (IW-1S). A summary of the injection volumes and schedule is outlined below:

- Shallow bedrock injection interval (IW-2D): Approximately 7,000 gallons of a 5% sodium permanganate solution, with potassium bromide tracer, was injected at a flow rate of approximately 13 to 14 gallons per minute (gpm) December 11 through 12, 2012. The average batch concentration for the potassium bromide tracer was 335 milligrams per liter (mg/L).

- Deep bedrock injection interval (IW-2D2): Approximately 9,000 gallons of a 5% sodium permanganate solution, with sodium chloride tracer, was injected at a flow rate of approximately 6 to 7 gpm December 13 through 18, 2012. The average batch concentration for the sodium chloride tracer was 830 mg/L.

- Shallow unconsolidated soil injection interval (IW-S): Approximately 2,350 gallons of a 5% sodium permanganate solution, with deuterated water tracer, was injected at a flow rate of approximately 3 to 4 gpm December 15 through December 17, 2012. The applied deuterated water concentration was approximately 0.9 milliliters (mil) of deuterated water per gallon (mL/gal) of injection solution, which corresponded to an average concentration of deuterium at 1,365 parts per thousand (per mil).

During the injection event, the dose response and monitoring wells were monitored regularly for the breakthrough of sodium permanganate and tracers. Changes in conductivity and color were used as primary indicators of injection solution breakthrough. The selected concentration of sodium permanganate concentration used for injection (5%) has a dark purple color and elevated conductivity response relative to that observed in dose response and monitoring wells at the initiation of the pilot test. Based on color change and deflection in background conductivity measurements during the vertical profiling activities, grab samples were collected for tracer (deuterium, bromide and chloride) laboratory analysis to confirm the qualitative response. Once breakthrough was confirmed, tracer samples were collected daily through the end of the injection event from the vertical interval in which the highest observed conductivity was observed. This interval was inferred to represent the

primary interval for hydraulic communication (e.g., bedrock fractures) between the injection wells and individual dose response and monitoring wells. The pH of each grab sample was also recorded.

Upon completion of injection into each of the independent injection intervals, groundwater grab samples were collected and submitted for laboratory analysis of dissolved Resource Conservation Recovery Act (RCRA) metals, manganese, iron, tracers, total organic carbon (TOC), and total dissolved solids (TDS). Groundwater analytical results are summarized in Table 2.

Post-Injection Monitoring

Post-injection monitoring is currently being completed in accordance with the approved Work Plan, as summarized in Table 3. The tracer and performance monitoring programs are used to characterize the distribution of sodium permanganate and tracer, characterize the rate of sodium permanganate consumption relative to the destruction of chlorinated ethenes, to evaluate the rate of groundwater washout of the injection solution from the treatment area, and to evaluate the extent of VOC rebound as mass diffuses from the bedrock matrix to the fracture network.

Initial post-injection tracer monitoring was completed during the weeks of December 17, December 24, and December 31, 2012. The weekly tracer monitoring following the injection event included collection of a water level measurement, vertical profile of the screen intervals for conductivity, visual inspection for color, and monitoring of tracer concentrations from groundwater grab samples collected at Monitoring Wells MW-18S, MW-19D/19D2, MW-20D/20D2, MW-21D/21D2, and the MW-3 series wells only.

The first full round of groundwater performance monitoring was conducted the week of January 14, 2013 (five weeks post injection). This event included water level gauging and collection of groundwater samples from Monitoring Wells MW-18S, MW-19D/19D2, MW-20D/20D2, and MW-21D/21D2, MP-13, and the MW-3 and MW-5 series wells for laboratory analysis using low-flow sampling techniques. Low flow samples collected from the middle of the screen are designated with a “MS” in Table 2. This sample method was used for consistency with the site-wide sampling methodology. Groundwater samples collected during this event were analyzed for: VOCs, total metals (arsenic, chromium, manganese, and iron), dissolved metals (RCRA metals, manganese, and iron), TOC, TDS, chloride, bromide, and deuterium. During the performance monitoring event, grab samples were also collected from the screen interval determined to have the highest conductivity (i.e., strongest breakthrough response) during the vertical conductivity profile at monitoring wells exhibiting sodium permanganate influence (as designated by color). Samples from

the highest conductivity interval are noted with a “HC” in Table 2. HC samples were collected to remain consistent with the injection and tracer monitoring methods. Samples were analyzed for VOCs, bromide, chloride, and deuterium.

During the performance monitoring events, water level and field groundwater quality parameters (pH, temperature, dissolved oxygen, and conductivity) were collected at each well when using low flow sampling techniques. Each monitoring event included a vertical profile of the screen interval to evaluate differences in conductivity before collecting grab or low flow samples.

Post-injection monitoring will continue on a bi-weekly basis through February 28, 2013. The remaining post-injection monitoring activities include:

- Tracer monitoring to be completed January 28, 2013 at Monitoring Wells MW-18S, MW-19D/19D2, MW-20D/20D2, MW-21D/21D2, and the MW-3 series wells only. Groundwater samples collected during this event will be analyzed for chloride, bromide, and deuterium.

- Groundwater performance monitoring will be completed February 11, 2013 at Monitoring Wells MW-18S, MW-19D/19D2, MW-20D/20D2, and MW-21D/21D2, all seven intervals at MP-13, and the MW-3 and MW-5 series wells. Groundwater samples collected during this event will be analyzed for VOCs, total metals (arsenic, chromium, manganese, and iron), dissolved metals (RCRA metals, manganese, and iron), TOC, TDS, chloride, bromide, and deuterium.

- Tracer monitoring will be completed February 25, 2013 at Monitoring Wells MW-18S, MW-19D/19D2, MW-20D/20D2, MW-21D/21D2, and the MW-3 series wells. Groundwater samples collected during this event will be analyzed for chloride, bromide, and deuterium.

Preliminary Results

This pilot test was designed to gain information concerning aquifer characteristics such as fracture flow, aquifer hydraulics, bedrock storage capacity and aquifer contaminant mass, in addition to evaluating the effectiveness of ISCO as a potential interim and final groundwater remedy.

Results presented in this summary letter include field observations and analytical results received through February 1, 2013. Based on the continued presence of reactive sodium permanganate within the injection area, post-injection monitoring activities are still in progress. While successful distribution of sodium permanganate and tracers was achieved during the injection event, the VOC destruction is likely ongoing due to the presence of sodium permanganate; as such, a full data analysis

cannot be completed at this time. The results reported here will be further refined following completion of the planned (or supplemental) post-injection monitoring events to fully evaluate the ISCO effectiveness for full scale application and remedial design.

Field Observations

Summaries of conductivity and injection volume over time for the middle of the screen and the interval with highest conductivity are presented on Figures 3 through 10. As noted above, conductivity and color breakthrough were used as the primary indicator of injection solution breakthrough during the field event.

During injection, breakthrough monitoring was conducted at multiple discrete depth intervals exhibiting high conductivity readings to characterize the nature of distribution across each independent well screen interval. Samples were also collected from the middle of the well screens, consistent with historical and site-wide groundwater monitoring events. This monitoring was conducted to evaluate preferential transport (via magnitude and timing of color and conductivity change) via bedrock fractures or more permeable soil intervals. In addition, this methodology also allowed post-injection assessment of reagent and tracer transport associated with either density differences (due to the presence of high sodium permanganate concentrations) or downward vertical flow gradients. The following includes a brief summary of field observations during the injection event.

Shallow Bedrock Interval – 60 to 90 feet bgs

During injection into Injection Well IW-2D, conductivity breakthrough, Figure 3, was observed at Dose Response Well MW-20D, located 10 feet north of the Injection Well (Figure 2), following delivery of approximately 400 gallons of sodium permanganate solution. Breakthrough was confirmed in the corresponding Dose Response Well MW-20D grab sample, with a recorded sodium permanganate concentration of 0.01 grams per liter (g/L) as measured by the colorimeter. Subsequent breakthrough was observed at Monitoring Well MW-19D, located 20 feet north of the injection well, and confirmed via both increased conductivity response and color change (0.22 g/L) following delivery of approximately 1,000 gallons of sodium permanganate solution (Figure 4). Following delivery of 3,000 gallons, increased conductivity and evidence of color change (10.6 g/L) was also observed at Monitoring Well MW-21D, located 20 feet south of the injection well (Figure 5).

Evidence of color response remains within the shallow bedrock interval to date, with a light pink color observed at Monitoring Wells MW-19D and MW-21D and a dark purple color observed at Dose Response Well MW-20D. A summary of color

observations made during the injection event and during the post-injection monitoring are included in Table 4. Conductivity readings have returned to levels near baseline at Monitoring Wells MW-19D and MW-21D and Dose Response Well MW-20D.

Deep Bedrock Interval – 110 to 140 feet bgs

Prior to injection into Injection Well IW-2D2, increased conductivity, Figure 6, and color change (0.38 g/L) was observed at Dose Response Well MW-20D2 (located 10 feet north of the injection well; Figure 2). These observations indicated that breakthrough of the sodium permanganate solution was achieved at Dose Response Well MW-20D2 (within the 110 to 140 feet bgs vertical interval) during injection into the 60 to 90 feet bgs interval. Following the injection of approximately 2,000 gallons of sodium permanganate solution into IW-2D2, increased conductivity and color intensity, 1.29 g/L, was observed at Dose Response Well MW-20D2. Color change, 2.02 g/L, was observed at Monitoring Well MW-21D2 (Figure 7), located 20 feet south of the injection well, afeeter injection of approximately 5,000 gallons of sodium permanganate solution.

The original design volume for this interval was approximately 7,000 gallons of sodium permanganate solution. While initial breakthrough was observed at Dose Response Well MW-20D2 and Monitoring Well MW-21D2 during the target 7,000 gallon injection volume, an additional 2,000 gallons of 5% sodium permanganate solution was injected into the deep bedrock interval to increase distribution for a total of 9,000 gallons. Even with the increased solution volume, no color or conductivity change has been observed to date at Monitoring Well MW-19D2 (located 20 feet north of the injection well; Figure 8).

Color remains in the deep bedrock interval to date (Table 4), with dark purple color at Dose Response Well MW-20D2 and Monitoring Well MW-21D2. Conductivity readings at Dose Response Well MW-20D2 are declining towards background, and an increase in conductivity has been observed at Monitoring Well MW-21D2.

Shallow Unconsolidated Injection Interval – 20 to 30 feet bgs

During injection into Injection Well IW-1S, conductivity breakthrough, Figure 9, was observed following delivery of approximately 2,000 gallons of sodium permanganate solution at Dose Response Well MW-3S (located 10 feet southeast of the injection well; Figure 2). A subsequent grab sample collected at Monitoring Well MW-3S confirmed color breakthrough, 1.6 g/L. Conductivity and color breakthrough, Figure 10, were not measured at Monitoring Well MW-18S (located 20 feet southeast of Injection Well IW-1S) during the injection event; however, visual evidence of color change has been observed since the completion of the injection event at this well location. An increase in conductivity has been observed in Monitoring Well MW-18S

since the completion of the injection event and readings have remained elevated above baseline throughout the tracer monitoring events.

At Monitoring Well MW-3S, color breakthrough was observed throughout the vertical horizon of the shallow injection interval by the end of injection. Initial color response was observed at an approximate depth of 27 to 29 feet bgs, which was the interval with the highest conductivity. Since the completion of the injection event, color is no longer present in the interval with the highest conductivity, but remains in samples when water is extracted from the middle of the screen at Monitoring Well MW-3S. The post-injection monitoring confirmed the continued presence of a purple color response at Monitoring Well MW-3S (Table 4). Conductivity readings have returned to near baseline at Monitoring Well MW-3S.

Preliminary Data Interpretation

Breakthrough Summary

As noted above, results presented in this summary letter include field observations and analytical results received through February 1, 2013. Sodium permanganate breakthrough is calculated based on semi-quantitative field analysis results. While the results are indicative of breakthrough and can be visually confirmed by color, these results are qualitative. While tracer concentrations are quantitative, both tracer and sodium permanganate concentrations used for breakthrough analysis are highly variable based on field collection and analysis methods, sodium permanganate reactivity within the aquifer, and sample collection time. All results reported here will be further refined following completion of the planned (or supplemental) post-injection monitoring events to adequately evaluate ISCO effectiveness for full scale application and to fully inform remedial design.

Shallow Bedrock Interval – 60 to 90 feet bgs

During the injection at Injection Well IW-2D, the maximum concentrations of sodium permanganate and bromide tracer at Monitoring Well MW-20D, located 10 feet north of the injection well (Figure 2), were 18 and 45% of injected concentrations respectively; however, the maximum bromide tracer response of 45% was observed in samples collected one day following completion of the injection. The observation of both sodium permanganate and bromide at Monitoring Well MW-20D2 prior to injection into the deeper interval indicates that fluid distribution was both horizontal and vertical in this location.

Concentrations of bromide tracer and sodium permanganate at Monitoring Well MW-19D, located 20 feet north of Injection Well IW-2D, have not been observed in excess of 1% of the injected concentrations during injection or post-injection monitoring to

date. The peak conductivity response was observed in the deeper portion of the screened interval (85 to 90 feet) following delivery of 7,000 gallons and immediately following completion of injection into Injection Well IW-2D. The maximum observed concentrations of sodium permanganate and bromide at Monitoring Well MW-21D, located 20 feet south of Injection Well IW-2D, were 11% and 23% of the injected concentrations, respectively, and were observed the day after injection of all 7,000 gallons.

Deep Bedrock Interval – 110 to 140 feet bgs

Increases in both conductivity and color intensity at Monitoring Well MW-20D2, located 10 feet north of the Injection Well (IW-2D2), were observed prior to injection within the 110 to 140 feet bgs interval, indicating that distribution from the shallow zone injection was observed at this well location. This is supported by analytical data, which showed bromide tracer at concentrations of approximately 4% of the injected concentration at Injection Well IW-2D. This vertical connection has not observed at Monitoring Wells MW-19D2 and MW-21D2 to date, but is consistent with the fractured bedrock characteristics at the Site. Chloride tracer concentrations also provided evidence of breakthrough as a result of injection at Injection Well IW-2D2, with increased color response observed after approximately 6,000 gallons was injected into Injection Well IW-2D2. The maximum chloride concentration observed was 57% of the injected chloride solution strength. Relative to the chloride response, the maximum sodium permanganate concentration observed during injection was close to 100% of the injected concentration. The increased sodium permanganate response is attributed to solution delivery from both the 60 to 90 feet bgs and 110 to 140 feet bgs injection intervals.

Breakthrough of tracer or sodium permanganate (related to injection at Injection Well IW-2D2) was not observed during injection, or during any of the post-injection monitoring events at Monitoring Well MW-19D2, located 20 feet north of the injection well. While color was observed at Monitoring Well MW-21D2 during injection, the sodium permanganate concentration did not exceed 1% of the injected concentration and no chloride response was observed.

Unconsolidated Soil Interval 20 to 30 feet bgs

During the injection at Injection Well IW-1S, deuterated water tracer breakthrough was not observed at Monitoring Well MW-3S, located 10 feet southeast of the injection well, or Monitoring Well MW-18S, located 20 feet southeast of the injection. The peak sodium permanganate response was observed at the end of injection (2,350 gallons) at a magnitude of 23% of the injected concentration. In addition, at Monitoring Well MW-3S the peak conductivity response was observed concurrent

with deuterated water tracer breakthrough (at 13% of the injected solution concentration) the day after the injection was completed.

Deuterated water tracer has not been observed at any other monitoring locations to date.

Preliminary Treatment Performance Summary

As post-injection monitoring is still being completed, a complete evaluation of the hydraulic, treatment, and rebound data cannot be completed at this time. All results reported here will be further refined based on the results of future monitoring that will be used to adequately evaluate ISCO effectiveness as a full scale remedial strategy and inform remedial design.

As noted above, the first full round of groundwater performance monitoring was conducted the week of January 14, 2013, five weeks post injection. Analytical results are presented in Table 2. Groundwater samples were collected from two intervals during this event. Grab samples were collected from the screen interval determined to have the highest conductivity (i.e., strongest breakthrough response) during the vertical conductivity sampling. HC samples were collected to remain consistent with the injection and tracer monitoring methods. A second, low-flow sample was collected from the middle of the screen. This sample was collected for consistency with the site-wide sampling methodology.

Standard practice at environmental sites using ISCO remediation techniques is to wait for the sodium permanganate solution to react completely before collecting VOC samples. Based on the added value of collecting and analyzing preliminary VOC treatment data prior to complete permanganate exhaustion, the United States Environmental Protection Agency (U.S. EPA) Ground Water Issue titled *Ground Water Sample Preservation at In-Situ Chemical Oxidation Sites- Recommended Guidelines* was used as a guidance document for sample collection and quenching of groundwater with sodium permanganate present during the performance monitoring event.

During the groundwater performance monitoring event, evidence of sodium permanganate was observed in the following monitoring wells: MW-3S, MW-19D, MW-20D, MW-21D2, MW-21D, and MW-21D2 (Table 4). VOC samples collected from these wells (both MS and HC) were quenched per the U.S. EPA guidance after sample collection before laboratory analysis. The intention of the quenching is to stop the chemical reaction at the time the sample is collected to accurately represent the chemical concentrations within the aquifer at the time of sampling. Unquenched samples submitted to the lab have additional reaction time during transit and therefore, may not be representative of aquifer conditions at the time of sampling.

A summary of baseline and post-injection tetrachloroethene (PCE) results is presented on Figure 11. While the results are interim, Monitoring Wells MW-3S exhibits a PCE reduction of approximately 83% in the shallow unconsolidated interval. Within the shallow bedrock interval, Monitoring Wells MW-19D, MW-20D, and MW-21D2 exhibit a PCE reduction ranging from approximately 29 to 88%. Within the deep bedrock interval, Monitoring Wells MW-20D2 and MW-21D1 exhibit a PCE reduction ranging from approximately 54 to 85%, with an increase in concentration observed at MW-19D2, located 20 feet north of the injection well.

The reduction of PCE correlates with the extent of sodium permanganate breakthrough as outlined above. Monitoring Wells MW-18S, MW-19D, MW-19D2, MW-21D, and MW-21D did not see breakthrough of sodium permanganate or respective tracers above 1%, and therefore, had a lower or no (MW-19D2) percent reduction in VOCs observed. Comparatively, Monitoring Wells MW-20D and MW-20D2 had the greatest percent breakthrough of both sodium permanganate and tracer and evidence of the greatest concentration reduction.

No color has been observed in Monitoring Wells MW-18S, MW-3D, MW-3D2, and MW-3D3, but concentration reduction was observed in unquenched samples collected during the performance monitoring event in January. The samples were unquenched because the groundwater collected did not indicate visual signs of sodium permanganate solution and therefore, reactions due to the sodium permanganate solution may have continued after sample collection, prior to laboratory analysis.

In the shallow unconsolidated soils interval, Monitoring Well MW-18S, exhibited a PCE reduction of approximately 75%. Within the shallow bedrock interval, Monitoring Wells MW-3D and MW-3D2 exhibited a PCE reduction ranging from approximately 57 to 63%. Within the deep bedrock interval, Monitoring Wells MW-3D2 and MW-3D3, exhibited a PCE reduction ranging from approximately 24 to 57%.

Monitoring results from Multiport Well MP-13 and the monitoring wells within the MW-5 well series do not indicate any change in concentration from the baseline monitoring event to the post-injection monitoring event, which is consistent with the absence of color and conductivity change at these well locations. These results are consistent with expectations due to their distance from the target injection area.

These results indicate that the ISCO injection has achieved a measured benefit within the injection area. Based on the continued presence of sodium permanganate, it is anticipated that additional reduction in the chlorinated compounds will occur in monitoring wells where sodium permanganate solution persists. Chlorinated compound mass may rebound after the sodium permanganate solution has been consumed. Mass diffusion from the bedrock matrix to the fracture

network is likely and will be monitored through post-injection monitoring. Continued post-injection monitoring will be used to monitor sodium permanganate presence, sodium permanganate washout, conductivity change, and potential concentration rebound in the injection area. Information from this further monitoring will be utilized to evaluate remedial design.

Recommendations

Field observations and final monitoring results collected during the course of the pilot test will be summarized in a final remedial summary letter and included in the comprehensive Site Investigation Report. This letter will include an evaluation of injection operations and treatment performance observed during post-injection monitoring activities and will include recommendations regarding application of the ISCO technology for treatment of chlorinated ethenes at the Site.

Based on the results reported here, continued groundwater monitoring will be required to fully evaluate the pilot test effectiveness and treatment performance to guide the remedial design. Monthly performance monitoring is proposed for 6 months beginning in March 2013 at Monitoring Wells MW-18S, MW-19D/19D2, MW-20D/20D2, and MW-21D/21D2, Multiport Well MP-13, and the MW-3 and MW-5 series wells. Groundwater samples collected during these events may be analyzed for VOCs, total metals (arsenic, chromium, manganese, and iron), dissolved metals (RCRA metals, manganese, and iron), chloride, bromide, and deuterium. During this period, monitoring frequency and analytes may be modified to support data assessment and evaluation.

Ongoing post-injection monitoring is critical for the evaluation of VOC concentrations in relation to the sodium permanganate presence in the injection areas. Once the existing sodium permanganate solution has been depleted, rebound monitoring will begin. This monitoring is critical to evaluate the extent of VOC rebound as mass may diffuse from the bedrock matrix to the fracture network and will further guide the remedial design.

Summary

The intention of the pilot study was to evaluate the feasibility of implementing a full-scale ISCO system and the effectiveness of VOC degradation at the Site, while at the same time initiating treatment of VOC mass in groundwater. The pilot test was designed to help determine design parameters (i.e., injection volumes, flow rate and injection pressures) for potential full-scale design and implementation. Preliminary injection and post-injection monitoring data indicates the following:

- Successful distribution of injection reagents can be achieved up to a radial distribution of 10 to 20 feet through gravity-feed injection. In addition, localized vertical connection has been observed between the shallow and deep bedrock intervals.

- Interim groundwater monitoring has confirmed PCE reduction at dose response and monitoring wells within the injection area.

- Color remains in the injection area, indicating that sodium permanganate is present in the injection area and that additional treatment is still ongoing.

- Ongoing monitoring will be completed to further characterize changes in VOCs as the sodium permanganate reacts.

- Monitoring activities conducted following complete depletion of the sodium permanganate will be used to evaluate the permanence of treatment and extent of VOC rebound.

- The results of the pilot test and subsequent monitoring will collectively be used to support development of the full-scale groundwater remediation design.

If you have any questions or require any additional information, please contact us at 414.276.7742.

Sincerely,

ARCADIS U.S., Inc.

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Table 1. ISCO Pilot Test Groundwater Elevations, Madison-Kipp Corporation, 201 Waubesa Street, Madison, Wisconsin.

Well/ Boring	Date	Screen Interval (ft bls)	Ground Elevation (ft amsl)	Top of Casing Elevation (ft amsl)	Depth to Water (ft btoc)	Groundwater Elevation (ft amsl)	Lithology
MW-1	11/30/12	14 - 24	861.71	861.08	15.32	845.76	Unconsolidated
MW-1	01/14/13	14 - 24	861.71	861.08	15.22	845.86	Unconsolidated
MW-2S	11/30/12	19 - 29	866.34	868.94	23.80	845.14	Unconsolidated
MW-2S	01/14/13	19 - 29	866.34	868.94	24.00	844.94	Unconsolidated
MW-2D	11/30/12	39 - 44	866.50	868.74	23.65	845.09	Upper Lone Rock
MW-2D	01/14/13	39 - 44	866.50	868.74	23.83	844.91	Upper Lone Rock
MW-3S	11/30/12	19 - 29	867.87	867.41	22.15	845.26	Unconsolidated
MW-3S	01/14/13	19 - 29	867.87	867.41	22.28	845.13	Unconsolidated
MW-3D	11/30/12	48 - 53	867.68	867.25	22.27	844.98	Upper Lone Rock
MW-3D	01/14/13	48 - 53	867.68	867.25	22.28	844.97	Upper Lone Rock
MW-3D2	11/30/12	76 - 81	867.58	867.39	22.64	844.75	Lower Lone Rock
MW-3D2	01/14/13	76 - 81	867.58	867.39	22.70	844.69	Lower Lone Rock
MW-3D3	11/30/12	214 - 224	867.61	867.35	23.84	843.51	Lower Wonewoc- Upper Eau Claire
MW-3D3	01/14/13	214 - 224	867.61	867.35	23.85	843.50	Lower Wonewoc- Upper Eau Claire
MW-4S	11/30/12	35 - 50	880.81	880.31	34.57	845.74	Upper Lone Rock
MW-4S	01/14/13	35 - 50	880.81	880.31	34.89	845.42	Upper Lone Rock
MW-4D	11/30/12	65 - 70	881.18	880.38	35.59	844.79	Lower Lone Rock
MW-4D	01/14/13	65 - 70	881.18	880.38	35.87	844.51	Lower Lone Rock
MW-4D2	11/30/12	91 - 96	880.36	880.20	35.82	844.38	Lower Lone Rock
MW-4D2	01/14/13	91 - 96	880.36	880.20	35.92	844.28	Lower Lone Rock
MW-5S	11/30/12	34 - 44	872.56	872.14	NA - Not gauged		Upper Lone Rock
MW-5S	01/14/13	34 - 44	872.56	872.14	27.36	844.78	Upper Lone Rock
MW-5D	11/30/12	75 - 80	872.58	872.10	27.38	844.72	Lower Lone Rock
MW-5D	01/14/13	75 - 80	872.58	872.10	27.52	844.58	Lower Lone Rock
MW-5D2	11/30/12	165 - 170	872.59	872.20	28.95	843.25	Lower Wonewoc
MW-5D2	01/14/13	165 - 170	872.59	872.20	28.89	843.31	Lower Wonewoc
MW-5D3	11/30/12	225 - 235	872.34	871.89	28.50	843.39	Lower Wonewoc- Upper Eau Claire
MW-5D3	01/14/13	225 - 235	872.34	871.89	28.47	843.42	Lower Wonewoc- Upper Eau Claire
MW-6S	11/30/12	32 - 42	877.20	876.69	NA - Car parked over well		Unconsolidated/ Upper Lone Rock
MW-6S	01/14/13	32 - 42	877.20	876.69	32.31	844.38	Unconsolidated/ Upper Lone Rock
MW-6D	11/30/12	65 - 70	877.11	876.69	NA - Car parked over well		Lower Lone Rock
MW-6D	01/14/13	65 - 70	877.11	876.69	32.38	844.31	Lower Lone Rock
MW-7	11/30/12	25 - 35	870.91	870.42	25.48	844.94	Unconsolidated
MW-7	01/14/13	25 - 35	870.91	870.42	25.82	844.60	Unconsolidated
MW-8	11/30/12	24 - 34	867.69	866.78	21.71	845.07	Unconsolidated
MW-8	01/14/13	24 - 34	867.69	866.78	21.97	844.81	Unconsolidated
MW-9D	11/30/12	44 - 49	855.80	855.47	NA - Not gauged		Upper Lone Rock
MW-9D	01/14/13	44 - 49	855.80	855.47	10.79	844.68	Upper Lone Rock

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Table 1. ISCO Pilot Test Groundwater Elevations, Madison-Kipp Corporation, 201 Waubesa Street, Madison, Wisconsin.

Well/ Boring	Date	Screen Interval (ft bls)	Ground Elevation (ft amsl)	Top of Casing Elevation (ft amsl)	Depth to Water (ft btoc)	Groundwater Elevation (ft amsl)	Lithology
MW-9D2	11/30/12	64 - 69	855.89	855.48	NA - Not gauged		Lower Lone Rock
MW-9D2	01/14/13	64 - 69	855.89	855.48	10.86	844.62	Lower Lone Rock
MW-10S	11/30/12	11 - 21	864.88	864.42	NA - Inaccessible		Unconsolidated
MW-10S	01/14/13	11 - 21	864.88	864.42	19.30	845.12	Unconsolidated
MW-11S	11/30/12	24 - 34	874.10	873.47	28.80	844.67	Unconsolidated
MW-11S	01/14/13	24 - 34	874.10	873.47	29.10	844.37	Unconsolidated
MW-12S	11/30/12	3 - 13	859.78	859.41	11.85	847.56	Unconsolidated
MW-12S	01/14/13	3 - 13	859.78	859.41	9.32	850.09	Unconsolidated
MP-13	12/01/12	44 - 48	864.49	863.99	18.50	845.49	Upper Lone Rock
MP-13	01/14/13	44 - 48	864.49	863.99	18.40	845.59	Upper Lone Rock
MP-13	12/01/12	67 - 71	864.49	863.99	18.80	845.19	Lower Lone Rock
MP-13	01/14/13	67 - 71	864.49	863.99	18.77	845.22	Lower Lone Rock
MP-13	12/01/12	81 - 85	864.49	863.99	18.90	845.09	Lower Lone Rock
MP-13	01/14/13	81 - 85	864.49	863.99	18.90	845.09	Lower Lone Rock
MP-13	12/01/12	102 - 106	864.49	863.99	19.90	844.09	Upper Wonewoc
MP-13	01/14/13	102 - 106	864.49	863.99	19.97	844.02	Upper Wonewoc
MP-13	12/01/12	121 - 125	864.49	863.99	20.00	843.99	Lower Wonewoc
MP-13	01/14/13	121 - 125	864.49	863.99	20.01	843.98	Lower Wonewoc
MP-13	12/01/12	135 - 139	864.49	863.99	20.10	843.89	Lower Wonewoc
MP-13	01/14/13	135 - 139	864.49	863.99	20.10	843.89	Lower Wonewoc
MP-13	12/01/12	163 - 167	864.49	863.99	20.40	843.59	Lower Wonewoc
MP-13	01/14/13	163 - 167	864.49	863.99	20.26	843.73	Lower Wonewoc
MP-14	01/14/13	70 - 75	866.88	867.28	21.73	845.55	Lower Lone Rock
MP-14	01/14/13	100 - 105	866.88	867.28	23.03	844.25	Upper Wonewoc
MP-14	01/14/13	135 - 140	866.88	867.28	23.34	843.94	Lower Wonewoc
MP-14	01/14/13	170 - 178	866.88	867.28	23.57	843.71	Lower Wonewoc
MP-15	01/14/13	88 - 92	855.98	855.50	11.12	844.38	Upper Wonewoc
MP-15	01/14/13	100 - 105	855.98	855.50	11.08	844.42	Upper Wonewoc
MP-15	01/14/13	120 - 125	855.98	855.50	11.15	844.35	Lower Wonewoc
MP-15	01/14/13	142 - 146	855.98	855.50	11.30	844.20	Lower Wonewoc
MP-15	01/14/13	177 - 187	855.98	855.50	11.36	844.14	Lower Wonewoc
MP-16	01/14/13	80 - 84	870.68	870.17	25.79	844.38	Lower Lone Rock
MP-16	01/14/13	106 - 116	870.68	870.17	26.72	843.45	Upper Wonewoc
MP-16	01/14/13	140 - 144	870.68	870.17	26.88	843.29	Lower Wonewoc
MP-16	01/14/13	175 - 179	870.68	870.17	27.13	843.04	Lower Wonewoc

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Well/ Boring	Date	Screen Interval (ft bls)	Ground Elevation (ft amsl)	Top of Casing Elevation (ft amsl)	Depth to Water (ft btoc)	Groundwater Elevation (ft amsl)	Lithology
MW-17	01/14/13	160 - 170	877.26	876.65	33.80	842.85	Lower Wonewoc
MW-18S	11/30/12	20 - 30	867.89	867.24	21.89	845.35	Unconsolidated
MW-18S	01/14/13	20 - 30	867.89	867.24	22.02	845.22	Unconsolidated
MW-19D	11/30/12	60 - 90	867.44	866.75	21.93	844.82	Lower Lone Rock
MW-19D	01/14/13	60 - 90	867.44	866.75	21.93	844.82	Lower Lone Rock
MW-19D2	11/30/12	110 - 140	867.44	866.71	23.11	843.60	Upper/Lower Wonewoc
MW-19D2	01/14/13	110 - 140	867.44	866.71	23.06	843.65	Upper/Lower Wonewoc
MW-20D	11/30/12	60 - 90	867.36	866.96	22.09	844.87	Lower Lone Rock
MW-20D	01/14/13	60 - 90	867.36	866.96	22.09	844.87	Lower Lone Rock
MW-20D2	11/30/12	110 - 140	867.36	867.04	23.32	843.72	Upper/Lower Wonewoc
MW-20D2	01/14/13	110 - 140	867.36	867.04	23.42	843.62	Upper/Lower Wonewoc
MW-21D	11/30/12	60 - 90	867.77	867.49	22.56	844.93	Lower Lone Rock
MW-21D	01/14/13	60 - 90	867.77	867.49	22.60	844.89	Lower Lone Rock
MW-21D2	11/30/12	110 - 170	867.77	867.46	23.85	843.61	Upper/Lower Wonewoc
MW-21D2	01/14/13	110 - 170	867.77	867.46	23.79	843.67	Upper/Lower Wonewoc
MW-22S	01/14/13	25 - 35	874.45	874.12	29.47	844.65	Unconsolidated
MW-22D	01/14/13	45 - 50	874.45	874.15	29.39	844.76	Upper Lone Rock
MW-23S	01/14/13	25 - 35	874.55	874.20	29.24	844.96	Unconsolidated
MW-23D	01/14/13	45 - 50	874.55	874.27	29.45	844.82	Upper Lone Rock
IW-1S	11/30/12	16 - 26	867.82	867.62	22.16	845.46	Unconsolidated
IW-2D	11/30/12	60 - 90	867.57	866.61	21.61	845.00	Lower Lone Rock
IW-2D2	11/30/12	110 - 140	867.57	866.57	22.77	843.80	Upper/Lower Wonewoc

ft amsl Above mean sea level.
ft bls Below land surface.
ft btoc Below top of casing.

Table 2. ISCO Pilot Test Groundwater Analytical Data, Madison Kipp Corporation, Madison, Wisconsin.

Well			IW-1S	IW-2D	IW-2D2	MP-13					
Sample Depth			MS	MS	MS	44-48'	44-48'	67-71'	67-71'	81-85'	81-85'
Sample Date	ES	PAL	11/29/12	11/29/12	11/29/12	12/06/12	1/19/13	12/06/12	1/19/13	12/06/12	12/12/12
VOC (µg/L)											
1,1,1,2-Tetrachloroethane	70	7	<0.5	<0.5	<0.5	<0.25	<0.25	<1.3	<1.3	<2.5	NA
1,1,2-Trichloroethane	5	0.5	<0.56	<0.56	<0.56	<0.28	<0.28	<1.4	<1.4	<2.8	NA
1,1-Dichloroethene	7	0.7	<0.62	<0.62	<0.62	***0.92 J***	***1.1***	***2.8 J***	***3.1 J***	<3.1	NA
Benzene	5	0.5	***0.71 J***	<0.15	<0.15	0.34 J	0.38 J	<0.37	***1.1 J***	<0.74	NA
Bromoform	4.4	0.44	<0.56	<0.56	<0.56	<0.28	<0.28	<1.4	<1.4	<2.8	NA
Bromomethane	10	1	<0.62	<0.62	<0.62	<0.31	<0.31	<1.6	<1.6	<3.1	NA
Carbon tetrachloride	5	0.5	<0.52	<0.52	<0.52	<0.26	<0.26	<1.3	<1.3	<2.6	NA
Chloroform	6	0.6	***1.9 J***	<0.4	<0.4	<0.2	<0.2	<1	<1	<2	NA
cis-1,2-Dichloroethene	70	7	***67***	***400***	***390***	***540***	***450***	***3,500***	***3,100***	***1,900***	NA
Ethylbenzene	700	140	<0.26	6.5	1.6	<0.13	<0.13	<0.65	<0.65	<1.3	NA
Naphthalene	100	10	<0.32	<0.32	<0.32	<0.16	<0.16	<0.8	<0.8	<1.6	NA
Tetrachloroethene	5	0.5	***1,200***	***1,500***	***1,300***	***640***	***760***	***3,800***	***4,300***	***5,600***	NA
Toluene	800	160	<0.22	1.1	0.45 J	<0.11	<0.11	<0.55	<0.55	<1.1	NA
trans-1,2-Dichloroethene	100	20	3.4	5.4	5.2	7.3	6.7	***60***	***56***	***29***	NA
Trichloroethene	5	0.5	***100***	***180***	***170***	***230***	***200***	***1,100***	***1,000***	***940***	NA
Vinyl chloride	0.2	0.02	<0.2	***2.6***	***2.6***	***15***	***17***	***150***	***180***	***64***	NA
Xylenes, Total	2,000	400	<0.14	25	7.2	<0.068	<0.068	<0.34	<0.34	<0.68	NA
Total Metals (µg/L)											
Arsenic	10	1	0.58 J	0.30 J	0.50 J	0.21 J	0.20 J	0.16 J	0.17 J	0.17 J	NA
Barium	2,000	400	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	5	0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	100	10	0.73 J	0.75 J	1.7 J	3.4 J	1.3 J	6.8	2.1 J	2.0 J	NA
Iron	300	150	***170 B***	***1,900 B***	***4,100 B***	***1,300***	***360***	61 J B	<37	62 J B	NA
Lead	15	1.5	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	300	60	***410***	54	***120***	***340***	***290***	10	3.3	14	NA
Mercury	2	0.2	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	50	10	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	50	10	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Metals (µg/L)											
Arsenic (Dissolved)	10	1	0.57 J	0.20 J	0.22 J	0.16 J	0.19 J	0.20 J	0.15 J	<0.15	NA
Barium (Dissolved)	2,000	400	120	51	54	180	190	26 B	24	24 B	NA

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Table 2. ISCO Pilot Test Groundwater Analytical Data, Madison Kipp Corporation, Madison, Wisconsin.

Well			IW-1S	IW-2D	IW-2D2	MP-13					
Sample Depth			MS	MS	MS	44-48'	44-48'	67-71'	67-71'	81-85'	81-85'
Sample Date	ES	PAL	11/29/12	11/29/12	11/29/12	12/06/12	1/19/13	12/06/12	1/19/13	12/06/12	12/12/12
Dissolved Metals (µg/L) (continued)											
Cadmium (Dissolved)	5	0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA
Chromium (Dissolved)	100	10	0.65 J	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64	NA
Iron (Dissolved)	300	150	***320 B***	***580 B***	***2,400 B***	***860***	85 J	43 J B	<37	43 J B	NA
Lead (Dissolved)	15	1.5	0.19 J	<0.16	<0.16	0.23 J	0.39 J	<0.16	<0.16	<0.16	NA
Manganese (Dissolved)	300	60	***420***	36	***81***	***360***	***280***	10	3	13	NA
Mercury (Dissolved)	2	0.2	0.073 J	<0.071	<0.071	<0.071	<0.071	<0.071	<0.071	<0.071	NA
Selenium (Dissolved)	50	10	1.1 J	0.50 J	0.43 J	0.27 J	0.29 J	<0.25	0.34 J	<0.25	NA
Silver (Dissolved)	50	10	<0.069	<0.069	<0.069	<0.069	<0.069	<0.069	<0.069	<0.069	NA
MISC (mg/L)											
Bromide	NA	NA	<0.77	<0.77	<0.77	<0.77	0.52	<0.77	0.5	<0.77	0.33
Chloride	250	NA	490	190	160	420	410	270	250	220	230
TOC	NA	NA	4.1	4.1	3.8	6.1	7.5	5.2	6.1	4.6	NA
Total Dissolved Solids	NA	NA	2,100	1,000	910	1,400	1,400	1,100	1,100	990	950
Deuterated Water (permil)	NA	NA	-54.40	-60.50	-60.60	-64.00	-63.88	-65.50	-64.71	-61.10	NA

Only VOCs detected in one or more water samples are listed on the table. Refer to laboratory analytical reports for a complete list of VOCs analyzed.

100	Concentration exceeds the NR 140 Wis. adm. code Preventive Action Limit (PAL).
100	Concentration exceeds the NR 140 Wis. adm. code Enforcement Standard (ES).
--	Not designated.
<	Not detected.
B	Compound was found in the blank and the sample.
J	Result is between the method detection limit and the limit of quantitation.
Q	Sample quenched using Environmental Protection Agency Guidance Document *Groundwater Sample Preservation at In-Situ Chemical Oxidation Sites - Recommended Guidelines*
U	Sample not quenched.
mg/L	Milligrams per liter.
µg/L	Micrograms per liter.
permil	Isotopic ratio of hydrogen and deuterium.
NA	Not analyzed.
VOCs	Volatile organic compounds.
MS	Sample collected from middle of screen.
HC	Sample collected from screen interval with highest conductivity.

Table 2. ISCO Pilot Test Groundwater Analytical Data, Madison Kipp Corporation, Madison, Wisconsin.

Well	MP-13 (continued)									MW-3S	
Sample Depth	81-85'	102-106'	102-106'	121-125'	121-125'	135-139'	135-139'	163-167'	163-167'	--	--
Sample Date	1/19/13	12/04/12	1/18/13	12/4/12	1/18/13	12/4/12	1/17/13	12/4/12	1/16/13	4/7/10	3/29/11
VOC (µg/L)											
1,1,1,2-Tetrachloroethane	4.8 J	<1.3	<0.5	<0.5	<1.3	<0.5	<1.3	<1.3	<0.25	<8	<6.3
1,1,2-Trichloroethane	<2.8	<1.4	<0.56	<0.56	<1.4	<0.56	<1.4	<1.4	<0.28	<8	<6.3
1,1-Dichloroethene	<3.1	<1.6	<0.62	<0.62	<1.6	***1.5 J***	<1.6	<1.6	***0.97 J***	<16	<13
Benzene	<0.74	<0.37	<0.15	<0.15	<0.37	0.41 J	***1.1 J***	<0.37	<0.074	<6.4	<5
Bromoform	<2.8	<1.4	<0.56	<0.56	<1.4	<0.56	<1.4	<1.4	<0.28	<6.4	<5
Bromomethane	<3.1	<1.6	<0.62	<0.62	<1.6	<0.62	<1.6	<1.6	<0.31	<16	<13
Carbon tetrachloride	<2.6	<1.3	<0.52	<0.52	<1.3	<0.52	<1.3	<1.3	<0.26	<26	<20
Chloroform	<2	<1	<0.4	<0.4	<1	<0.4	<1	<1	<0.2	<6.4	<5
cis-1,2-Dichloroethene	***1,800***	***1,100***	***690***	***910***	***1,000***	***1,100***	***910***	***970***	***730***	***83***	***37***
Ethylbenzene	<1.3	<0.65	<0.26	<0.26	<0.65	<0.26	<0.65	<0.65	<0.13	<16	<13
Naphthalene	<1.6	<0.8	<0.32	<0.32	<0.8	<0.32	<0.8	<0.8	<0.16	<8	<6.3
Tetrachloroethene	***6,800***	***1,800***	***1,100***	***1,500***	***2,600***	***1,900***	***2,300***	***1,400***	***930***	***2,000***	***1,100***
Toluene	<1.1	<0.55	<0.22	<0.22	<0.55	<0.22	<0.55	<0.55	<0.11	<16	<13
trans-1,2-Dichloroethene	***38***	15	9.5	12	17	17	15	15	13	<16	<13
Trichloroethene	***1,100***	***440***	***330***	***340***	***460***	***450***	***430***	***370***	***250***	***130***	***66***
Vinyl chloride	***120***	***33***	***23***	***36***	***54***	***50***	***42***	***41***	***27***	<6.4	<5
Xylenes, Total	<0.68	<0.34	<0.14	<0.14	<0.34	<0.14	<0.34	<0.34	<0.068	<16	<13
Total Metals (µg/L)											
Arsenic	<0.15	0.24 J	0.32 J	0.18 J	0.29 J	0.15 J	<0.15	0.15 J	<0.15	NA	NA
Barium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	0.79 J	4.2 J	2.6 J	***12***	1.4 J	9.6	***34***	<0.64	1.2 J	NA	NA
Iron	<37	46 J B	<37	***230 B***	<37	86 J B	150	***200 B***	<37	NA	NA
Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	6.1	***83***	***100***	***63***	51	42	19	***100***	***66***	NA	NA
Mercury	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Metals (µg/L)											
Arsenic (Dissolved)	<0.15	0.21 J	0.20 J	0.38 J	0.27 J	<0.15	<0.15	<0.15	<0.15	NA	NA
Barium (Dissolved)	23	65 B	45	72 B	57	66 B	42	70 B	45	NA	NA

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Table 2. ISCO Pilot Test Groundwater Analytical Data, Madison Kipp Corporation, Madison, Wisconsin.

Well	MP-13 (continued)									MW-3S	
Sample Depth	**81-85'**	**102-106'**	**102-106'**	**121-125'**	**121-125'**	**135-139'**	**135-139'**	**163-167'**	**163-167'**	**--**	**--**
Sample Date	**1/19/13**	**12/04/12**	**1/18/13**	**12/4/12**	**1/18/13**	**12/4/12**	**1/17/13**	**12/4/12**	**1/16/13**	**4/7/10**	**3/29/11**
Dissolved Metals (µg/L) (continued)											
Cadmium (Dissolved)	<0.1	0.17 J	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA	NA
Chromium (Dissolved)	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64	<0.64	NA	NA
Iron (Dissolved)	<37	<37	<37	120 B	<37	43 J B	<37	52 J B	49 J B	NA	NA
Lead (Dissolved)	<0.16	0.20 J	<0.16	0.23 J	0.30 J	0.58	0.86	<0.16	<0.16	NA	NA
Manganese (Dissolved)	6.3	***86***	***97***	***67***	54	43	17	***100***	***66***	NA	NA
Mercury (Dissolved)	<0.071	<0.071	<0.071	<0.071	<0.071	<0.071	NA	<0.071	<0.071	NA	NA
Selenium (Dissolved)	<0.25	0.54 J	0.36 J	0.56 J	0.43 J	0.55 J	0.34 J	0.61 J	0.38 J	NA	NA
Silver (Dissolved)	<0.069	<0.069	<0.069	<0.069	<0.069	<0.069	<0.069	<0.069	<0.069	NA	NA
MISC (mg/L)											
Bromide	1.7	<0.77	0.38	<0.77	0.46	<0.77	0.19 J	<0.77	0.16 J	NA	NA
Chloride	200	290	180	310	240	300	220	320	180	NA	NA
TOC	5.4	5	6.7	5.2	6.2	5.2	6.4	5	4.5	NA	NA
Total Dissolved Solids	910	1,100	970	1,100	1,000	1,100	960	1,100	850	NA	NA
Deuterated Water	-61.40	-62.10	-59.02	-62.90	-61.62	-63.20	-60.82	-63.90	-61.22	NA	NA

Only VOCs detected in one or more water samples are listed on the table. Refer to laboratory analytical reports for a complete list of VOCs analyzed.

100	Concentration exceeds the NR 140 Wis. adm. code Preventive Action Limit (PAL).
100	Concentration exceeds the NR 140 Wis. adm. code Enforcement Standard (ES).
--	Not designated.
<	Not detected.
B	Compound was found in the blank and the sample.
J	Result is between the method detection limit and the limit of quantitation.
Q	Sample quenched using Environmental Protection Agency Guidance Document *Groundwater Sample Preservation at In-Situ Chemical Oxidation Sites - Recommended Guidelines*
U	Sample not quenched.
mg/L	Milligrams per liter.
µg/L	Micrograms per liter.
permil	Isotopic ratio of hydrogen and deuterium.
NA	Not analyzed.
VOCs	Volatile organic compounds.
MS	Sample collected from middle of screen.
HC	Sample collected from screen interval with highest conductivity.

Table 2. ISCO Pilot Test Groundwater Analytical Data, Madison Kipp Corporation, Madison, Wisconsin.

Well	MW-3S (continued)										
Sample Depth	**--**	**MS**	**HC**	**HC**	**HC**	**HC**	**HC**	**HC**	**HCU**	**MSQ**	**MSU**
Sample Date	**4/12/12**	**11/30/12**	**12/16/12**	**12/17/12**	**12/18/12**	**12/19/12**	**12/28/12**	**1/3/13**	**1/15/13**	**1/15/13**	**1/15/13**
VOC (µg/L)											
1,1,1,2-Tetrachloroethane	<1.6	<1.3	NA	NA	NA	NA	NA	NA	<0.25	<0.25	<0.25
1,1,2-Trichloroethane	<1.5	<1.4	NA	NA	NA	NA	NA	NA	<0.28	<0.28	<0.28
1,1-Dichloroethene	<1.5	<1.6	NA	NA	NA	NA	NA	NA	<0.31	<0.31	<0.31
Benzene	<0.6	***1.5 J***	NA	NA	NA	NA	NA	NA	0.28 J	0.42 J	***0.54***
Bromoform	<2.3	<1.4	NA	NA	NA	NA	NA	NA	<0.28	<0.28	***1.8***
Bromomethane	<2.5	<1.6	NA	NA	NA	NA	NA	NA	<0.31	<0.31	<0.31
Carbon tetrachloride	<1.4	<1.3	NA	NA	NA	NA	NA	NA	<0.26	<0.26	<0.26
Chloroform	***3.7 J***	***5***	NA	NA	NA	NA	NA	NA	***1***	***1.6***	***2.1***
cis-1,2-Dichloroethene	***89***	***98***	NA	NA	NA	NA	NA	NA	***13***	<0.12	<0.12
Ethylbenzene	<0.7	<0.65	NA	NA	NA	NA	NA	NA	<0.13	0.36 J	<0.13
Naphthalene	<1.2	<0.8	NA	NA	NA	NA	NA	NA	<0.16	<0.16	<0.16
Tetrachloroethene	***1,600***	***2,400***	NA	NA	NA	NA	NA	NA	***420***	***88***	<0.17
Toluene	<0.75	<0.55	NA	NA	NA	NA	NA	NA	<0.11	0.38 J	<0.11
trans-1,2-Dichloroethene	5.4	6	NA	NA	NA	NA	NA	NA	0.58 J	<0.25	<0.25
Trichloroethene	***120***	***160***	NA	NA	NA	NA	NA	NA	***25***	<0.19	<0.19
Vinyl chloride	<0.65	<0.5	NA	NA	NA	NA	NA	NA	<0.1	<0.1	<0.1
Xylenes, Total	<1.5	<0.34	NA	NA	NA	NA	NA	NA	<0.068	2.4	<0.068
Total Metals (µg/L)											
Arsenic	NA	0.49 J	NA	<3.7	NA	NA	NA	NA	NA	<3.7	NA
Barium	NA	NA	NA	69	NA	NA	NA	NA	NA	NA	NA
Cadmium	NA	NA	NA	<2.6	NA	NA	NA	NA	NA	NA	NA
Chromium	NA	<0.64	NA	***270***	NA	NA	NA	NA	NA	***510***	NA
Iron	NA	37 J	NA	<920	NA	NA	NA	NA	NA	<920	NA
Lead	NA	NA	NA	<0.78	NA	NA	NA	NA	NA	NA	NA
Manganese	NA	34	NA	***800,000***	NA	NA	NA	NA	NA	***460,000***	NA
Mercury	NA	NA	NA	***13***	NA	NA	NA	NA	NA	NA	NA
Selenium	NA	NA	NA	***23 J***	NA	NA	NA	NA	NA	NA	NA
Silver	NA	NA	NA	7.1 J	NA	NA	NA	NA	NA	NA	NA
Dissolved Metals (µg/L)											
Arsenic (Dissolved)	NA	0.45 J	NA	NA	NA	NA	NA	NA	NA	<3.7	NA
Barium (Dissolved)	NA	88	NA	NA	NA	NA	NA	NA	NA	34 J	NA

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Table 2. ISCO Pilot Test Groundwater Analytical Data, Madison Kipp Corporation, Madison, Wisconsin.

Well	MW-3S (continued)										
Sample Depth	**--**	**MS**	**HC**	**HC**	**HC**	**HC**	**HC**	**HC**	**HCU**	**MSQ**	**MSU**
Sample Date	**4/12/12**	**11/30/12**	**12/16/12**	**12/17/12**	**12/18/12**	**12/19/12**	**12/28/12**	**1/3/13**	**1/15/13**	**1/15/13**	**1/15/13**
Dissolved Metals (µg/L) (continued)											
Cadmium (Dissolved)	NA	<0.1	NA	NA	NA	NA	NA	NA	NA	<2.6	NA
Chromium (Dissolved)	NA	<0.64	NA	NA	NA	NA	NA	NA	NA	***510***	NA
Iron (Dissolved)	NA	<37	NA	NA	NA	NA	NA	NA	NA	<920	NA
Lead (Dissolved)	NA	<0.16	NA	NA	NA	NA	NA	NA	NA	<3.9	NA
Manganese (Dissolved)	NA	26	NA	NA	NA	NA	NA	NA	NA	***370,000***	NA
Mercury (Dissolved)	NA	0.072 J	NA	NA	NA	NA	NA	NA	NA	***4.1***	NA
Selenium (Dissolved)	NA	0.74 J	NA	NA	NA	NA	NA	NA	NA	***35 J***	NA
Silver (Dissolved)	NA	<0.069	NA	NA	NA	NA	NA	NA	NA	2.6 J	NA
MISC (mg/L)											
Bromide	NA	<3.9	NA	NA	<15	<0.77	<0.77	0.39 J	<0.077	<0.77	NA
Chloride	NA	730	NA	NA	420	3,600	1,400	1,700	1,400	940	NA
TOC	NA	2.4	NA	12	NA	NA	NA	NA	NA	16	NA
Total Dissolved Solids	NA	2,500	NA	NA	12,000	7,100	3,400	3,800	2,700	3,400	NA
Deuterated Water	NA	-60.40	-46.12	298.00	133.50	-67.02	-52.88	-54.90	-75.97	-34.06	NA

Only VOCs detected in one or more water samples are listed on the table. Refer to laboratory analytical reports for a complete list of VOCs analyzed.

100	Concentration exceeds the NR 140 Wis. adm. code Preventive Action Limit (PAL).
100	Concentration exceeds the NR 140 Wis. adm. code Enforcement Standard (ES).
--	Not designated.
<	Not detected.
B	Compound was found in the blank and the sample.
J	Result is between the method detection limit and the limit of quantitation.
Q	Sample quenched using Environmental Protection Agency Guidance Document *Groundwater Sample Preservation at In-Situ Chemical Oxidation Sites - Recommended Guidelines*
U	Sample not quenched.
mg/L	Milligrams per liter.
µg/L	Micrograms per liter.
permil	Isotopic ratio of hydrogen and deuterium.
NA	Not analyzed.
VOCs	Volatile organic compounds.
MS	Sample collected from middle of screen.
HC	Sample collected from screen interval with highest conductivity.

Table 2. ISCO Pilot Test Groundwater Analytical Data, Madison Kipp Corporation, Madison, Wisconsin.

Well	MW-3D									MW-3D2	
Sample Depth	--	--	--	--	MS	MS	MS	MS	MS	--	--
Sample Date	4/7/10	10/1/10	3/30/11	4/12/12	11/30/12	12/19/12	12/28/12	1/3/13	1/16/13	12/31/09	4/7/10
VOC (µg/L)											
1,1,1,2-Tetrachloroethane	<8	<0.25	<5	<0.31	<1.3	NA	NA	NA	<0.25	<6.3	<13
1,1,2-Trichloroethane	<8	<0.25	<5	<0.3	<1.4	NA	NA	NA	<0.28	<6.3	<13
1,1-Dichloroethene	<16	<0.5	<10	<0.29	<1.6	NA	NA	NA	<0.31	<13	<25
Benzene	<6.4	0.31	<4	0.39 J	<0.37	NA	NA	NA	0.32 J	<5	<10
Bromoform	<6.4	<0.2	<4	<0.45	<1.4	NA	NA	NA	<0.28	<5	<10
Bromomethane	<16	<0.5	<10	<0.49	<1.6	NA	NA	NA	<0.31	<13	<25
Carbon tetrachloride	<26	<0.8	<16	<0.28	<1.3	NA	NA	NA	<0.26	<20	<40
Chloroform	<6.4	***0.78***	<4	***0.93 J***	<1	NA	NA	NA	***0.89 J***	<5	<10
cis-1,2-Dichloroethene	***510***	***310***	***300***	***350***	***520***	NA	NA	NA	***290***	***520***	***510***
Ethylbenzene	<16	<0.5	<10	<0.14	<0.65	NA	NA	NA	<0.13	<13	<25
Naphthalene	<8	<0.25	<5	<0.24	<0.8	NA	NA	NA	<0.16	<6.3	<13
Tetrachloroethene	***1,700***	***1,500***	***1,200***	***1,100***	***1,800***	NA	NA	NA	***660***	***4,900***	***4,400***
Toluene	<16	<0.5	<10	<0.15	<0.55	NA	NA	NA	<0.11	<13	<25
trans-1,2-Dichloroethene	<16	6.6	<10	5.9	7.7	NA	NA	NA	6	<13	<25
Trichloroethene	***270***	***200***	***170***	***160***	***250***	NA	NA	NA	***140***	***280***	***240***
Vinyl chloride	<6.4	<0.2	<4	<0.13	<0.5	NA	NA	NA	<0.1	<5	<10
Xylenes, Total	<16	<0.5	<10	<0.3	<0.34	NA	NA	NA	<0.068	<13	<25
Total Metals (µg/L)											
Arsenic	NA	NA	NA	NA	0.32 J	NA	NA	NA	0.18 J	NA	NA
Barium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	NA	NA	NA	NA	3.7 J	NA	NA	NA	0.70 J	NA	NA
Iron	NA	NA	NA	NA	***400***	NA	NA	NA	79 J B	NA	NA
Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	NA	NA	NA	NA	42	NA	NA	NA	***170***	NA	NA
Mercury	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Metals (µg/L)											
Arsenic (Dissolved)	NA	NA	NA	NA	0.23 J	NA	NA	NA	0.18 J	NA	NA
Barium (Dissolved)	NA	NA	NA	NA	68	NA	NA	NA	66	NA	NA

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Table 2. ISCO Pilot Test Groundwater Analytical Data, Madison Kipp Corporation, Madison, Wisconsin.

Well	MW-3D									MW-3D2	
Sample Depth	**--**	**--**	**--**	**--**	**MS**	**MS**	**MS**	**MS**	**MS**	**--**	**--**
Sample Date	**4/7/10**	**10/1/10**	**3/30/11**	**4/12/12**	**11/30/12**	**12/19/12**	**12/28/12**	**1/3/13**	**1/16/13**	**12/31/09**	**4/7/10**
Dissolved Metals (µg/L) (continued)											
Cadmium (Dissolved)	NA	NA	NA	NA	0.13 J	NA	NA	NA	0.15 J	NA	NA
Chromium (Dissolved)	NA	NA	NA	NA	2.4 J	NA	NA	NA	0.77 J	NA	NA
Iron (Dissolved)	NA	NA	NA	NA	<37	NA	NA	NA	<37	NA	NA
Lead (Dissolved)	NA	NA	NA	NA	<0.16	NA	NA	NA	0.29 J	NA	NA
Manganese (Dissolved)	NA	NA	NA	NA	28	NA	NA	NA	***170***	NA	NA
Mercury (Dissolved)	NA	NA	NA	NA	<0.071	NA	NA	NA	NA	NA	NA
Selenium (Dissolved)	NA	NA	NA	NA	<0.25	NA	NA	NA	<0.25	NA	NA
Silver (Dissolved)	NA	NA	NA	NA	<0.069	NA	NA	NA	<0.069	NA	NA
MISC (mg/L)											
Bromide	NA	NA	NA	NA	<0.77	0.22 J	0.23 J	0.21 J	0.27	NA	NA
Chloride	NA	NA	NA	NA	350	900	1,200	1,200	590	NA	NA
TOC	NA	NA	NA	NA	3.6	NA	NA	NA	4.5	NA	NA
Total Dissolved Solids	NA	NA	NA	NA	1,700	2,100	2,400	2,200	2,000	NA	NA
Deuterated Water	NA	NA	NA	NA	-58.30	-78.71	-79.49	-72.19	-64.38	NA	NA

Only VOCs detected in one or more water samples are listed on the table. Refer to laboratory analytical reports for a complete list of VOCs analyzed.

100	Concentration exceeds the NR 140 Wis. adm. code Preventive Action Limit (PAL).
100	Concentration exceeds the NR 140 Wis. adm. code Enforcement Standard (ES).
--	Not designated.
<	Not detected.
B	Compound was found in the blank and the sample.
J	Result is between the method detection limit and the limit of quantitation.
Q	Sample quenched using Environmental Protection Agency Guidance Document *Groundwater Sample Preservation at In-Situ Chemical Oxidation Sites - Recommended Guidelines*
U	Sample not quenched.
mg/L	Milligrams per liter.
µg/L	Micrograms per liter.
permil	Isotopic ratio of hydrogen and deuterium.
NA	Not analyzed.
VOCs	Volatile organic compounds.
MS	Sample collected from middle of screen.
HC	Sample collected from screen interval with highest conductivity.

Table 2. ISCO Pilot Test Groundwater Analytical Data, Madison Kipp Corporation, Madison, Wisconsin.

Well	MW-3D2 (continued)									MW-3D3	
Sample Depth	--	--	--	--	MS	MS	MS	MS	MS	--	MS
Sample Date	7/1/10	10/1/10	3/30/11	4/12/12	11/30/12	12/19/12	12/28/12	1/3/13	1/16/13	7/24/12	11/27/12
VOC (µg/L)											
1,1,1,2-Tetrachloroethane	<13	<0.25	<13	<1.6	<1.3	NA	NA	NA	<0.5	<0.25	<0.25
1,1,2-Trichloroethane	<13	<0.25	<13	<1.5	<1.4	NA	NA	NA	<0.56	<0.28	<0.28
1,1-Dichloroethene	<25	<0.5	<25	<1.5	<1.6	NA	NA	NA	<0.62	<0.31	<0.31
Benzene	<10	<0.2	<10	<0.6	<0.37	NA	NA	NA	<0.15	<0.074	<0.074
Bromoform	<10	<0.2	<10	<2.3	<1.4	NA	NA	NA	<0.56	<0.28	<0.28
Bromomethane	<25	<0.5	<25	<2.5	<1.6	NA	NA	NA	<0.62	<0.31	<0.31
Carbon tetrachloride	<40	<0.8	<40	<1.4	<1.3	NA	NA	NA	<0.52	<0.26	<0.26
Chloroform	<10	0.37	<10	<1.3	<1	NA	NA	NA	<0.4	<0.2	<0.2
cis-1,2-Dichloroethene	***460***	***400***	***440***	***440***	***420***	NA	NA	NA	***320***	2.2	6.8
Ethylbenzene	<25	<0.5	<25	<0.7	<0.65	NA	NA	NA	<0.26	<0.13	<0.13
Naphthalene	***240***	<0.25	***13***	<1.2	<0.8	NA	NA	NA	<0.32	<0.16	<0.16
Tetrachloroethene	***3,900***	***3,900***	***3,800***	***2,600***	***2,800***	NA	NA	NA	***1,200***	***6.6***	***1.7***
Toluene	<25	<0.5	<25	<0.75	<0.55	NA	NA	NA	<0.22	<0.11	<0.11
trans-1,2-Dichloroethene	<25	7	<25	6.4	5.6	NA	NA	NA	4.9	<0.25	<0.25
Trichloroethene	***240***	***240***	***230***	***190***	***190***	NA	NA	NA	***110***	***1.1***	***1.1***
Vinyl chloride	<10	***0.65***	<10	<0.65	<0.5	NA	NA	NA	<0.2	<0.1	<0.1
Xylenes, Total	<25	<0.5	<25	<1.5	<0.34	NA	NA	NA	<0.14	<0.068	<0.068
Total Metals (µg/L)											
Arsenic	NA	NA	NA	NA	0.21 J	NA	NA	NA	0.19 J	NA	0.93 J
Barium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	NA	NA	NA	NA	4.1 J	NA	NA	NA	4.1 J	NA	0.83 J
Iron	NA	NA	NA	NA	<37	NA	NA	NA	<37	NA	***4,400***
Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	NA	NA	NA	NA	1.6 J	NA	NA	NA	17	NA	***870***
Mercury	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Metals (µg/L)											
Arsenic (Dissolved)	NA	NA	NA	NA	0.28 J	NA	NA	NA	0.15 J	NA	0.91 J
Barium (Dissolved)	NA	NA	NA	NA	43	NA	NA	NA	42	NA	85

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Table 2. ISCO Pilot Test Groundwater Analytical Data, Madison Kipp Corporation, Madison, Wisconsin.

Well	MW-3D2 (continued)									MW-3D3	
Sample Depth	**--**	**--**	**--**	**--**	**MS**	**MS**	**MS**	**MS**	**MS**	**--**	**MS**
Sample Date	**7/1/10**	**10/1/10**	**3/30/11**	**4/12/12**	**11/30/12**	**12/19/12**	**12/28/12**	**1/3/13**	**1/16/13**	**7/24/12**	**11/27/12**
Dissolved Metals (µg/L) (continued)											
Cadmium (Dissolved)	NA	NA	NA	NA	<0.1	NA	NA	NA	0.10 J	NA	<0.1
Chromium (Dissolved)	NA	NA	NA	NA	4.0 J	NA	NA	NA	4.4 J	NA	<0.64
Iron (Dissolved)	NA	NA	NA	NA	<37	NA	NA	NA	<37	NA	***4,200***
Lead (Dissolved)	NA	NA	NA	NA	<0.16	NA	NA	NA	0.16 J	NA	<0.16
Manganese (Dissolved)	NA	NA	NA	NA	3.4	NA	NA	NA	19	NA	***820***
Mercury (Dissolved)	NA	NA	NA	NA	<0.071	NA	NA	NA	NA	NA	0.17 J B
Selenium (Dissolved)	NA	NA	NA	NA	0.39 J	NA	NA	NA	0.42 J	NA	<0.25
Silver (Dissolved)	NA	NA	NA	NA	<0.069	NA	NA	NA	<0.069	NA	<0.069
MISC (mg/L)											
Bromide	NA	NA	NA	NA	<0.77	0.12 J	<0.077	<0.077	0.15 J	NA	<0.077
Chloride	NA	NA	NA	NA	100	550	840	480	260	NA	2.5
TOC	NA	NA	NA	NA	2.7	NA	NA	NA	3.3	NA	3.7
Total Dissolved Solids	NA	NA	NA	NA	730	1,300	1,800	1,500	1,000	NA	410
Deuterated Water	NA	NA	NA	NA	-60.40	-64.76	-64.18	-62.02	-61.31	NA	-59.60

Only VOCs detected in one or more water samples are listed on the table. Refer to laboratory analytical reports for a complete list of VOCs analyzed.

100	Concentration exceeds the NR 140 Wis. adm. code Preventive Action Limit (PAL).
100	Concentration exceeds the NR 140 Wis. adm. code Enforcement Standard (ES).
--	Not designated.
<	Not detected.
B	Compound was found in the blank and the sample.
J	Result is between the method detection limit and the limit of quantitation.
Q	Sample quenched using Environmental Protection Agency Guidance Document *Groundwater Sample Preservation at In-Situ Chemical Oxidation Sites - Recommended Guidelines*
U	Sample not quenched.
mg/L	Milligrams per liter.
µg/L	Micrograms per liter.
permil	Isotopic ratio of hydrogen and deuterium.
NA	Not analyzed.
VOCs	Volatile organic compounds.
MS	Sample collected from middle of screen.
HC	Sample collected from screen interval with highest conductivity.

Table 2. ISCO Pilot Test Groundwater Analytical Data, Madison Kipp Corporation, Madison, Wisconsin.

Well	MW-3D3 (continued)				MW-5S					MW-5D		
Sample Depth	MS	MS	MS	MS	--	--	MS	MS	MS	--	--	MS
Sample Date	12/19/12	12/31/12	1/3/13	1/18/13	4/7/10	10/1/10	4/12/12	11/28/12	1/17/13	4/7/10	4/12/12	11/28/12
VOC (µg/L)												
1,1,1,2-Tetrachloroethane	NA	NA	NA	<0.25	<0.25	<0.25	<0.31	<0.25	<0.25	<5	<0.31	<1.3
1,1,2-Trichloroethane	NA	NA	NA	<0.28	<0.25	<0.25	<0.3	<0.28	<0.28	<5	<0.3	<1.4
1,1-Dichloroethene	NA	NA	NA	<0.31	<0.5	<0.5	<0.29	<0.31	<0.31	<10	<0.29	<1.6
Benzene	NA	NA	NA	0.30 J	<0.2	<0.2	<0.12	<0.074	<0.074	<4	0.29 J	***1.1 J***
Bromoform	NA	NA	NA	<0.28	<0.2	<0.2	<0.45	<0.28	<0.28	<4	<0.45	<1.4
Bromomethane	NA	NA	NA	<0.31	<0.5	<0.5	<0.49	<0.31	0.73 J	<10	<0.49	<1.6
Carbon tetrachloride	NA	NA	NA	<0.26	<0.8	<0.8	***1.2***	***1.1***	<0.26	<16	<0.28	<1.3
Chloroform	NA	NA	NA	<0.2	<0.2	0.55	***0.84 J***	***0.79 J***	***0.79 J***	<4	<0.25	<1
cis-1,2-Dichloroethene	NA	NA	NA	***15***	1.4	***10***	***13***	4.2	3.8	***48***	***26***	***93***
Ethylbenzene	NA	NA	NA	<0.13	<0.5	<0.5	<0.14	<0.13	<0.13	<10	<0.14	<0.65
Naphthalene	NA	NA	NA	<0.16	1.4	<0.25	<0.24	<0.16	<0.16	<5	<0.24	<0.8
Tetrachloroethene	NA	NA	NA	***1.3***	***41***	***670***	***360***	***240***	***260***	***1,100***	***400***	***2,000***
Toluene	NA	NA	NA	0.21 J	<0.5	<0.5	<0.15	<0.11	<0.11	<10	0.30 J	<0.55
trans-1,2-Dichloroethene	NA	NA	NA	<0.25	<0.5	0.5	<0.27	<0.25	<0.25	<10	1.3	3.9 J
Trichloroethene	NA	NA	NA	0.40 J	***1***	***13***	***9.8***	***4.7***	***4.4***	***100***	***48***	***190***
Vinyl chloride	NA	NA	NA	<0.1	<0.2	<0.2	<0.13	<0.1	<0.1	<4	<0.13	<0.5
Xylenes, Total	NA	NA	NA	<0.068	<0.5	<0.5	<0.3	<0.068	<0.068	<10	<0.3	<0.34
Total Metals (µg/L)												
Arsenic	NA	NA	NA	***1.4***	NA	NA	NA	0.36 J	0.28 J	NA	NA	0.25 J
Barium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	NA	NA	NA	2.2 J	NA	NA	NA	4.3 J	3.8 J	NA	NA	***33***
Iron	NA	NA	NA	***5,000***	NA	NA	NA	***310***	75 J	NA	NA	***220***
Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	NA	NA	NA	***670***	NA	NA	NA	48	5.3 B	NA	NA	20
Mercury	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Metals (µg/L)												
Arsenic (Dissolved)	NA	NA	NA	***1.5***	NA	NA	NA	0.24 J	0.26 J	NA	NA	<0.15
Barium (Dissolved)	NA	NA	NA	81	NA	NA	NA	96	97	NA	NA	24

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Table 2. ISCO Pilot Test Groundwater Analytical Data, Madison Kipp Corporation, Madison, Wisconsin.

Well	MW-3D3 (continued)				MW-5S					MW-5D		
Sample Depth	**MS**	**MS**	**MS**	**MS**	**--**	**--**	**MS**	**MS**	**MS**	**--**	**--**	**MS**
Sample Date	**12/19/12**	**12/31/12**	**1/3/13**	**1/18/13**	**4/7/10**	**10/1/10**	**4/12/12**	**11/28/12**	**1/17/13**	**4/7/10**	**4/12/12**	**11/28/12**
Dissolved Metals (µg/L) (continued)												
Cadmium (Dissolved)	NA	NA	NA	<0.1	NA	NA	NA	<0.1	<0.1	NA	NA	<0.1
Chromium (Dissolved)	NA	NA	NA	0.81 J	NA	NA	NA	3.8 J	3.8 J	NA	NA	***22***
Iron (Dissolved)	NA	NA	NA	***4,900***	NA	NA	NA	<37	<37	NA	NA	<37
Lead (Dissolved)	NA	NA	NA	<0.16	NA	NA	NA	<0.16	0.20 J	NA	NA	<0.16
Manganese (Dissolved)	NA	NA	NA	***690***	NA	NA	NA	8.8	0.86 J B	NA	NA	10
Mercury (Dissolved)	NA	NA	NA	<0.071	NA	NA	NA	0.17 J B	<0.071	NA	NA	***0.22 B***
Selenium (Dissolved)	NA	NA	NA	<0.25	NA	NA	NA	<0.25	<0.25	NA	NA	<0.25
Silver (Dissolved)	NA	NA	NA	<0.069	NA	NA	NA	<0.069	<0.069	NA	NA	<0.069
MISC (mg/L)												
Bromide	<0.077	<0.077	<0.077	<0.077	NA	NA	NA	<0.77	0.093 J	NA	NA	<0.77
Chloride	2.7	3	3.7	3	NA	NA	NA	350	360	NA	NA	130
TOC	NA	NA	NA	7	NA	NA	NA	1.7	1.7	NA	NA	2.7
Total Dissolved Solids	350	360	320	300	NA	NA	NA	960	930	NA	NA	980
Deuterated Water	-58.58	-58.83	-58.13	-58.26	NA	NA	NA	-54.60	-53.84	NA	NA	-55.00

Only VOCs detected in one or more water samples are listed on the table. Refer to laboratory analytical reports for a complete list of VOCs analyzed.

100	Concentration exceeds the NR 140 Wis. adm. code Preventive Action Limit (PAL).
100	Concentration exceeds the NR 140 Wis. adm. code Enforcement Standard (ES).
--	Not designated.
<	Not detected.
B	Compound was found in the blank and the sample.
J	Result is between the method detection limit and the limit of quantitation.
Q	Sample quenched using Environmental Protection Agency Guidance Document *Groundwater Sample Preservation at In-Situ Chemical Oxidation Sites - Recommended Guidelines*
U	Sample not quenched.
mg/L	Milligrams per liter.
µg/L	Micrograms per liter.
permil	Isotopic ratio of hydrogen and deuterium.
NA	Not analyzed.
VOCs	Volatile organic compounds.
MS	Sample collected from middle of screen.
HC	Sample collected from screen interval with highest conductivity.

Table 2. ISCO Pilot Test Groundwater Analytical Data, Madison Kipp Corporation, Madison, Wisconsin.

Well	MW-5D (continued)	MW-5D2				MW-5D3			MW-18S	
Sample Depth	MS	--	--	MS	MS	--	MS	MS	MS	HC
Sample Date	1/17/13	4/8/10	4/12/12	11/30/12	1/17/13	7/24/12	11/28/12	1/18/13	11/28/12	12/17/12
VOC (µg/L)										
1,1,1,2-Tetrachloroethane	<0.5	<0.25	<0.31	NA	<0.25	<0.25	<0.25	<0.25	<1.3	NA
1,1,2-Trichloroethane	<0.56	<0.25	<0.3	NA	<0.28	<0.28	<0.28	<0.28	<1.4	NA
1,1-Dichloroethene	<0.62	<0.5	<0.29	NA	<0.31	<0.31	<0.31	<0.31	<1.6	NA
Benzene	***1.2***	<0.2	<0.12	NA	<0.074	<0.074	<0.074	0.28 J	***3.2***	NA
Bromoform	<0.56	<0.2	<0.45	NA	<0.28	<0.28	<0.28	<0.28	<1.4	NA
Bromomethane	<0.62	<0.5	<0.49	NA	<0.31	<0.31	<0.31	<0.31	<1.6	NA
Carbon tetrachloride	<0.52	<0.8	<0.28	NA	<0.26	<0.26	<0.26	<0.26	<1.3	NA
Chloroform	***1.0 J***	<0.2	<0.25	NA	<0.2	<0.2	<0.2	<0.2	***7.2***	NA
cis-1,2-Dichloroethene	***110***	<0.5	<0.22	NA	6.6	3.7	3.1	***12***	***150***	NA
Ethylbenzene	<0.26	<0.5	<0.14	NA	<0.13	<0.13	<0.13	<0.13	<0.65	NA
Naphthalene	<0.32	1.6	<0.24	NA	<0.16	<0.16	<0.16	<0.16	<0.8	NA
Tetrachloroethene	***1,800***	***81***	***47***	NA	***650***	***23***	***19***	***0.59 J***	***3,300***	NA
Toluene	<0.22	<0.5	<0.15	NA	0.7	<0.11	<0.11	<0.11	1.1 J	NA
trans-1,2-Dichloroethene	3.9	<0.5	<0.27	NA	<0.25	<0.25	<0.25	<0.25	7.4	NA
Trichloroethene	***180***	***0.71***	<0.18	NA	***9.5***	***2.4***	***2.6***	<0.19	***230***	NA
Vinyl chloride	<0.2	<0.2	<0.13	NA	<0.1	<0.1	<0.1	<0.1	<0.5	NA
Xylenes, Total	<0.14	<0.5	<0.3	NA	<0.068	<0.068	<0.068	<0.068	<0.34	NA
Total Metals (µg/L)										
Arsenic	0.15 J	NA	NA	0.25 J	0.18 J	NA	0.61 J	***1.1***	0.58 J	0.40 J
Barium	NA	NA	NA	NA	NA	NA	NA	NA	NA	240
Cadmium	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.13 J
Chromium	***20***	NA	NA	8.6	6.5	NA	1.3 J	1.2 J	<0.64	<0.64
Iron	<37	NA	NA	120	***250***	NA	***840***	***1,000***	***410***	<37
Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.16
Manganese	9.4 B	NA	NA	18	34 B	NA	***400***	***570***	***1,600***	***620***
Mercury	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.071
Selenium	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.58 J
Silver	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.069
Dissolved Metals (µg/L)										
Arsenic (Dissolved)	0.15 J	NA	NA	0.15 J	<0.15	NA	0.30 J	0.61 J	0.46 J	NA
Barium (Dissolved)	24	NA	NA	18	22	NA	70	68	200	NA

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Table 2. ISCO Pilot Test Groundwater Analytical Data, Madison Kipp Corporation, Madison, Wisconsin.

Well	MW-5D (continued)	MW-5D2				MW-5D3			MW-18S	
Sample Depth	**MS**	**--**	**--**	**MS**	**MS**	**--**	**MS**	**MS**	**MS**	**HC**
Sample Date	**1/17/13**	**4/8/10**	**4/12/12**	**11/30/12**	**1/17/13**	**7/24/12**	**11/28/12**	**1/18/13**	**11/28/12**	**12/17/12**
Dissolved Metals (µg/L) (continued)										
Cadmium (Dissolved)	<0.1	NA	NA	<0.1	<0.1	NA	<0.1	<0.1	<0.1	NA
Chromium (Dissolved)	***21***	NA	NA	8.8	5.1	NA	1.1 J	<0.64	<0.64	NA
Iron (Dissolved)	<37	NA	NA	<37	<37	NA	***850***	***970***	<37	NA
Lead (Dissolved)	<0.16	NA	NA	<0.16	<0.16	NA	<0.16	<0.16	<0.16	NA
Manganese (Dissolved)	10 B	NA	NA	14	29 B	NA	***430***	***560***	***1,600***	NA
Mercury (Dissolved)	<0.071	NA	NA	0.072 J	<0.071	NA	0.17 J B	<0.071	<0.071	NA
Selenium (Dissolved)	<0.25	NA	NA	1.5 J	1.6 J	NA	<0.25	<0.25	0.43 J	NA
Silver (Dissolved)	<0.069	NA	NA	<0.069	<0.069	NA	<0.069	<0.069	<0.069	NA
MISC (mg/L)										
Bromide	0.19 J	NA	NA	<0.077	<0.077	NA	<0.077	<0.077	13	NA
Chloride	120	NA	NA	46	51	NA	4.4	2.6	1,200	NA
TOC	2.6	NA	NA	1.4	0.95 J	NA	2.8	3.6	2.4	4.2
Total Dissolved Solids	930	NA	NA	720	590	NA	360	290	3,300	NA
Deuterated Water	-54.30	NA	NA	-57.10	-56.75	NA	-57.50	-56.97	-53.20	-55.32

Only VOCs detected in one or more water samples are listed on the table. Refer to laboratory analytical reports for a complete list of VOCs analyzed.

100	Concentration exceeds the NR 140 Wis. adm. code Preventive Action Limit (PAL).
100	Concentration exceeds the NR 140 Wis. adm. code Enforcement Standard (ES).
--	Not designated.
<	Not detected.
B	Compound was found in the blank and the sample.
J	Result is between the method detection limit and the limit of quantitation.
Q	Sample quenched using Environmental Protection Agency Guidance Document *Groundwater Sample Preservation at In-Situ Chemical Oxidation Sites - Recommended Guidelines*
U	Sample not quenched.
mg/L	Milligrams per liter.
µg/L	Micrograms per liter.
permil	Isotopic ratio of hydrogen and deuterium.
NA	Not analyzed.
VOCs	Volatile organic compounds.
MS	Sample collected from middle of screen.
HC	Sample collected from screen interval with highest conductivity.

Table 2. ISCO Pilot Test Groundwater Analytical Data, Madison Kipp Corporation, Madison, Wisconsin.

Well	MW-18S (continued)						MW-19D				
Sample Depth	HC	HC	HC	HC	HC	MS	MS	HC	HC	HC	HC
Sample Date	12/18/12	12/19/12	12/28/12	1/3/13	1/15/13	1/15/13	11/29/12	12/11/12	12/12/12	12/13/12	12/14/12
VOC (µg/L)											
1,1,1,2-Tetrachloroethane	NA	NA	NA	NA	<0.5	<0.25	<1.3	NA	NA	NA	NA
1,1,2-Trichloroethane	NA	NA	NA	NA	<0.56	<0.28	<1.4	NA	NA	NA	NA
1,1-Dichloroethene	NA	NA	NA	NA	<0.62	<0.31	<1.6	NA	NA	NA	NA
Benzene	NA	NA	NA	NA	***0.90 J***	0.46 J	<0.37	NA	NA	NA	NA
Bromoform	NA	NA	NA	NA	<0.56	<0.28	<1.4	NA	NA	NA	NA
Bromomethane	NA	NA	NA	NA	<0.62	<0.31	<1.6	NA	NA	NA	NA
Carbon tetrachloride	NA	NA	NA	NA	<0.52	<0.26	<1.3	NA	NA	NA	NA
Chloroform	NA	NA	NA	NA	***3.1***	***2.3***	<1	NA	NA	NA	NA
cis-1,2-Dichloroethene	NA	NA	NA	NA	***56***	***40***	***530***	NA	NA	NA	NA
Ethylbenzene	NA	NA	NA	NA	<0.26	<0.13	<0.65	NA	NA	NA	NA
Naphthalene	NA	NA	NA	NA	<0.32	<0.16	<0.8	NA	NA	NA	NA
Tetrachloroethene	NA	NA	NA	NA	***830***	***690***	***2,400***	NA	NA	NA	NA
Toluene	NA	NA	NA	NA	<0.22	<0.11	<0.55	NA	NA	NA	NA
trans-1,2-Dichloroethene	NA	NA	NA	NA	3.3	2.6	7.2	NA	NA	NA	NA
Trichloroethene	NA	NA	NA	NA	***75***	***59***	***230***	NA	NA	NA	NA
Vinyl chloride	NA	NA	NA	NA	<0.2	<0.1	***9.1***	NA	NA	NA	NA
Xylenes, Total	NA	NA	NA	NA	<0.14	<0.068	<0.34	NA	NA	NA	NA
Total Metals (µg/L)											
Arsenic	NA	NA	NA	NA	NA	0.35 J	0.17 J	NA	NA	<1.5	NA
Barium	NA	NA	NA	NA	NA	NA	NA	NA	NA	31 B	NA
Cadmium	NA	NA	NA	NA	NA	NA	NA	NA	NA	<1	NA
Chromium	NA	NA	NA	NA	NA	1.3 J	<0.64	NA	NA	***31 J***	NA
Iron	NA	NA	NA	NA	NA	55 J	<37	NA	NA	<370	NA
Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA	<1.6	NA
Manganese	NA	NA	NA	NA	NA	***570***	24	NA	NA	***63,000 B***	NA
Mercury	NA	NA	NA	NA	NA	NA	NA	NA	NA	***1.4***	NA
Selenium	NA	NA	NA	NA	NA	NA	NA	NA	NA	<2.5	NA
Silver	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.69	NA
Dissolved Metals (µg/L)											
Arsenic (Dissolved)	NA	NA	NA	NA	NA	0.34 J	0.17 J	NA	NA	NA	NA
Barium (Dissolved)	NA	NA	NA	NA	NA	260	63	NA	NA	NA	NA

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Table 2. ISCO Pilot Test Groundwater Analytical Data, Madison Kipp Corporation, Madison, Wisconsin.

Well	MW-18S (continued)						MW-19D				
Sample Depth	**HC**	**HC**	**HC**	**HC**	**HC**	**MS**	**MS**	**HC**	**HC**	**HC**	**HC**
Sample Date	**12/18/12**	**12/19/12**	**12/28/12**	**1/3/13**	**1/15/13**	**1/15/13**	**11/29/12**	**12/11/12**	**12/12/12**	**12/13/12**	**12/14/12**
Dissolved Metals (µg/L) (continued)											
Cadmium (Dissolved)	NA	NA	NA	NA	NA	<0.1	<0.1	NA	NA	NA	NA
Chromium (Dissolved)	NA	NA	NA	NA	NA	<0.64	<0.64	NA	NA	NA	NA
Iron (Dissolved)	NA	NA	NA	NA	NA	<37	<37	NA	NA	NA	NA
Lead (Dissolved)	NA	NA	NA	NA	NA	<0.16	<0.16	NA	NA	NA	NA
Manganese (Dissolved)	NA	NA	NA	NA	NA	***570***	26	NA	NA	NA	NA
Mercury (Dissolved)	NA	NA	NA	NA	NA	<0.071	<0.071	NA	NA	NA	NA
Selenium (Dissolved)	NA	NA	NA	NA	NA	0.45 J	0.48 J	NA	NA	NA	NA
Silver (Dissolved)	NA	NA	NA	NA	NA	<0.069	<0.069	NA	NA	NA	NA
MISC (mg/L)											
Bromide	0.69	0.51	0.63	0.53	0.63	0.7	<0.77	<1.5	4.1 J	3.8 J	3.7 J
Chloride	570	2,700	2,600	2,000	1,600	1,200	200	180	180	190	190
TOC	NA	NA	NA	NA	NA	2.4	4.1	NA	NA	4.0 J	NA
Total Dissolved Solids	1,700	4,800	4,300	3,900	3,200	2,700	910	1,100	1,400	1,300	1,300
Deuterated Water	-58.30	-69.81	-67.84	-65.10	-64.85	-65.18	-62.20	NA	NA	NA	NA

Only VOCs detected in one or more water samples are listed on the table. Refer to laboratory analytical reports for a complete list of VOCs analyzed.

100	Concentration exceeds the NR 140 Wis. adm. code Preventive Action Limit (PAL).
100	Concentration exceeds the NR 140 Wis. adm. code Enforcement Standard (ES).
--	Not designated.
<	Not detected.
B	Compound was found in the blank and the sample.
J	Result is between the method detection limit and the limit of quantitation.
Q	Sample quenched using Environmental Protection Agency Guidance Document *Groundwater Sample Preservation at In-Situ Chemical Oxidation Sites - Recommended Guidelines*
U	Sample not quenched.
mg/L	Milligrams per liter.
µg/L	Micrograms per liter.
permil	Isotopic ratio of hydrogen and deuterium.
NA	Not analyzed.
VOCs	Volatile organic compounds.
MS	Sample collected from middle of screen.
HC	Sample collected from screen interval with highest conductivity.

Table 2. ISCO Pilot Test Groundwater Analytical Data, Madison Kipp Corporation, Madison, Wisconsin.

Well	MW-19D (continued)									MW-19D2
Sample Depth	HC	HC	HC	HC	HC	HC	HC	HCQ	MSQ	MS
Sample Date	12/15/12	12/16/12	12/17/12	12/18/12	12/19/12	12/27/12	1/2/13	1/16/13	1/16/13	11/29/12
VOC (µg/L)										
1,1,1,2-Tetrachloroethane	NA	NA	NA	NA	NA	NA	NA	<0.5	<1.3	<0.5
1,1,2-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	<0.56	<1.4	<0.56
1,1-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	<0.62	<1.6	<0.62
Benzene	NA	NA	NA	NA	NA	NA	NA	<0.15	<0.37	<0.15
Bromoform	NA	NA	NA	NA	NA	NA	NA	<0.56	<1.4	<0.56
Bromomethane	NA	NA	NA	NA	NA	NA	NA	<0.62	<1.6	<0.62
Carbon tetrachloride	NA	NA	NA	NA	NA	NA	NA	<0.52	<1.3	<0.52
Chloroform	NA	NA	NA	NA	NA	NA	NA	<0.4	<1	<0.4
cis-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	***130***	***170***	***250***
Ethylbenzene	NA	NA	NA	NA	NA	NA	NA	<0.26	<0.65	<0.26
Naphthalene	NA	NA	NA	NA	NA	NA	NA	<0.32	<0.8	<0.32
Tetrachloroethene	NA	NA	NA	NA	NA	NA	NA	***1,300***	***1,700***	***680***
Toluene	NA	NA	NA	NA	NA	NA	NA	0.88 J	<0.55	<0.22
trans-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	<0.5	<1.3	3.4
Trichloroethene	NA	NA	NA	NA	NA	NA	NA	***41***	***69***	***110***
Vinyl chloride	NA	NA	NA	NA	NA	NA	NA	***2.8***	***3.2***	***0.93 J***
Xylenes, Total	NA	NA	NA	NA	NA	NA	NA	<0.14	<0.34	<0.14
Total Metals (µg/L)										
Arsenic	NA	NA	NA	NA	NA	NA	NA	NA	<0.15	0.25 J
Barium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	NA	NA	NA	NA	NA	NA	NA	NA	10	1.4 J
Iron	NA	NA	NA	NA	NA	NA	NA	NA	120 B	50 J B
Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	NA	NA	NA	NA	NA	NA	NA	NA	***1,100***	***330***
Mercury	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Metals (µg/L)										
Arsenic (Dissolved)	NA	NA	NA	NA	NA	NA	NA	NA	<0.15	0.27 J
Barium (Dissolved)	NA	NA	NA	NA	NA	NA	NA	NA	49	130

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Table 2. ISCO Pilot Test Groundwater Analytical Data, Madison Kipp Corporation, Madison, Wisconsin.

Well	MW-19D (continued)									MW-19D2
Sample Depth	**HC**	**HC**	**HC**	**HC**	**HC**	**HC**	**HC**	**HCQ**	**MSQ**	**MS**
Sample Date	**12/15/12**	**12/16/12**	**12/17/12**	**12/18/12**	**12/19/12**	**12/27/12**	**1/2/13**	**1/16/13**	**1/16/13**	**11/29/12**
Dissolved Metals (µg/L) (continued)										
Cadmium (Dissolved)	NA	NA	NA	NA	NA	NA	NA	NA	<0.1	<0.1
Chromium (Dissolved)	NA	NA	NA	NA	NA	NA	NA	NA	9.6	1.1 J
Iron (Dissolved)	NA	NA	NA	NA	NA	NA	NA	NA	<37	<37
Lead (Dissolved)	NA	NA	NA	NA	NA	NA	NA	NA	<0.16	0.42 J
Manganese (Dissolved)	NA	NA	NA	NA	NA	NA	NA	NA	***940***	***290***
Mercury (Dissolved)	NA	NA	NA	NA	NA	NA	NA	NA	***0.32***	0.12 J
Selenium (Dissolved)	NA	NA	NA	NA	NA	NA	NA	NA	0.97 J	0.75 J
Silver (Dissolved)	NA	NA	NA	NA	NA	NA	NA	NA	<0.069	<0.069
MISC (mg/L)										
Bromide	2.1 J	4.1 J	<1.5	<0.77	<0.77	0.38 J	0.33	0.34	0.33	<0.77
Chloride	200	210	200	200	200	210	200	200	200	300
TOC	NA	NA	NA	NA	NA	NA	NA	NA	5.2	4.6
Total Dissolved Solids	1,200	1,100	1,100	1,000	1,100	1,000	990	1,100	1,100	1,500
Deuterated Water	NA	NA	-61.30	-62.70	-62.66	-62.36	-62.67	-61.77	-62.37	-61.60

Only VOCs detected in one or more water samples are listed on the table. Refer to laboratory analytical reports for a complete list of VOCs analyzed.

100	Concentration exceeds the NR 140 Wis. adm. code Preventive Action Limit (PAL).
100	Concentration exceeds the NR 140 Wis. adm. code Enforcement Standard (ES).
--	Not designated.
<	Not detected.
B	Compound was found in the blank and the sample.
J	Result is between the method detection limit and the limit of quantitation.
Q	Sample quenched using Environmental Protection Agency Guidance Document *Groundwater Sample Preservation at In-Situ Chemical Oxidation Sites - Recommended Guidelines*
U	Sample not quenched.
mg/L	Milligrams per liter.
µg/L	Micrograms per liter.
permil	Isotopic ratio of hydrogen and deuterium.
NA	Not analyzed.
VOCs	Volatile organic compounds.
MS	Sample collected from middle of screen.
HC	Sample collected from screen interval with highest conductivity.

Table 2. ISCO Pilot Test Groundwater Analytical Data, Madison Kipp Corporation, Madison, Wisconsin.

Well	MW-19D2 (continued)								MW-20D		
Sample Depth	HC	HC	HC	HC	HC	HC	HC	MS	MS	HC	HC
Sample Date	12/16/12	12/17/12	12/18/12	12/19/12	12/27/12	1/2/13	1/17/13	1/17/13	11/29/12	12/11/12	12/12/12
VOC (µg/L)											
1,1,1,2-Tetrachloroethane	NA	NA	NA	NA	NA	NA	<0.25	<0.5	<1.3	NA	NA
1,1,2-Trichloroethane	NA	NA	NA	NA	NA	NA	<0.28	<0.56	<1.4	NA	NA
1,1-Dichloroethene	NA	NA	NA	NA	NA	NA	<0.31	<0.62	<1.6	NA	NA
Benzene	NA	NA	NA	NA	NA	NA	<0.074	<0.15	<0.37	NA	NA
Bromoform	NA	NA	NA	NA	NA	NA	<0.28	<0.56	<1.4	NA	NA
Bromomethane	NA	NA	NA	NA	NA	NA	<0.31	<0.62	<1.6	NA	NA
Carbon tetrachloride	NA	NA	NA	NA	NA	NA	<0.26	<0.52	<1.3	NA	NA
Chloroform	NA	NA	NA	NA	NA	NA	***0.61 J***	<0.4	<1	NA	NA
cis-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	***280***	***320***	***370***	NA	NA
Ethylbenzene	NA	NA	NA	NA	NA	NA	<0.13	<0.26	<0.65	NA	NA
Naphthalene	NA	NA	NA	NA	NA	NA	<0.16	<0.32	<0.8	NA	NA
Tetrachloroethene	NA	NA	NA	NA	NA	NA	***620***	***1,200***	***1,600***	NA	NA
Toluene	NA	NA	NA	NA	NA	NA	<0.11	<0.22	<0.55	NA	NA
trans-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	4.2	4.9	5	NA	NA
Trichloroethene	NA	NA	NA	NA	NA	NA	***110***	***160***	***170***	NA	NA
Vinyl chloride	NA	NA	NA	NA	NA	NA	<0.1	<0.2	***3.2***	NA	NA
Xylenes, Total	NA	NA	NA	NA	NA	NA	<0.068	<0.14	<0.34	NA	NA
Total Metals (µg/L)											
Arsenic	NA	0.22 J	NA	NA	NA	NA	NA	***1.3 J***	0.24 J	NA	NA
Barium	NA	140	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	NA	0.11 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	NA	<0.64	NA	NA	NA	NA	NA	<3.2	<0.64	NA	NA
Iron	NA	<37	NA	NA	NA	NA	NA	***1,800***	<37	NA	NA
Lead	NA	<0.16	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	NA	***480***	NA	NA	NA	NA	NA	***1,800***	27	NA	NA
Mercury	NA	<0.071	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	NA	0.69 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	NA	<0.069	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Metals (µg/L)											
Arsenic (Dissolved)	NA	NA	NA	NA	NA	NA	NA	0.95 J	0.18 J	NA	NA
Barium (Dissolved)	NA	NA	NA	NA	NA	NA	NA	***550***	59	NA	NA

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Table 2. ISCO Pilot Test Groundwater Analytical Data, Madison Kipp Corporation, Madison, Wisconsin.

Well	MW-19D2 (continued)								MW-20D		
Sample Depth	**HC**	**HC**	**HC**	**HC**	**HC**	**HC**	**HC**	**MS**	**MS**	**HC**	**HC**
Sample Date	**12/16/12**	**12/17/12**	**12/18/12**	**12/19/12**	**12/27/12**	**1/2/13**	**1/17/13**	**1/17/13**	**11/29/12**	**12/11/12**	**12/12/12**
Dissolved Metals (µg/L) (continued)											
Cadmium (Dissolved)	NA	NA	NA	NA	NA	NA	NA	***0.58 J***	<0.1	NA	NA
Chromium (Dissolved)	NA	NA	NA	NA	NA	NA	NA	<3.2	<0.64	NA	NA
Iron (Dissolved)	NA	NA	NA	NA	NA	NA	NA	<180	<37	NA	NA
Lead (Dissolved)	NA	NA	NA	NA	NA	NA	NA	<0.78	<0.16	NA	NA
Manganese (Dissolved)	NA	NA	NA	NA	NA	NA	NA	***1,700***	25	NA	NA
Mercury (Dissolved)	NA	NA	NA	NA	NA	NA	NA	NA	<0.071	NA	NA
Selenium (Dissolved)	NA	NA	NA	NA	NA	NA	NA	2.1 J	0.71 J	NA	NA
Silver (Dissolved)	NA	NA	NA	NA	NA	NA	NA	<0.34	<0.069	NA	NA
MISC (mg/L)											
Bromide	0.22 J	0.24 J	0.23 J	0.23 J	0.22 J	0.23 J	0.20 J	0.21 J	<0.77	<1.5	93 J
Chloride	290	300	320	320	270	270	290	280	170	150	170
TOC	NA	4.3	NA	NA	NA	NA	NA	5.2	3.6	NA	NA
Total Dissolved Solids	1,600	1,600	1,500	1,500	1,500	1,500	1,400	1,500	920	990	5,000
Deuterated Water	NA	-60.23	-61.30	-60.90	-60.67	-60.90	-60.80	-60.80	-61.30	NA	NA

Only VOCs detected in one or more water samples are listed on the table. Refer to laboratory analytical reports for a complete list of VOCs analyzed.

100	Concentration exceeds the NR 140 Wis. adm. code Preventive Action Limit (PAL).
100	Concentration exceeds the NR 140 Wis. adm. code Enforcement Standard (ES).
--	Not designated.
<	Not detected.
B	Compound was found in the blank and the sample.
J	Result is between the method detection limit and the limit of quantitation.
Q	Sample quenched using Environmental Protection Agency Guidance Document *Groundwater Sample Preservation at In-Situ Chemical Oxidation Sites - Recommended Guidelines*
U	Sample not quenched.
mg/L	Milligrams per liter.
µg/L	Micrograms per liter.
permil	Isotopic ratio of hydrogen and deuterium.
NA	Not analyzed.
VOCs	Volatile organic compounds.
MS	Sample collected from middle of screen.
HC	Sample collected from screen interval with highest conductivity.

Table 2. ISCO Pilot Test Groundwater Analytical Data, Madison Kipp Corporation, Madison, Wisconsin.

Well	MW-20D (continued)										
Sample Depth	HC	HC	HC	HC	HC	HC	HC	HC	HC	HCQ	MSQ
Sample Date	12/13/12	12/14/12	12/15/12	12/16/12	12/17/12	12/18/12	12/19/12	12/27/12	1/2/13	1/16/13	1/16/13
VOC (µg/L)											
1,1,1,2-Tetrachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.25	<0.25
1,1,2-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.28	<0.28
1,1-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.31	<0.31
Benzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.074	<0.074
Bromoform	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.28	<0.28
Bromomethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.31	<0.31
Carbon tetrachloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.26	<0.26
Chloroform	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.2	<0.2
cis-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.12	0.69 J
Ethylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.13	<0.13
Naphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.16	<0.16
Tetrachloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	***130***	***190***
Toluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.39 J	0.45 J
trans-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.25	<0.25
Trichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.19	***0.54***
Vinyl chloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.1	<0.1
Xylenes, Total	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.068	<0.068
Total Metals (µg/L)											
Arsenic	<1.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.74
Barium	45 B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	<1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	***80***	NA	NA	NA	NA	NA	NA	NA	NA	NA	***100***
Iron	<370	NA	NA	NA	NA	NA	NA	NA	NA	NA	<180
Lead	<1.6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	***81,000 B***	NA	NA	NA	NA	NA	NA	NA	NA	NA	***35,000***
Mercury	***1.2***	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	<2.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	<0.69	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Metals (µg/L)											
Arsenic (Dissolved)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.74
Barium (Dissolved)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	25

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Table 2. ISCO Pilot Test Groundwater Analytical Data, Madison Kipp Corporation, Madison, Wisconsin.

Well	MW-20D (continued)										
Sample Depth	**HC**	**HC**	**HC**	**HC**	**HC**	**HC**	**HC**	**HC**	**HC**	**HCQ**	**MSQ**
Sample Date	**12/13/12**	**12/14/12**	**12/15/12**	**12/16/12**	**12/17/12**	**12/18/12**	**12/19/12**	**12/27/12**	**1/2/13**	**1/16/13**	**1/16/13**
Dissolved Metals (µg/L) (continued)											
Cadmium (Dissolved)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.52
Chromium (Dissolved)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	***100***
Iron (Dissolved)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<180
Lead (Dissolved)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	***4***
Manganese (Dissolved)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	***34,000***
Mercury (Dissolved)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	***0.65***
Selenium (Dissolved)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.0 J
Silver (Dissolved)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.34
MISC (mg/L)											
Bromide	150	74	33 J	13 J	20 J	11 J	8.8	3.2 J	4.5 J	1.3	1.3
Chloride	180	170	170	170	170	180	180	110	170	120	130
TOC	3.7 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.5 J
Total Dissolved Solids	16,000	10,000	4,800	2,500	3,100	2,200	1,900	940	1,300	900	940
Deuterated Water	NA	NA	NA	NA	-60.62	-61.50	-61.24	-59.28	-61.13	-60.48	-60.36

Only VOCs detected in one or more water samples are listed on the table. Refer to laboratory analytical reports for a complete list of VOCs analyzed.

100	Concentration exceeds the NR 140 Wis. adm. code Preventive Action Limit (PAL).
100	Concentration exceeds the NR 140 Wis. adm. code Enforcement Standard (ES).
--	Not designated.
<	Not detected.
B	Compound was found in the blank and the sample.
J	Result is between the method detection limit and the limit of quantitation.
Q	Sample quenched using Environmental Protection Agency Guidance Document *Groundwater Sample Preservation at In-Situ Chemical Oxidation Sites - Recommended Guidelines*
U	Sample not quenched.
mg/L	Milligrams per liter.
µg/L	Micrograms per liter.
permil	Isotopic ratio of hydrogen and deuterium.
NA	Not analyzed.
VOCs	Volatile organic compounds.
MS	Sample collected from middle of screen.
HC	Sample collected from screen interval with highest conductivity.

Table 2. ISCO Pilot Test Groundwater Analytical Data, Madison Kipp Corporation, Madison, Wisconsin.

Well	MW-20D2										
Sample Depth	**MS**	**HC**	**HC**	**HC**	**HC**	**HC**	**HC**	**HC**	**HC**	**HC**	**HCQ**
Sample Date	**11/29/12**	**12/13/12**	**12/14/12**	**12/15/12**	**12/16/12**	**12/17/12**	**12/18/12**	**12/19/12**	**12/27/12**	**1/2/13**	**1/16/13**
VOC (µg/L)											
1,1,1,2-Tetrachloroethane	<0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.25
1,1,2-Trichloroethane	<0.56	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.28
1,1-Dichloroethene	<0.62	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.31
Benzene	<0.15	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.074
Bromoform	<0.56	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.28
Bromomethane	<0.62	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.31
Carbon tetrachloride	<0.52	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.26
Chloroform	<0.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.2
cis-1,2-Dichloroethene	***330***	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.12
Ethylbenzene	<0.26	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.13
Naphthalene	<0.32	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.16
Tetrachloroethene	***1,300***	NA	NA	NA	NA	NA	NA	NA	NA	NA	***3***
Toluene	<0.22	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.68
trans-1,2-Dichloroethene	4.3	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.25
Trichloroethene	***150***	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.19
Vinyl chloride	***1.7***	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.1
Xylenes, Total	<0.14	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.068
Total Metals (µg/L)											
Arsenic	0.26 J	NA	NA	NA	NA	<0.74	NA	NA	NA	NA	NA
Barium	NA	NA	NA	NA	NA	84	NA	NA	NA	NA	NA
Cadmium	NA	NA	NA	NA	NA	<0.52	NA	NA	NA	NA	NA
Chromium	<0.64	NA	NA	NA	NA	***50***	NA	NA	NA	NA	NA
Iron	<37	NA	NA	NA	NA	<180	NA	NA	NA	NA	NA
Lead	NA	NA	NA	NA	NA	<0.78	NA	NA	NA	NA	NA
Manganese	50	NA	NA	NA	NA	***110,000***	NA	NA	NA	NA	NA
Mercury	NA	NA	NA	NA	NA	***0.9***	NA	NA	NA	NA	NA
Selenium	NA	NA	NA	NA	NA	5.2 J	NA	NA	NA	NA	NA
Silver	NA	NA	NA	NA	NA	<0.34	NA	NA	NA	NA	NA
Dissolved Metals (µg/L)											
Arsenic (Dissolved)	0.27 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium (Dissolved)	170	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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Table 2. ISCO Pilot Test Groundwater Analytical Data, Madison Kipp Corporation, Madison, Wisconsin.

Well	MW-20D2										
Sample Depth	**MS**	**HC**	**HC**	**HC**	**HC**	**HC**	**HC**	**HC**	**HC**	**HC**	**HCQ**
Sample Date	**11/29/12**	**12/13/12**	**12/14/12**	**12/15/12**	**12/16/12**	**12/17/12**	**12/18/12**	**12/19/12**	**12/27/12**	**1/2/13**	**1/16/13**
Dissolved Metals (µg/L) (continued)											
Cadmium (Dissolved)	<0.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium (Dissolved)	<0.64	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron (Dissolved)	<37	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead (Dissolved)	<0.16	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese (Dissolved)	16	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury (Dissolved)	0.10 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium (Dissolved)	1.2 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver (Dissolved)	<0.069	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MISC (mg/L)											
Bromide	<0.77	3.2 J	11 J	13	<39	<39	<39	<39	<39	<39	<39
Chloride	190	280	250	230	910	480	1,300	1,200	740	580	420
TOC	3.8	NA	NA	NA	NA	2.5 J	NA	NA	NA	NA	NA
Total Dissolved Solids	1,000	1,500	2,400	3,000	25,000	12,000	42,000	34,000	19,000	12,000	8,700
Deuterated Water	-60.80	NA	NA	NA	NA	-59.23	-59.30	-59.56	-60.25	-60.81	-60.68

Only VOCs detected in one or more water samples are listed on the table. Refer to laboratory analytical reports for a complete list of VOCs analyzed.

100	Concentration exceeds the NR 140 Wis. adm. code Preventive Action Limit (PAL).
100	Concentration exceeds the NR 140 Wis. adm. code Enforcement Standard (ES).
--	Not designated.
<	Not detected.
B	Compound was found in the blank and the sample.
J	Result is between the method detection limit and the limit of quantitation.
Q	Sample quenched using Environmental Protection Agency Guidance Document *Groundwater Sample Preservation at In-Situ Chemical Oxidation Sites - Recommended Guidelines*
U	Sample not quenched.
mg/L	Milligrams per liter.
µg/L	Micrograms per liter.
permil	Isotopic ratio of hydrogen and deuterium.
NA	Not analyzed.
VOCs	Volatile organic compounds.
MS	Sample collected from middle of screen.
HC	Sample collected from screen interval with highest conductivity.

Table 2. ISCO Pilot Test Groundwater Analytical Data, Madison Kipp Corporation, Madison, Wisconsin.

Well	MW-20D2 (continued)		MW-21D								
Sample Depth	**HCU**	**MSQ**	**MS**	**HC**	**HC**	**HC**	**HC**	**HC**	**HC**	**HC**	**HC**
Sample Date	**1/16/13**	**1/16/13**	**11/28/12**	**12/12/12**	**12/13/12**	**12/14/12**	**12/15/12**	**12/16/12**	**12/17/12**	**12/18/12**	**12/19/12**
VOC (µg/L)											
1,1,1,2-Tetrachloroethane	<0.25	<0.25	<0.5	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	<0.28	<0.28	<0.56	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	<0.31	<0.31	<0.62	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	0.30 J	<0.074	<0.15	NA	NA	NA	NA	NA	NA	NA	NA
Bromoform	***4.1***	<0.28	<0.56	NA	NA	NA	NA	NA	NA	NA	NA
Bromomethane	<0.31	<0.31	<0.62	NA	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	<0.26	<0.26	<0.52	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	<0.2	0.47 J	<0.4	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	<0.12	<0.12	***380***	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	<0.13	<0.13	<0.26	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	<0.16	<0.16	<0.32	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	<0.17	***190***	***1,200***	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	<0.11	0.34 J	<0.22	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	<0.25	<0.25	5.1	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene	<0.19	<0.19	***180***	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl chloride	<0.1	<0.1	***1.4***	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes, Total	<0.068	<0.068	<0.14	NA	NA	NA	NA	NA	NA	NA	NA
Total Metals (µg/L)											
Arsenic	NA	<0.74	0.20 J	NA	<1.5	NA	NA	NA	NA	NA	NA
Barium	NA	NA	NA	NA	29 B	NA	NA	NA	NA	NA	NA
Cadmium	NA	NA	NA	NA	<1	NA	NA	NA	NA	NA	NA
Chromium	NA	***39***	<0.64	NA	***41 J***	NA	NA	NA	NA	NA	NA
Iron	NA	<180	<37	NA	<370	NA	NA	NA	NA	NA	NA
Lead	NA	NA	NA	NA	<1.6	NA	NA	NA	NA	NA	NA
Manganese	NA	***140,000***	***74***	NA	***220,000 B***	NA	NA	NA	NA	NA	NA
Mercury	NA	NA	NA	NA	***0.66***	NA	NA	NA	NA	NA	NA
Selenium	NA	NA	NA	NA	<2.5	NA	NA	NA	NA	NA	NA
Silver	NA	NA	NA	NA	<0.69	NA	NA	NA	NA	NA	NA
Dissolved Metals (µg/L)											
Arsenic (Dissolved)	NA	<0.74	0.19 J	NA	NA	NA	NA	NA	NA	NA	NA
Barium (Dissolved)	NA	28	75	NA	NA	NA	NA	NA	NA	NA	NA

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Table 2. ISCO Pilot Test Groundwater Analytical Data, Madison Kipp Corporation, Madison, Wisconsin.

Well	MW-20D2 (continued)		MW-21D								
Sample Depth	**HCU**	**MSQ**	**MS**	**HC**	**HC**	**HC**	**HC**	**HC**	**HC**	**HC**	**HC**
Sample Date	**1/16/13**	**1/16/13**	**11/28/12**	**12/12/12**	**12/13/12**	**12/14/12**	**12/15/12**	**12/16/12**	**12/17/12**	**12/18/12**	**12/19/12**
Dissolved Metals (µg/L) (continued)											
Cadmium (Dissolved)	NA	<0.52	<0.1	NA	NA	NA	NA	NA	NA	NA	NA
Chromium (Dissolved)	NA	***42***	<0.64	NA	NA	NA	NA	NA	NA	NA	NA
Iron (Dissolved)	NA	<180	<37	NA	NA	NA	NA	NA	NA	NA	NA
Lead (Dissolved)	NA	<0.78	<0.16	NA	NA	NA	NA	NA	NA	NA	NA
Manganese (Dissolved)	NA	***170,000***	***75***	NA	NA	NA	NA	NA	NA	NA	NA
Mercury (Dissolved)	NA	0.16 J	0.16 J B	NA	NA	NA	NA	NA	NA	NA	NA
Selenium (Dissolved)	NA	3.8 J	<0.25	NA	NA	NA	NA	NA	NA	NA	NA
Silver (Dissolved)	NA	<0.34	0.12 J	NA	NA	NA	NA	NA	NA	NA	NA
MISC (mg/L)											
Bromide	NA	<7.7	<0.77	0.12 J	77	17	22 J	29 J	14	8.2 J	5.4
Chloride	NA	260	260	110	190	200	190	210	220	230	230
TOC	NA	3.7 J	3.8	NA	3.4 J	NA	NA	NA	NA	NA	NA
Total Dissolved Solids	NA	2,400	1,400	1,000	8,900	3,000	3,800	3,700	2,700	2,000	1,700
Deuterated Water	NA	-60.76	-59.30	NA	NA	NA	NA	NA	-58.94	-60.60	-60.32

Only VOCs detected in one or more water samples are listed on the table. Refer to laboratory analytical reports for a complete list of VOCs analyzed.

100	Concentration exceeds the NR 140 Wis. adm. code Preventive Action Limit (PAL).
100	Concentration exceeds the NR 140 Wis. adm. code Enforcement Standard (ES).
--	Not designated.
<	Not detected.
B	Compound was found in the blank and the sample.
J	Result is between the method detection limit and the limit of quantitation.
Q	Sample quenched using Environmental Protection Agency Guidance Document *Groundwater Sample Preservation at In-Situ Chemical Oxidation Sites - Recommended Guidelines*
U	Sample not quenched.
mg/L	Milligrams per liter.
µg/L	Micrograms per liter.
permil	Isotopic ratio of hydrogen and deuterium.
NA	Not analyzed.
VOCs	Volatile organic compounds.
MS	Sample collected from middle of screen.
HC	Sample collected from screen interval with highest conductivity.

Table 2. ISCO Pilot Test Groundwater Analytical Data, Madison Kipp Corporation, Madison, Wisconsin.

Well	MW-21D (continued)				MW-21D2					
Sample Depth	**HC**	**HC**	**HCQ**	**MSQ**	**MS**	**HC**	**HC**	**HC**	**HC**	**HC**
Sample Date	**12/27/12**	**1/2/13**	**1/17/13**	**1/17/13**	**11/28/12**	**12/16/12**	**12/17/12**	**12/18/12**	**12/19/12**	**12/27/12**
VOC (µg/L)										
1,1,1,2-Tetrachloroethane	NA	NA	<0.25	<0.25	<1.3	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	NA	NA	<0.28	<0.28	<1.4	NA	NA	NA	NA	NA
1,1-Dichloroethene	NA	NA	<0.31	<0.31	<1.6	NA	NA	NA	NA	NA
Benzene	NA	NA	<0.074	<0.074	<0.37	NA	NA	NA	NA	NA
Bromoform	NA	NA	<0.28	<0.28	<1.4	NA	NA	NA	NA	NA
Bromomethane	NA	NA	<0.31	<0.31	<1.6	NA	NA	NA	NA	NA
Carbon tetrachloride	NA	NA	<0.26	<0.26	<1.3	NA	NA	NA	NA	NA
Chloroform	NA	NA	0.52 J	<0.2	<1	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	NA	NA	***22***	***85***	***300***	NA	NA	NA	NA	NA
Ethylbenzene	NA	NA	0.58	0.43 J	<0.65	NA	NA	NA	NA	NA
Naphthalene	NA	NA	<0.16	<0.16	<0.8	NA	NA	NA	NA	NA
Tetrachloroethene	NA	NA	***270***	***700***	***2,600***	NA	NA	NA	NA	NA
Toluene	NA	NA	0.55	0.38 J	<0.55	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	NA	NA	<0.25	<0.25	2.7 J	NA	NA	NA	NA	NA
Trichloroethene	NA	NA	***8.5***	***23***	***160***	NA	NA	NA	NA	NA
Vinyl chloride	NA	NA	<0.1	<0.1	<0.5	NA	NA	NA	NA	NA
Xylenes, Total	NA	NA	5	2.5	<0.34	NA	NA	NA	NA	NA
Total Metals (µg/L)										
Arsenic	NA	NA	NA	<0.74	0.29 J	NA	0.17 J	NA	NA	NA
Barium	NA	NA	NA	NA	NA	NA	38	NA	NA	NA
Cadmium	NA	NA	NA	NA	NA	NA	<0.1	NA	NA	NA
Chromium	NA	NA	NA	***22 J***	6.5	NA	2.7 J	NA	NA	NA
Iron	NA	NA	NA	<180	***460***	NA	<37	NA	NA	NA
Lead	NA	NA	NA	NA	NA	NA	<0.16	NA	NA	NA
Manganese	NA	NA	NA	***6,000***	***450***	NA	***110***	NA	NA	NA
Mercury	NA	NA	NA	NA	NA	NA	<0.071	NA	NA	NA
Selenium	NA	NA	NA	NA	NA	NA	0.34 J	NA	NA	NA
Silver	NA	NA	NA	NA	NA	NA	<0.069	NA	NA	NA
Dissolved Metals (µg/L)										
Arsenic (Dissolved)	NA	NA	NA	<0.74	0.22 J	NA	NA	NA	NA	NA
Barium (Dissolved)	NA	NA	NA	26	100	NA	NA	NA	NA	NA

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Table 2. ISCO Pilot Test Groundwater Analytical Data, Madison Kipp Corporation, Madison, Wisconsin.

Well	MW-21D (continued)				MW-21D2					
Sample Depth	**HC**	**HC**	**HCQ**	**MSQ**	**MS**	**HC**	**HC**	**HC**	**HC**	**HC**
Sample Date	**12/27/12**	**1/2/13**	**1/17/13**	**1/17/13**	**11/28/12**	**12/16/12**	**12/17/12**	**12/18/12**	**12/19/12**	**12/27/12**
Dissolved Metals (µg/L) (continued)										
Cadmium (Dissolved)	NA	NA	NA	<0.52	<0.1	NA	NA	NA	NA	NA
Chromium (Dissolved)	NA	NA	NA	***23 J***	5.6	NA	NA	NA	NA	NA
Iron (Dissolved)	NA	NA	NA	<180	<37	NA	NA	NA	NA	NA
Lead (Dissolved)	NA	NA	NA	<0.78	<0.16	NA	NA	NA	NA	NA
Manganese (Dissolved)	NA	NA	NA	***6,100***	***410***	NA	NA	NA	NA	NA
Mercury (Dissolved)	NA	NA	NA	NA	0.18 J B	NA	NA	NA	NA	NA
Selenium (Dissolved)	NA	NA	NA	<1.3	0.37 J	NA	NA	NA	NA	NA
Silver (Dissolved)	NA	NA	NA	<0.34	<0.069	NA	NA	NA	NA	NA
MISC (mg/L)										
Bromide	1.6 J	0.96 J	0.45 J	0.39 J	<0.77	0.097 J	0.094 J	0.097 J	0.10 J	<0.39
Chloride	220	250	190	190	150	100	110	98	100	100
TOC	NA	NA	NA	4.4	3.4	NA	2.3	NA	NA	NA
Total Dissolved Solids	1,300	1,300	1,200	1,200	1,100	950	930	910	920	1,000
Deuterated Water	-60.30	-61.20	-60.35	-60.74	-55.90	NA	-53.75	-55.70	-55.36	-55.80

Only VOCs detected in one or more water samples are listed on the table. Refer to laboratory analytical reports for a complete list of VOCs analyzed.

100	Concentration exceeds the NR 140 Wis. adm. code Preventive Action Limit (PAL).
100	Concentration exceeds the NR 140 Wis. adm. code Enforcement Standard (ES).
--	Not designated.
<	Not detected.
B	Compound was found in the blank and the sample.
J	Result is between the method detection limit and the limit of quantitation.
Q	Sample quenched using Environmental Protection Agency Guidance Document *Groundwater Sample Preservation at In-Situ Chemical Oxidation Sites - Recommended Guidelines*
U	Sample not quenched.
mg/L	Milligrams per liter.
µg/L	Micrograms per liter.
permil	Isotopic ratio of hydrogen and deuterium.
NA	Not analyzed.
VOCs	Volatile organic compounds.
MS	Sample collected from middle of screen.
HC	Sample collected from screen interval with highest conductivity.

Table 2. ISCO Pilot Test Groundwater Analytical Data, Madison Kipp Corporation, Madison, Wisconsin.

Well	MW-21D2 (continued)		
Sample Depth	**HC**	**HCQ**	**MSQ**
Sample Date	**1/2/13**	**1/17/13**	**1/17/13**
VOC (µg/L)			
1,1,1,2-Tetrachloroethane	NA	<0.25	<0.25
1,1,2-Trichloroethane	NA	<0.28	***1.4***
1,1-Dichloroethene	NA	<0.31	<0.31
Benzene	NA	0.23 J	0.25 J
Bromoform	NA	<0.28	<0.28
Bromomethane	NA	<0.31	<0.31
Carbon tetrachloride	NA	<0.26	<0.26
Chloroform	NA	***0.74 J***	<0.2
cis-1,2-Dichloroethene	NA	<0.12	<0.12
Ethylbenzene	NA	0.57	0.62
Naphthalene	NA	1.8	<0.16
Tetrachloroethene	NA	***170***	***1,200***
Toluene	NA	0.67	0.48 J
trans-1,2-Dichloroethene	NA	<0.25	<0.25
Trichloroethene	NA	<0.19	<0.19
Vinyl chloride	NA	<0.1	<0.1
Xylenes, Total	NA	4.5	4.3
Total Metals (µg/L)			
Arsenic	NA	NA	<0.74
Barium	NA	NA	NA
Cadmium	NA	NA	NA
Chromium	NA	NA	***40***
Iron	NA	NA	<180
Lead	NA	NA	NA
Manganese	NA	NA	***340,000***
Mercury	NA	NA	NA
Selenium	NA	NA	NA
Silver	NA	NA	NA
Dissolved Metals (µg/L)			
Arsenic (Dissolved)	NA	NA	<0.74
Barium (Dissolved)	NA	NA	37

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Table 2. ISCO Pilot Test Groundwater Analytical Data, Madison Kipp Corporation, Madison, Wisconsin.

Well	MW-21D2 (continued)		
Sample Depth	**HC**	**HCQ**	**MSQ**
Sample Date	**1/2/13**	**1/17/13**	**1/17/13**
Dissolved Metals (µg/L) (continued)			
Cadmium (Dissolved)	NA	NA	<0.52
Chromium (Dissolved)	NA	NA	***45***
Iron (Dissolved)	NA	NA	<180
Lead (Dissolved)	NA	NA	<0.78
Manganese (Dissolved)	NA	NA	***340,000***
Mercury (Dissolved)	NA	NA	NA
Selenium (Dissolved)	NA	NA	5.4 J
Silver (Dissolved)	NA	NA	<0.34
MISC (mg/L)			
Bromide	<0.77	<0.77	<0.77
Chloride	130	140	130
TOC	NA	NA	2.8 J
Total Dissolved Solids	1,100	1,900	1,800
Deuterated Water	-55.48	-55.05	-54.90

Only VOCs detected in one or more water samples are listed on the table. Refer to laboratory analytical reports for a complete list of VOCs analyzed.

100	Concentration exceeds the NR 140 Wis. adm. code Preventive Action Limit (PAL).
100	Concentration exceeds the NR 140 Wis. adm. code Enforcement Standard (ES).
--	Not designated.
<	Not detected.
B	Compound was found in the blank and the sample.
J	Result is between the method detection limit and the limit of quantitation.
Q	Sample quenched using Environmental Protection Agency Guidance Document *Groundwater Sample Preservation at In-Situ Chemical Oxidation Sites - Recommended Guidelines*
U	Sample not quenched.
mg/L	Milligrams per liter.
µg/L	Micrograms per liter.
permil	Isotopic ratio of hydrogen and deuterium.
NA	Not analyzed.
VOCs	Volatile organic compounds.
MS	Sample collected from middle of screen.
HC	Sample collected from screen interval with highest conductivity.

Table 3. ISCO Pilot Test Groundwater Monitoring Schedule, Madison-Kipp Corporation, 201 Waubesa Street, Madison, Wisconsin.

Total Number of Sample Events	Well	Screen Interval		Conductivity Profile -Screen Interval	VOCs - 3 40ml VOAs HCl Preserve	Dissolved RCRA Metals + Fe, Mn (Field Filtered) - 1 500mL Plastic HNO_3 Preserve	Total Metals (Ar, Cr, Mn, Fe) - 1 500mL Plastic HNO_3 Preserve	Deuterium - 2 40 ml VOAs No Preserve	Bromide , Chloride, Total Dissolved Solids - 1 L Plastic No Preserve	Total Organic Carbon - 1 500 mL plastic H_2SO_4 Preserve	Notes
Baseline Monitoring Schedule											
1	IW1S	16-26		X	X	X	X	X	X		Samples collected using low flow techniques.
1	IW2D	60-90		X	X	X	X	X	X		
1	IW2D2	110-130		X	X	X	X	X	X		
1	MW3S	19-29		X	X	X	X	X	X		
1	MW3D	48-53		X	X	X	X	X	X		
1	MW3D2	76-81		X	X	X	X	X	X		
1	MW3D3	214-224		X	X	X	X	X	X		
1	MW5S	34-44		X	X	X	X	X	X		
1	MW5D	75-80		X	X	X	X	X	X		
1	MW5D2	165-170		X	X	X	X	X	X		
1	MW5D3	225-235		X	X	X	X	X	X		
1	MW18S	20-30		X	X	X	X	X	X		
1	MW19D	60-90		X	X	X	X	X	X		
1	MW19D2	110-140		X	X	X	X	X	X		
1	MW20D	60-90		X	X	X	X	X	X		
1	MW20D2	110-140		X	X	X	X	X	X		
1	MW21D	60-90		X	X	X	X	X	X		
1	MW21D2	110-170		X	X	X	X	X	X		
1	MP13 (44-48)	44-48		X	X	X	X	X	X		
1	MP13 (67-71)	67-71		X	X	X	X	X	X		
1	MP13 (81-85)	81-85		X	X	X	X	X	X		
1	MP13 (102-106)	102-106		X	X	X	X	X	X		

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Table 3. ISCO Pilot Test Groundwater Monitoring Schedule, Madison-Kipp Corporation, 201 Waubesa Street, Madison, Wisconsin.

Total Number of Sample Events	Well	Screen Interval	Conductivity Profile -Screen Interval	VOCs - 3 40ml VOAs HCl Preserve	Dissolved RCRA Metals + Fe, Mn (Field Filtered) - 1 500mL Plastic HNO_3 Preserve	Total Metals (Ar, Cr, Mn, Fe) - 1 500mL Plastic HNO_3 Preserve	Deuterium - 2 40 ml VOAs No Preserve	Bromide , Chloride, Total Dissolved Solids - 1 L Plastic No Preserve	Total Organic Carbon - 1 500 mL plastic H_2SO_4 Preserve	Notes
Baseline Monitoring Schedule (continued)										
1	MP 13 (121-125)	121-125		X	X	X	X	X	X	Samples collected using low flow techniques.
1	MP13 (135-139)	135-139		X	X	X	X	X	X	
1	MP13 (163-167)	163-167		X	X	X	X	X	X	
Injection Monitoring - During Injection Event										
V	MW3S HC	19-29	X				X	X		Grab samples collected. Tracer samples (bromide, chloride, and deuterium) collected daily upon breakthrough of the sodium permanganate solution at respective monitoring wells. Total metals, dissolved metals, and total organic carbon collected once at the completion of the injection volume at the respective injection interval.
V	MW3D	48-53	X		X	X	X	X	X	
V	MW3D2	76-81	X		X	X	X	X	X	
V	MW3D3	214-224			X	X	X	X	X	
V	MW18S HC	20-30	X				X	X		
V	MW19D HC	60-90	X				X	X		
V	MW19D2 HC	110-140	X				X	X		
V	MW20D HC	60-90	X				X	X		
V	MW20D2 HC	110-140	X				X	X		
V	MW21D HC	60-90	X				X	X		
V	MW21D2 HC	110-170	X				X	X		
V	MP13 (81-85)	81-85						X		Tracer sample collected once at the completion of the injection into IW-2D
Post Injection Tracer Monitoring Schedule (Weeks 1, 2, 3, 7, and 11 Post Injection)										
5	MW3S HC	19-29	X				X	X		Grab samples collected.
5	MW3D	48-53	X				X	X		
5	MW3D2	76-81	X				X	X		

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Table 3. ISCO Pilot Test Groundwater Monitoring Schedule, Madison-Kipp Corporation, 201 Waubesa Street, Madison, Wisconsin.

Total Number of Sample Events	Well	Screen Interval	Conductivity Profile -Screen Interval	VOCs - 3 40ml VOAs HCl Preserve	Dissolved RCRA Metals + Fe, Mn (Field Filtered) - 1 500mL Plastic HNO_3 Preserve	Total Metals (Ar, Cr, Mn, Fe) - 1 500mL Plastic HNO_3 Preserve	Deuterium - 2 40 ml VOAs No Preserve	Bromide , Chloride, Total Dissolved Solids - 1 L Plastic No Preserve	Total Organic Carbon - 1 500 mL plastic H_2SO_4 Preserve	Notes
Post Injection Tracer Monitoring Schedule (Weeks 1, 2, 3, 7, and 11 Post Injection) (continued)										
5	MW3D3	214-224					X	X		Grab samples collected.
5	MW18S HC	20-30	X				X	X		
5	MW19D HC	60-90	X				X	X		
5	MW19D2 HC	110-140	X				X	X		
5	MW20D HC	60-90	X				X	X		
5	MW20D2 HC	110-140	X				X	X		
5	MW21D HC	60-90	X				X	X		
5	MW21D2 HC	110-170	X				X	X		
2 Events - Post Injection Performance Monitoring Schedule (Weeks 5 and 9 Post Injection)										
2	MW3S * MS	19-29	X	X	X	X	X	X	X	MS samples collected using low flow techniques. HC samples collected as grab samples.
2	MW3S * HC	19-29	X	X			X	X		
2	MW3D	48-53	X	X	X	X	X	X	X	
2	MW3D2	76-81	X	X	X	X	X	X	X	
2	MW3D3	214-224		X	X	X	X	X	X	
2	MW5S	34-44		X	X	X	X	X	X	
2	MW5D	75-80		X	X	X	X	X	X	
2	MW5D2	165-170		X	X	X	X	X	X	
2	MW5D3	225-235		X	X	X	X	X	X	
2	MW18S * MS	20-30	X	X	X	X	X	X	X	
2	MW18S * HC	20-30	X	X			X	X		
2	MW19D * MS	60-90	X	X	X	X	X	X	X	
2	MW19D * HC	60-90	X	X			X	X		

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Table 3. ISCO Pilot Test Groundwater Monitoring Schedule, Madison-Kipp Corporation, 201 Waubesa Street, Madison, Wisconsin.

Total Number of Sample Events	Well	Screen Interval	Conductivity Profile -Screen Interval	VOCs - 3 40ml VOAs HCl Preserve	Dissolved RCRA Metals + Fe, Mn (Field Filtered) - 1 500mL Plastic HNO_3 Preserve	Total Metals (Ar, Cr, Mn, Fe) - 1 500mL Plastic HNO_3 Preserve	Deuterium - 2 40 ml VOAs No Preserve	Bromide , Chloride, Total Dissolved Solids - 1 L Plastic No Preserve	Total Organic Carbon - 1 500 mL plastic H_2SO_4 Preserve	Notes
2 Events - Post Injection Performance Monitoring Schedule (Weeks 5 and 9 Post Injection) (continued)										
2	MW19D2 * MS	110-140	X	X	X	X	X	X	X	MS samples collected using low flow techniques. HC samples collected as grab samples.
2	MW19D2 * HC	110-140	X	X			X	X		
2	MW20D * MS	60-90	X	X	X	X	X	X	X	
2	MW20D * HC	60-90	X	X			X	X		
2	MW20D2 * MS	110-140	X	X	X	X	X	X	X	
2	MW20D2 * HC	110-140	X	X			X	X		
2	MW21D * MS	60-90	X	X	X	X	X	X	X	
2	MW21D * HC	60-90	X	X			X	X		
2	MW21D2 * MS	110-170	X	X	X	X	X	X	X	
2	MW21D2 * HC	110-170	X	X			X	X		
2	MP13 (44-48)	44-48		X	X	X	X	X	X	
2	MP13 (67-71)	67-71		X	X	X	X	X	X	
2	MP13 (81-85)	81-85		X	X	X	X	X	X	
2	MP13 (102-106)	102-106		X	X	X	X	X	X	
2	MP 13 (121-125)	121-125		X	X	X	X	X	X	
2	MP13 (135-139)	135-139		X	X	X	X	X	X	
2	MP13 (163-167)	163-167		X	X	X	X	X	X	

* Wells designated with the asterisk may require quenching. See quenching procedure.

HC Interval with highest conductivity

MS Middle of screen

V Varies per monitoring well

Table 4. Field Observation Summary Table, Madison-Kipp Corporation, 201 Waubesa Street, Madison, Wisconsin.

Injection Well / Monitoring Well	Screen Interval (ft bgs)	Approximate Distance from Injection Well (ft)	Direction from Injection Well	Sodium Permanganate Color Observed Injection Event	Sodium Permanganate Color Observed Post-Injection Tracer Monitoring Week 1	Sodium Permanganate Color Observed Post-Injection Tracer Monitoring Week 2	Sodium Permanganate Color Observed Post-Injection Tracer Monitoring Week 3	Sodium Permanganate Color Observed Post-Injection Performance Monitoring Week 5	Sodium Permanganate Color Observed Post-Injection Tracer Monitoring Week 7	Interim Percent Reduction PCE Week 5
IW-1S - Shallow Interval	20-30	--	--	Yes	--	--	--	--	Yes	--
MW3S * MS	19-29	10	SE	Yes	--	--	--	Yes	--	--
MW3S * HC	19-29	10	SE	Yes	Yes	Yes	Yes	Yes	Yes	83%
MW18S * MS	20-30	20	SE	No	No	No	No	No	No	--
MW18S * HC	20-30	20	SE	No	No	No	No	No	No	75%
MW5S	34-44	255	SE	No	No	No	No	No	No	--
IW-2D - Shallow Bedrock	60-90	--	--	Yes	--	--	--	--	Yes	--
MW19D * MS	60-90	20	N	Yes	Yes	Yes	Yes	Yes	Yes	29%
MW19D * HC	60-90	20	N	Yes	Yes	Yes	Yes	Yes	Yes	--
MW20D * MS	60-90	10	N	Yes	Yes	Yes	Yes	Yes	Yes	88%
MW20D * HC	60-90	10	N	Yes	Yes	Yes	Yes	Yes	Yes	--
MW21D * MS	60-90	20	S	Yes	Yes	Yes	Yes	Yes	Yes	42%
MW21D * HC	60-90	20	S	Yes	Yes	Yes	Yes	Yes	Yes	--
MW3D	48-53	22	SW	No	No	No	No	No	No	63%
MW3D2	76-81	22	SW	No	No	No	No	No	No	57%
MW5D	75-80	255	SE	No	No	No	No	No	No	--
MP13 (44-48)	44-48	165	N	No	No	No	No	No	No	--
MP13 (67-71)	67-71	165	N	No	No	No	No	No	No	--
MP13 (81-85)	81-85	165	N	No	No	No	No	No	No	--
IW-2D2 - Deep Bedrock	110-140	--	--	Yes	--	--	--	--	Yes	--
MW19D2 * MS	110-140	20	N	No	No	No	No	No	No	--
MW19D2 * HC	110-140	20	N	No	No	No	No	No	No	--
MW20D2 * MS	110-140	10	N	Yes	Yes	Yes	Yes	Yes	Yes	--
MW20D2 * HC	110-140	10	N	Yes	Yes	Yes	Yes	Yes	Yes	85%

Footnotes on Page 2.

Table 4. Field Observation Summary Table, Madison-Kipp Corporation, 201 Waubesa Street, Madison, Wisconsin.

Injection Well / Monitoring Well	Screen Interval (ft bgs)	Approximate Distance from Injection Well (ft)	Direction from Injection Well	Sodium Permanganate Color Observed Injection Event	Sodium Permanganate Color Observed Post-Injection Tracer Monitoring Week 1	Sodium Permanganate Color Observed Post-Injection Tracer Monitoring Week 2	Sodium Permanganate Color Observed Post-Injection Tracer Monitoring Week 3	Sodium Permanganate Color Observed Post-Injection Performance Monitoring Week 5	Sodium Permanganate Color Observed Post-Injection Tracer Monitoring Week 7	Interim Percent Reduction PCE Week 5
MW21D2 * MS	110-170	20	S	Yes	Yes	Yes	Yes	Yes	Yes	54%
MW21D2 * HC	110-170	20	S	Yes	Yes	Yes	Yes	Yes	Yes	--
MW3D3	214-224	20	SW	No	No	No	No	No	No	--
MW5D2	165-170	250	SE	No	No	No	No	No	No	--
MW5D3	225-235	240	SE	No	No	No	No	No	No	--
MP13 (102-106)	102-106	165	N	No	No	No	No	No	No	--
MP 13 (121-125)	121-125	165	N	No	No	No	No	No	No	--
MP13 (135-139)	135-139	165	N	No	No	No	No	No	No	--
MP13 (163-167)	163-167	165	N	No	No	No	No	No	No	--

* VOC samples collected from designated well interval was quenched using ascorbic acid. See quenching procedure.

HC Interval with highest conductivity

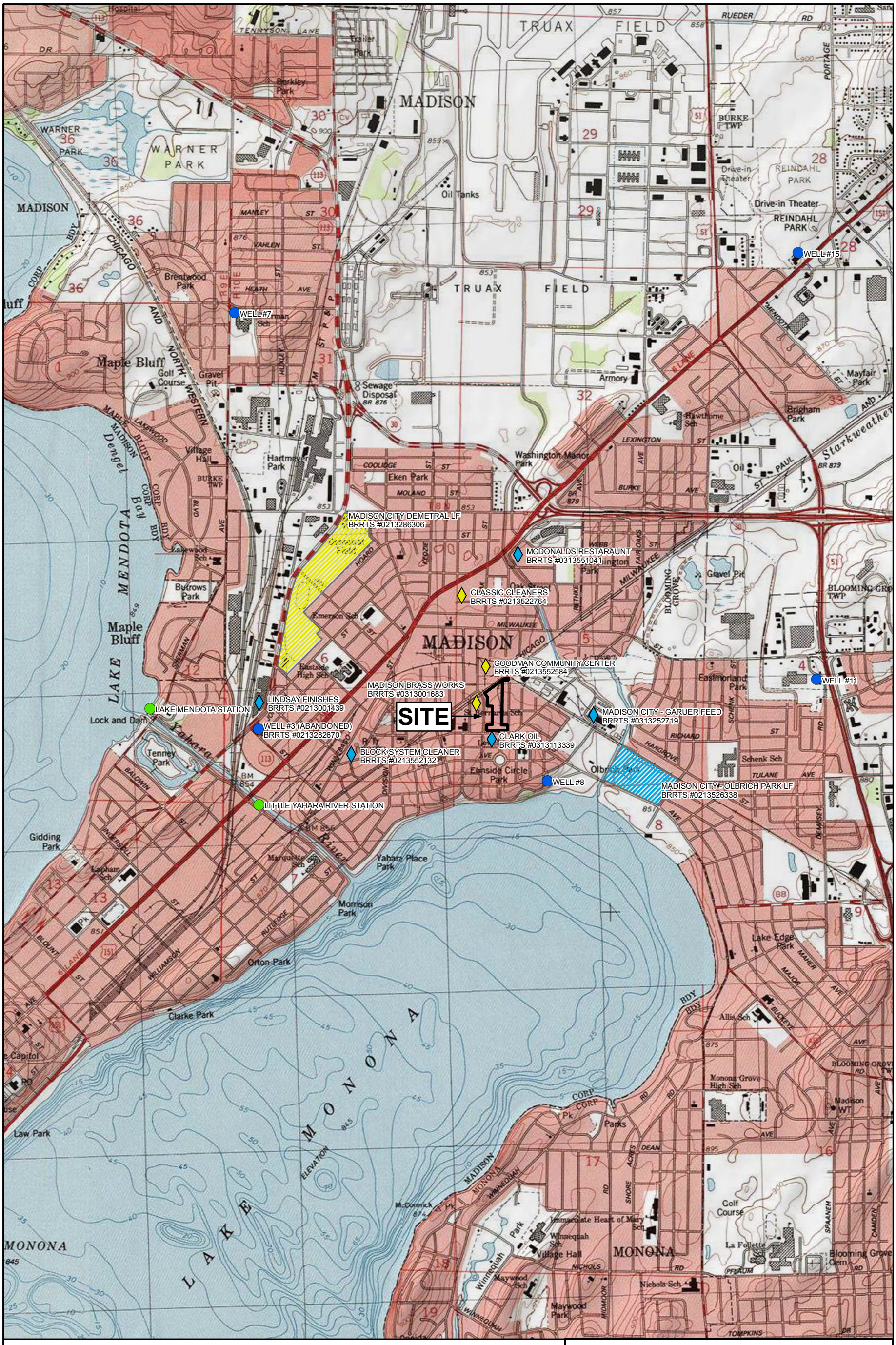
MS Middle of screen

N North

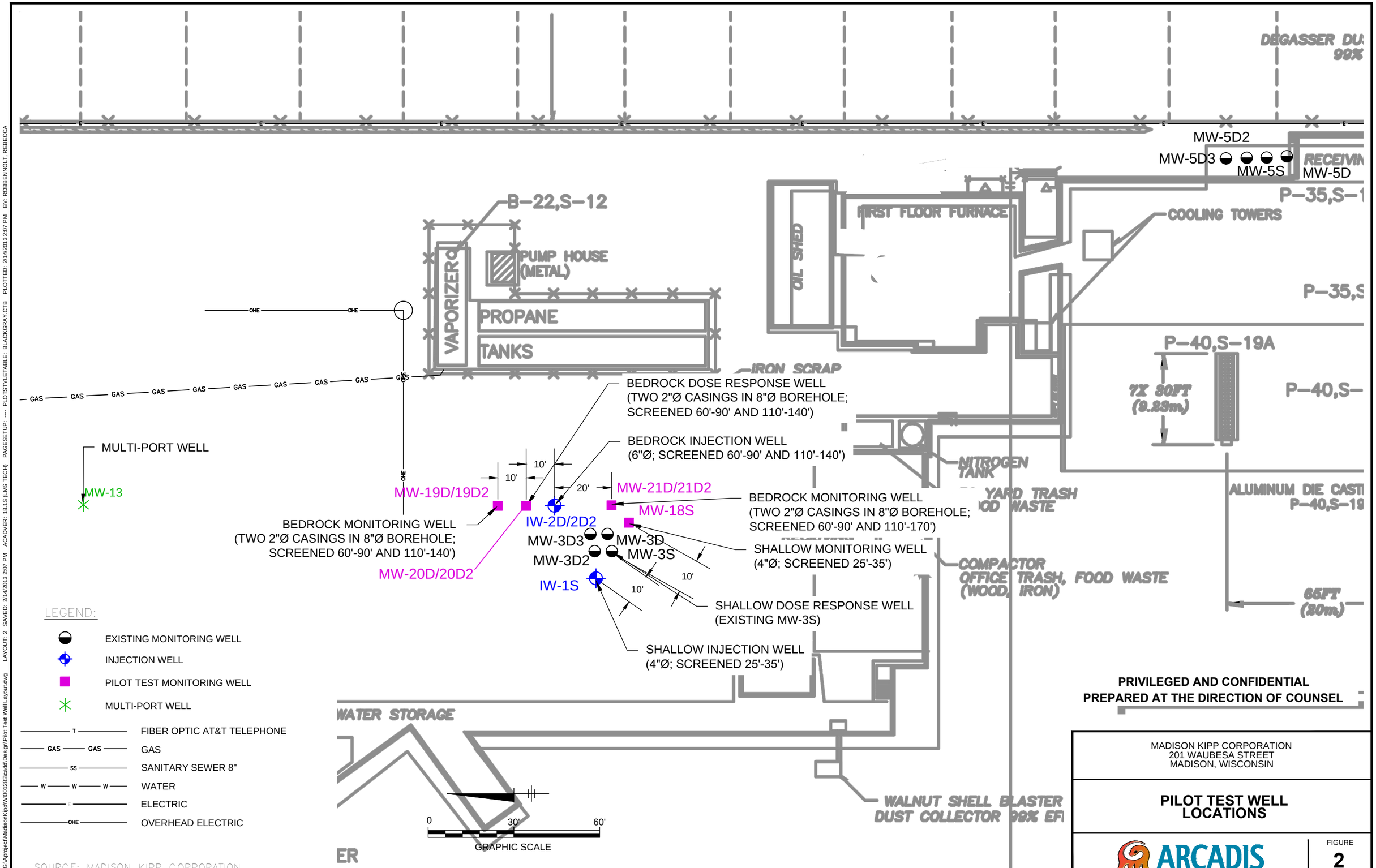
S South

SE Southeast

SW Southwest



CITY: MPLS DIV/GROUP: IM DB: EH LD: CK
MADISON-KIPP
G:\Aproject\MadisonKipp\WI001283\cadd\GIS\Updated Figures\Figure 2-1 Site Location Map.mxd



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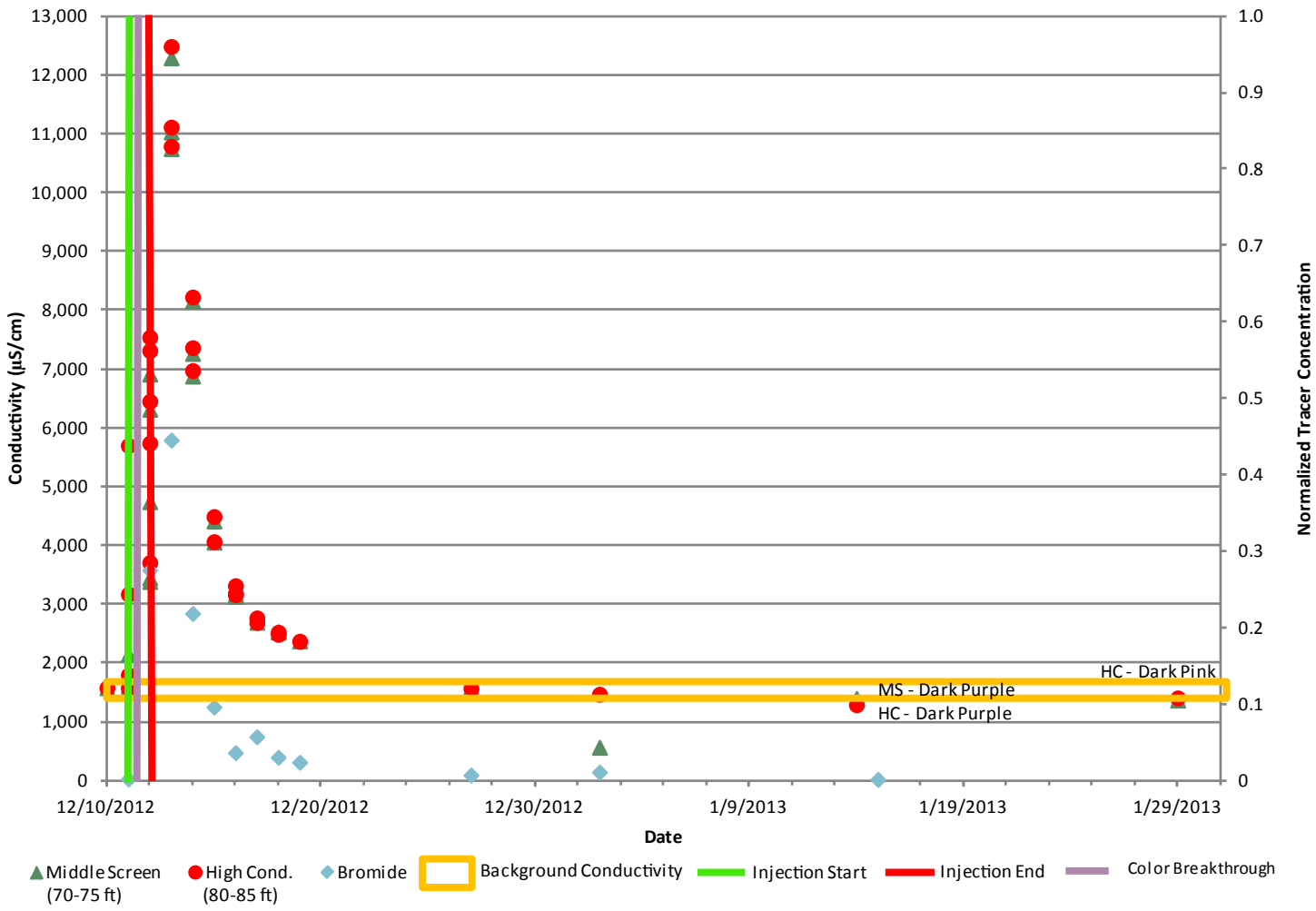
MADISON KIPP CORPORATION
201 WAUBESA STREET
MADISON, WISCONSIN

PILOT TEST WELL LOCATIONS

ARCADIS

FIGURE
2



Injection Summary

- 12/11/12 2,000 gallons
- 12/12/12 5,000 gallons
- 7,000 gallons total
- Dark purple color observed 12/11/12
- MS - Middle of screen samples were collected from the center of the well screen interval, consitent with historical low flow sample methodologies.
- HC - High conductivity interval corresponds to the highest response (conductivity) measured in the well screen interval. This interval is inferred to represent the most transmissive depth interval at the respective monitoring well location.
- µS/cm - microsiemens per centimeter
- feet bgs - feet below ground surface

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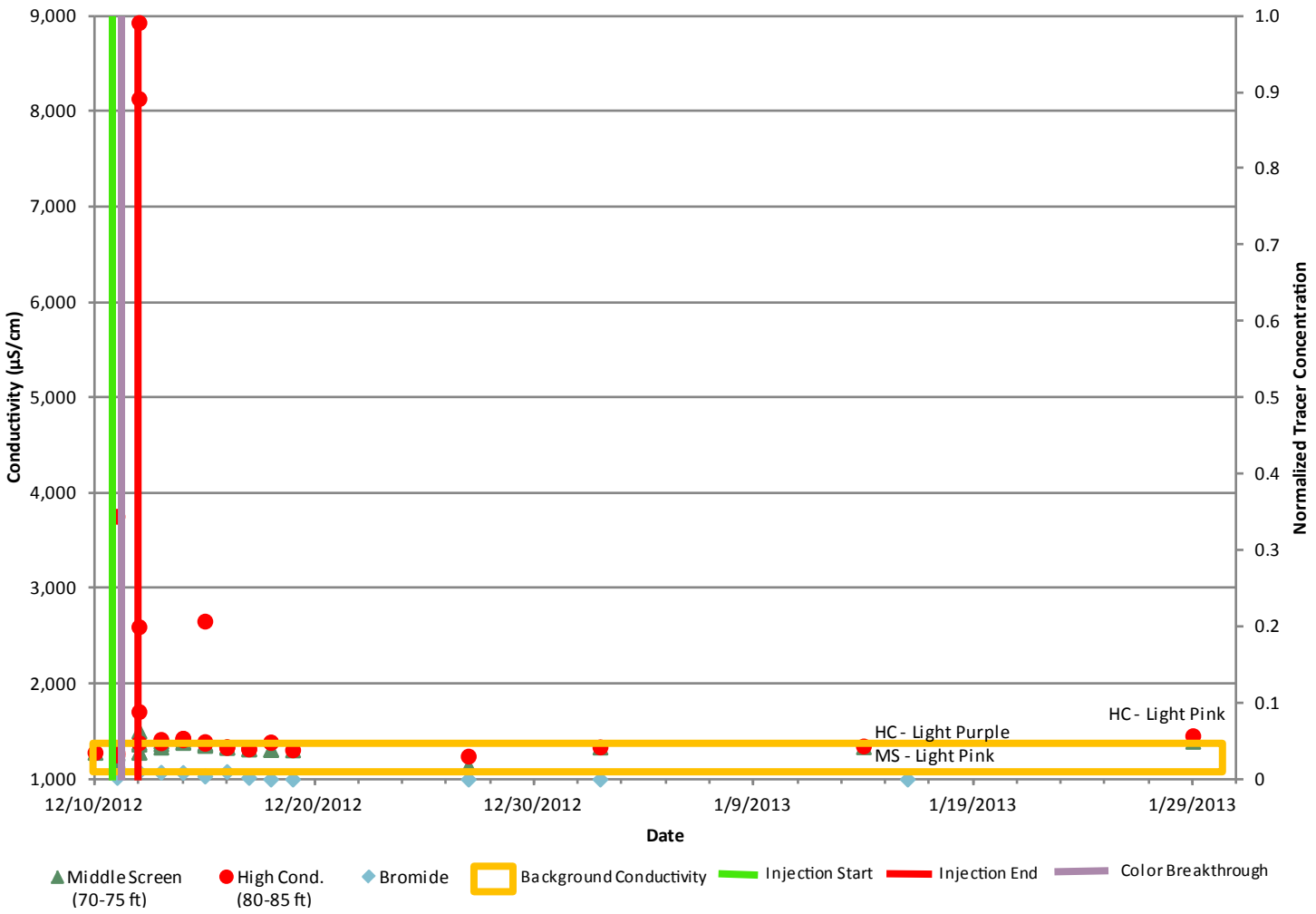
MADISON, WISCONSIN

IMPLEMENTATION SUMMARY OF THE ISCO PILOT TEST - MW-20D SHALLOW BEDROCK INTERVAL 60-90 FEET BGS

ARCADIS

FIGURE
3

15FEB13\ENVIRONMENT\RR\LMB
MADISONKPPWI001283\GRAPHICS\INSITY CHEMICAL OXIDATION GROUNDWATER PILOT TEST MW-20DAI



Injection Summary

- 12/11/12 2,000 gallons
- 12/12/12 5,000 gallons
- 7,000 gallons total
- Pink color breakthrough on 12/11/12
- MS - Middle of screen samples were collected from the center of the well screen interval, consitent with historical low flow sample methodologies.
- HC - High conductivity interval corresponds to the highest response (conductivity) measured in the well screen interval. This interval is inferred to represent the most transmissive depth interval at the respective monitoring well location.
- µS/cm - microsiemens per centimeter
- feet bgs - feet below ground surface

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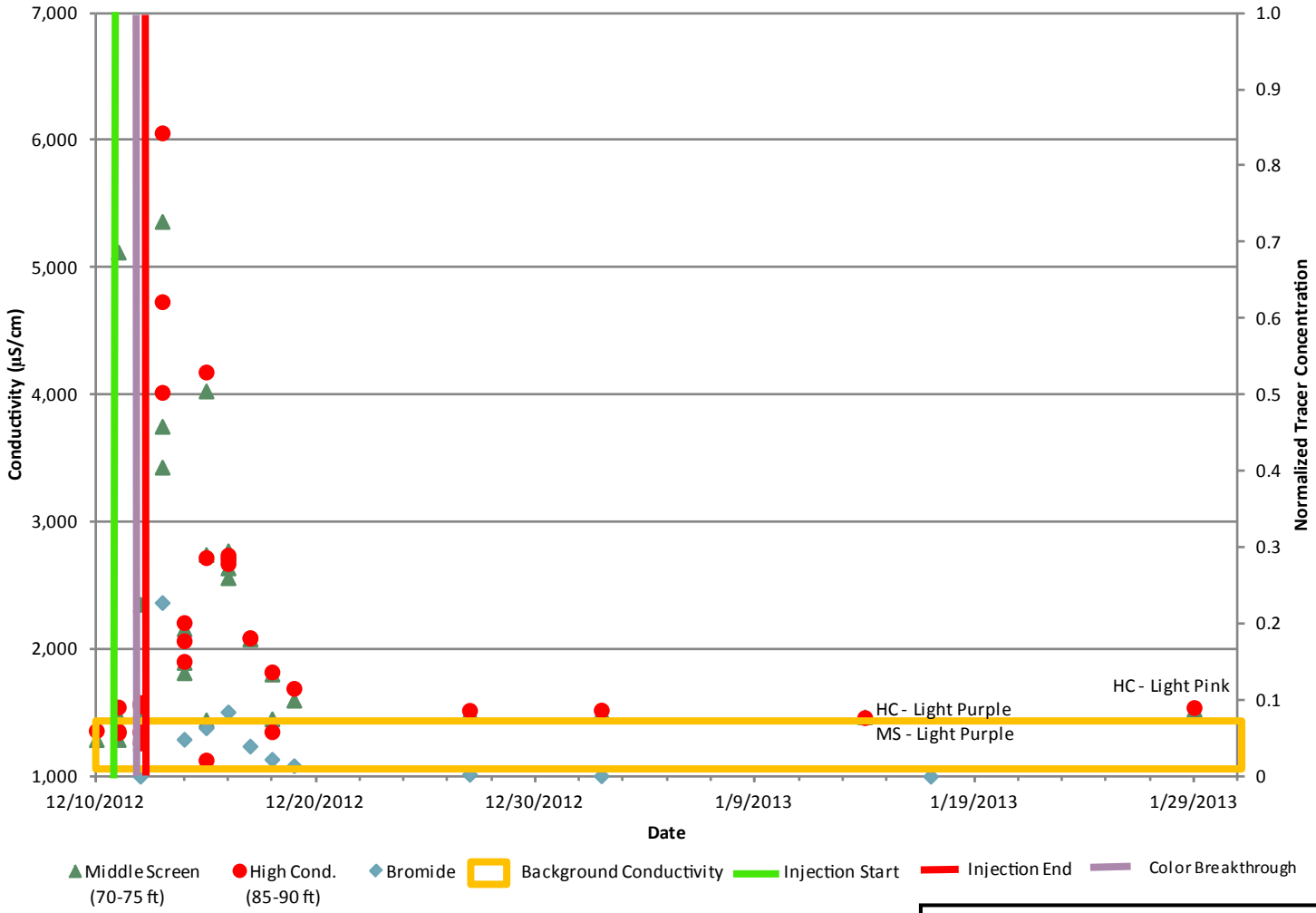
IMPLEMENTATION SUMMARY OF THE ISCO PILOT TEST - MW-19D SHALLOW BEDROCK INTERVAL 60-90 FEET BGS

ARCADIS

FIGURE
4

15FEB13\ENVIRONMENT\RR\LMB
MADISONKPP\WI001283\GRAPHICS\INSITY CHEMICAL OXIDATION GROUNDWATER PILOT TEST MW-19DAI



Injection Summary

- 12/11/12 2,000 gallon
- 12/12/12 5,000 gallon
- 7,000 gallons total
- Purple color observed 12/12/12
- MS - Middle of screen samples were collected from the center of the well screen interval, consitent with historical low flow sample methodologies.
- HC - High conductivity interval corresponds to the highest response (conductivity) measured in the well screen interval. This interval is inferred to represent the most transmissive depth interval at the respective monitoring well location.
- µS/cm - microsiemens per centimeter
- feet bgs - feet below ground surface

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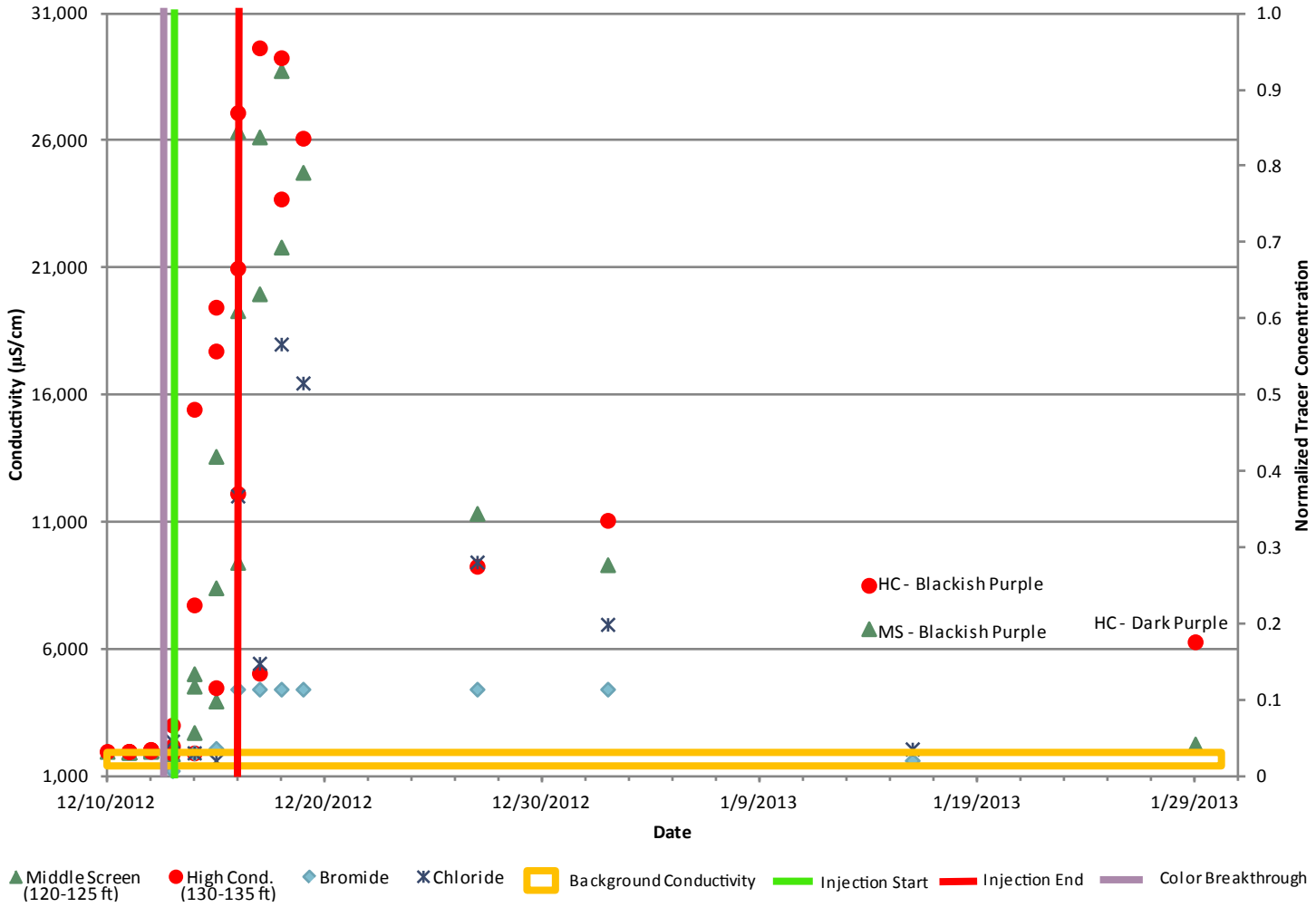
IMPLEMENTATION SUMMARY OF THE ISCO PILOT TEST - MW-21D SHALLOW BEDROCK INTERVAL 60-90 FEET BGS

ARCADIS

FIGURE
5

15FEB13\ENVIRONMENT\RR\LMB
MADISONKPP\WI001283\GRAPHICS\INSITY CHEMICAL OXIDATION GROUNDWATER PILOT TEST MW-21DAI



Injection Summary

- 12/13/12 2,000 gallons
- 12/15/12 1,000 gallons
- 12/16/12 2,000 gallons
- 12/17/12 1,000 gallons
- 12/18/12 1,000 gallons
- 9,000 gallons total
- Purple color observed 12/13/12
- MS - Middle of screen samples were collected from the center of the well screen interval, consitent with historical low flow sample methodologies.
- HC - High conductivity interval corresponds to the highest response (conductivity) measured in the well screen interval. This interval is inferred to represent the most transmissive depth interval at the respective monitoring well location.
- µS/cm - microsiemens per centimeter
- feet bgs - feet below ground surface

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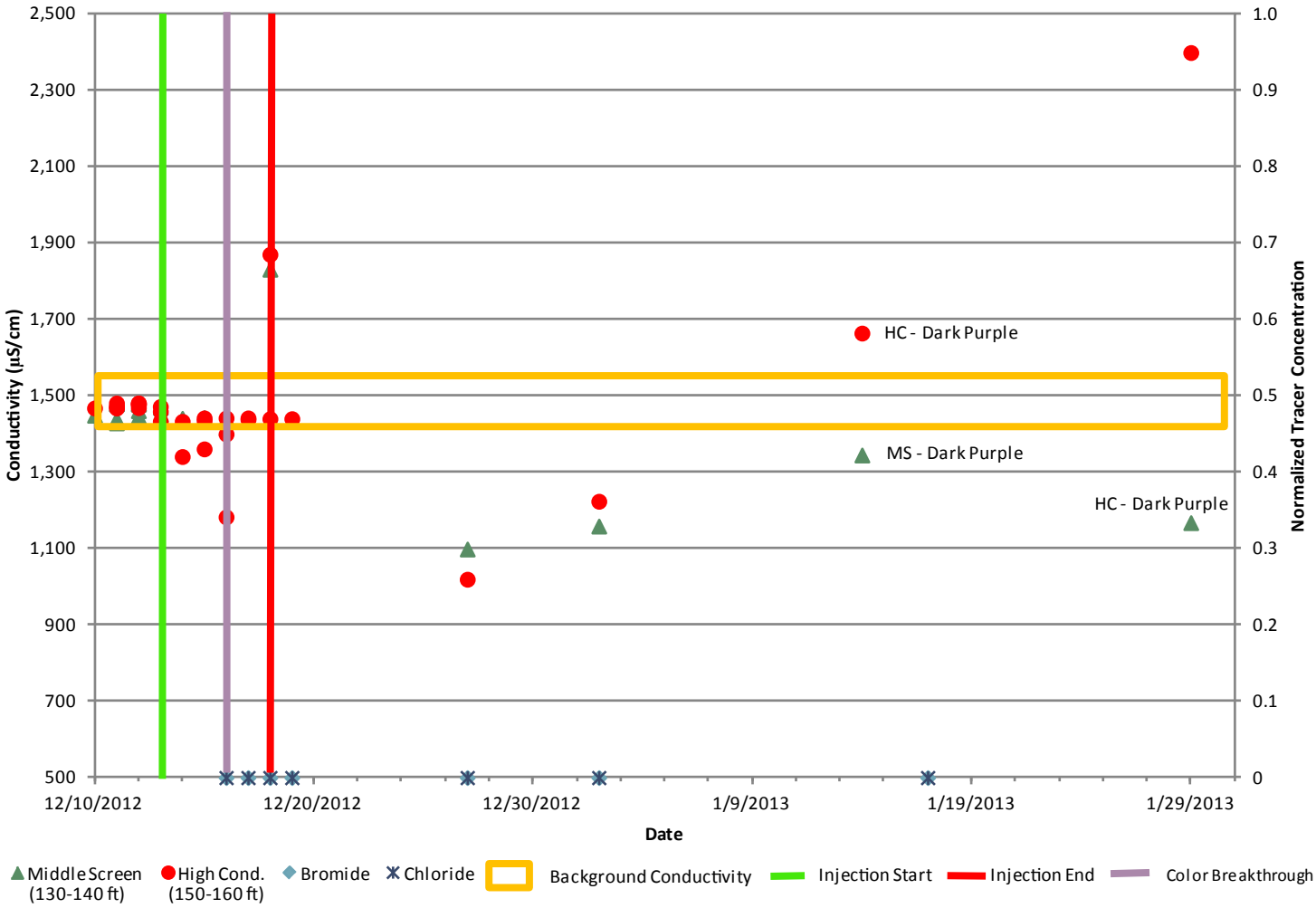
IMPLEMENTATION SUMMARY OF THE ISCO PILOT TEST - MW-20D2 DEEP BEDROCK INTERVAL 110-140 FEET BGS

ARCADIS

FIGURE
6

15FEB13\ENVIRONMENT\RR\LMB
MADISONKPP\WI001283\GRAPHICS\INSITY CHEMICAL OXIDATION GROUNDWATER PILOT TEST MW-20D2AI



Injection Summary

- 12/13/12 2,000 gallons
- 12/13/12 2,000 gallons
- 12/15/12 1,000 gallons
- 12/16/12 2,000 gallons
- 12/17/12 1,000 gallons
- 12/18/12 1,000 gallons
- 9,000 gallons total
- Purple color observed 12/16/12
- MS - Middle of screen samples were collected from the center of the well screen interval, consitent with historical low flow sample methodologies. HC - High conductivity interval corresponds to the highest response (conductivity) measured in the well screen interval. This interval is inferred to represent the most transmissive depth interval at the respective monitoring well location.
- µS/cm - microsiemens per centimeter
- feet bgs - feet below ground surface

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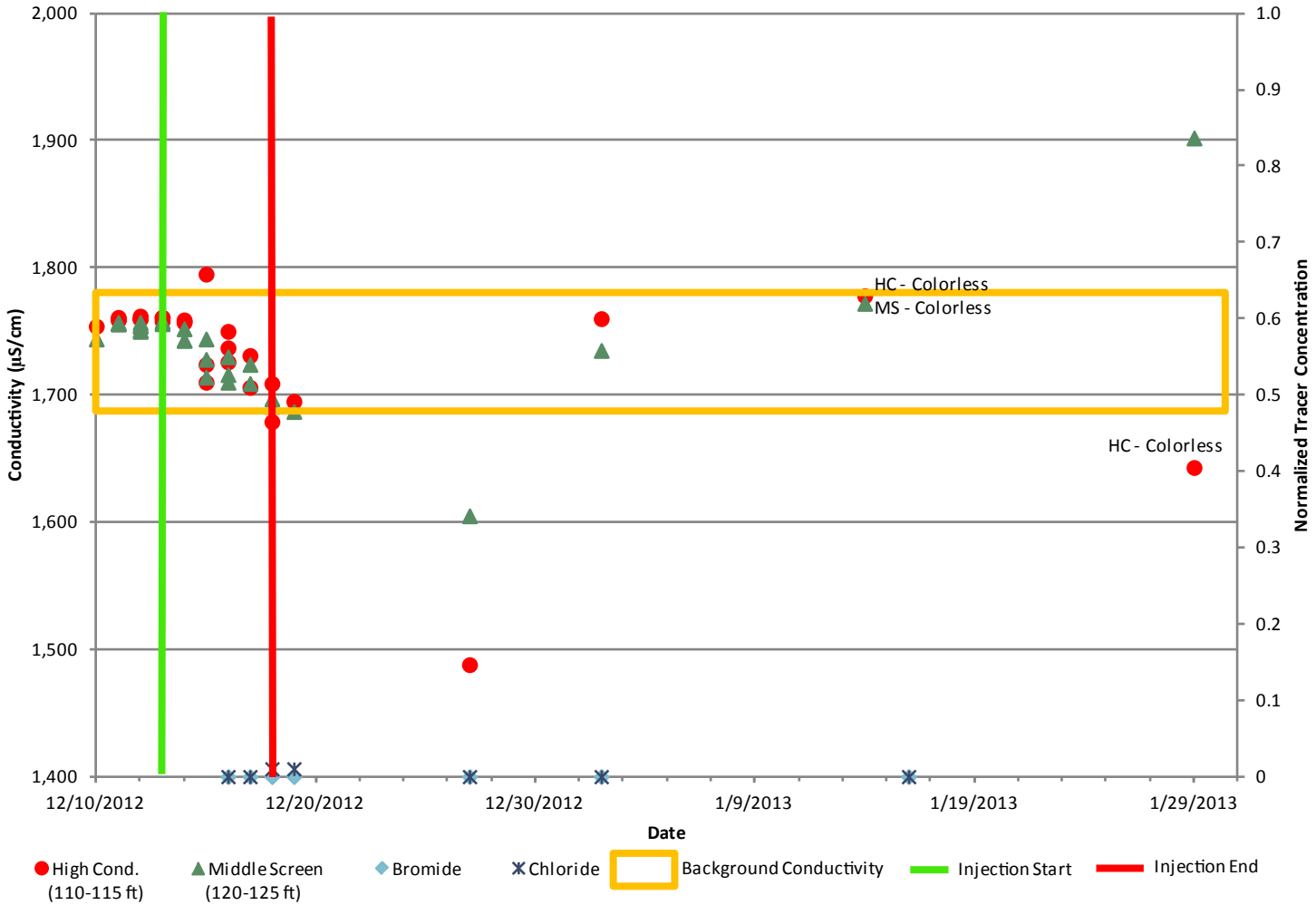
IMPLEMENTATION SUMMARY OF THE ISCO PILOT TEST - MW-21D2 DEEP BEDROCK INTERVAL 110-170 FEET BGS

ARCADIS

FIGURE
7

15FEB13\ENVIRONMENT\RR\LMB
MADISONKPP\WI001283\GRAPHICS\INSITY CHEMICAL OXIDATION GROUNDWATER PILOT TEST MW-21D2AI



Injection Summary

- 12/13/12 2,000 gallons
- 12/14/12 2,000 gallons
- 12/15/12 1,000 gallons
- 12/16/12 2,000 gallons
- 12/17/12 1,000 gallons
- 12/18/12 1,000 gallons
- 9,000 gallons total
- No color break through to date
- MS - Middle of screen samples were collected from the center of the well screen interval, consitent with historical low flow sample methodologies. HC - High conductivity interval corresponds to the highest response (conductivity) measured in the well screen interval. This interval is inferred to represent the most transmissive depth interval at the respective monitoring well location.
- µS/cm - microsiemens per centimeter
- feet bgs - feet below ground surface

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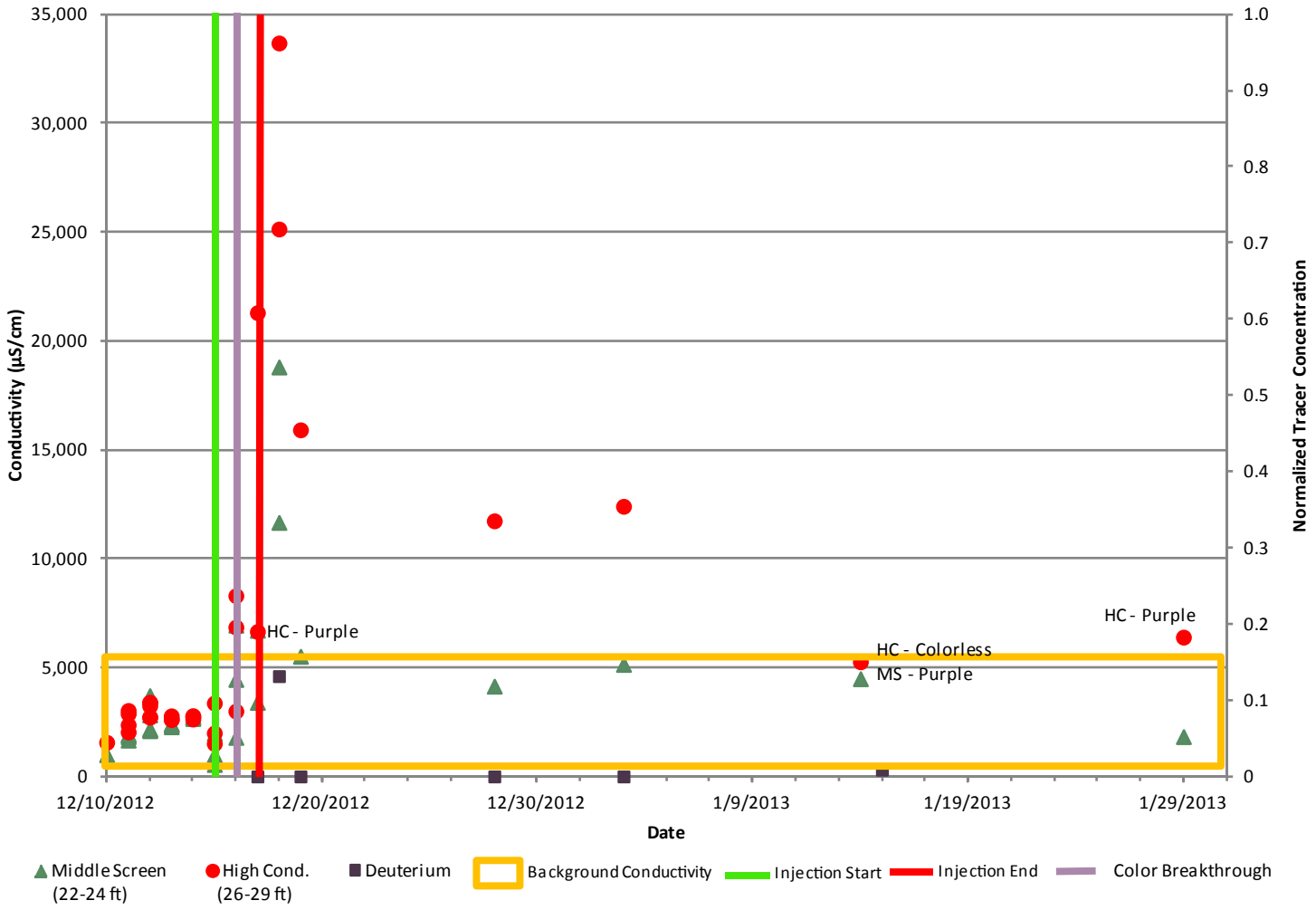
IMPLEMENTATION SUMMARY OF THE ISCO PILOT TEST - MW-19D2 DEEP BEDROCK INTERVAL 110-140 FEET BGS

ARCADIS

FIGURE
8

15FEB13\ENVIRONMENT\RR\LMB
MADISONKPP\WI001283\GRAPHICS\INSITY CHEMICAL OXIDATION GROUNDWATER PILOT TEST MW-19D2AI



Injection Summary

- 12/15/12 1,000 gallons
- 12/16/12 1,000 gallons
- 12/17/12 350 gallons
- 2,350 gallons total
- Purple color breakthrough 12/16/12
- MS - Middle of screen samples were collected from the center of the well screen interval, consitent with historical low flow sample methodologies.
- HC - High conductivity interval corresponds to the highest response (conductivity) measured in the well screen interval. This interval is inferred to represent the most transmissive depth interval at the respective monitoring well location.
- µS/cm - microsiemens per centimeter
- feet bgs - feet below ground surface

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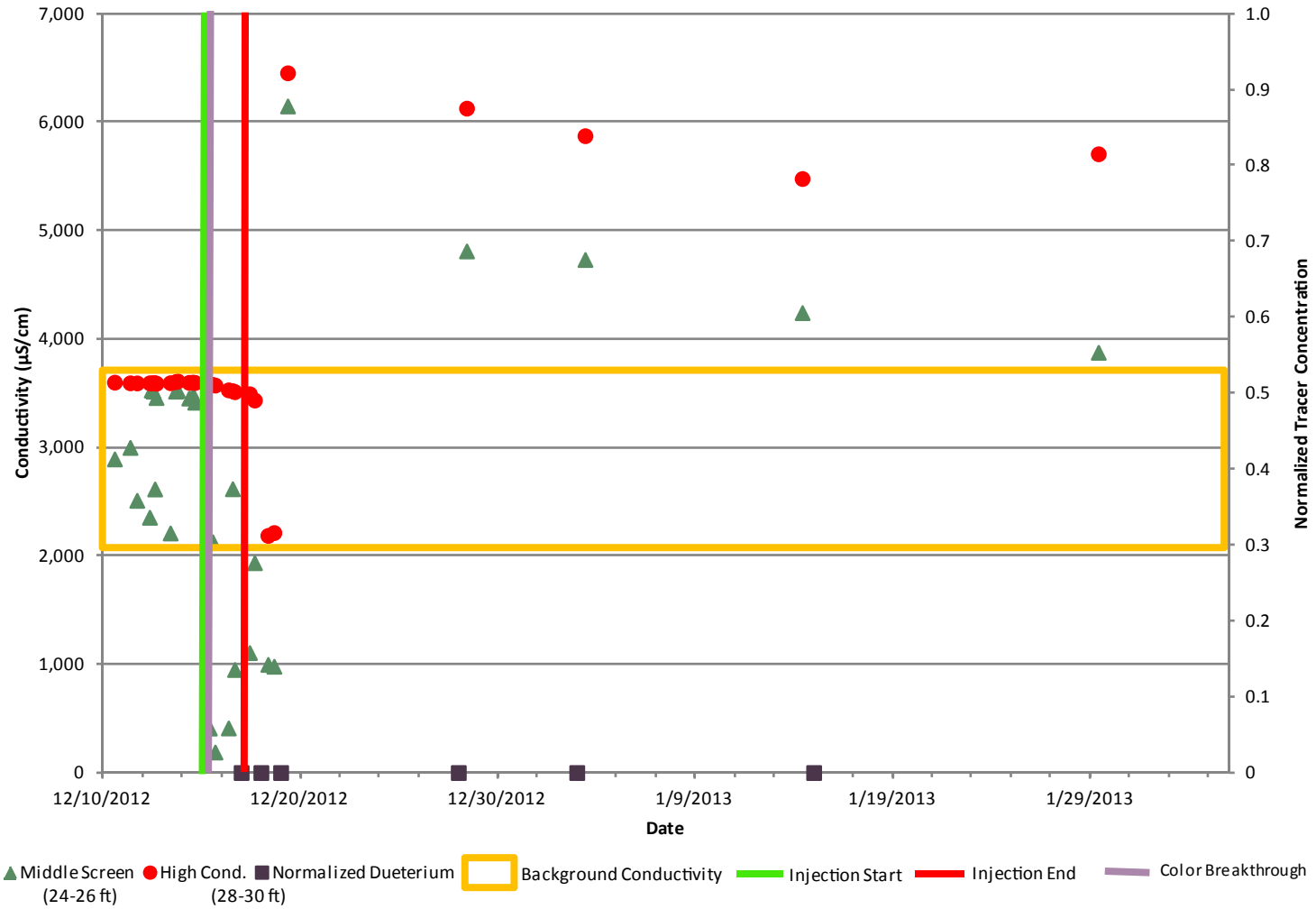
IMPLEMENTATION SUMMARY OF THE ISCO PILOT TEST - MW-3S SHALLOW UNCONSOLIDATED INTERVAL 19-29 FEET BGS

ARCADIS

FIGURE
9

15FEB13\ENVIRONMENT\RR\LMB
MADISONKPP\WI001283\GRAPHICS\INSITY CHEMICAL OXIDATION GROUNDWATER PILOT TEST MW-3SAI



Injection Summary

- 12/15/12 1,000 gallons
- 12/16/12 1,000 gallons
- 12/17/12 350 gallons
- 2,350 gallons total
- No color to date
- MS - Middle of screen samples were collected from the center of the well screen interval, consitent with historical low flow sample methodologies.
- HC - High conductivity interval corresponds to the highest response (conductivity) measured in the well screen interval. This interval is inferred to represent the most transmissive depth interval at the respective monitoring well location.
- µS/cm - microsiemens per centimeter
- feet bgs - feet below ground surface

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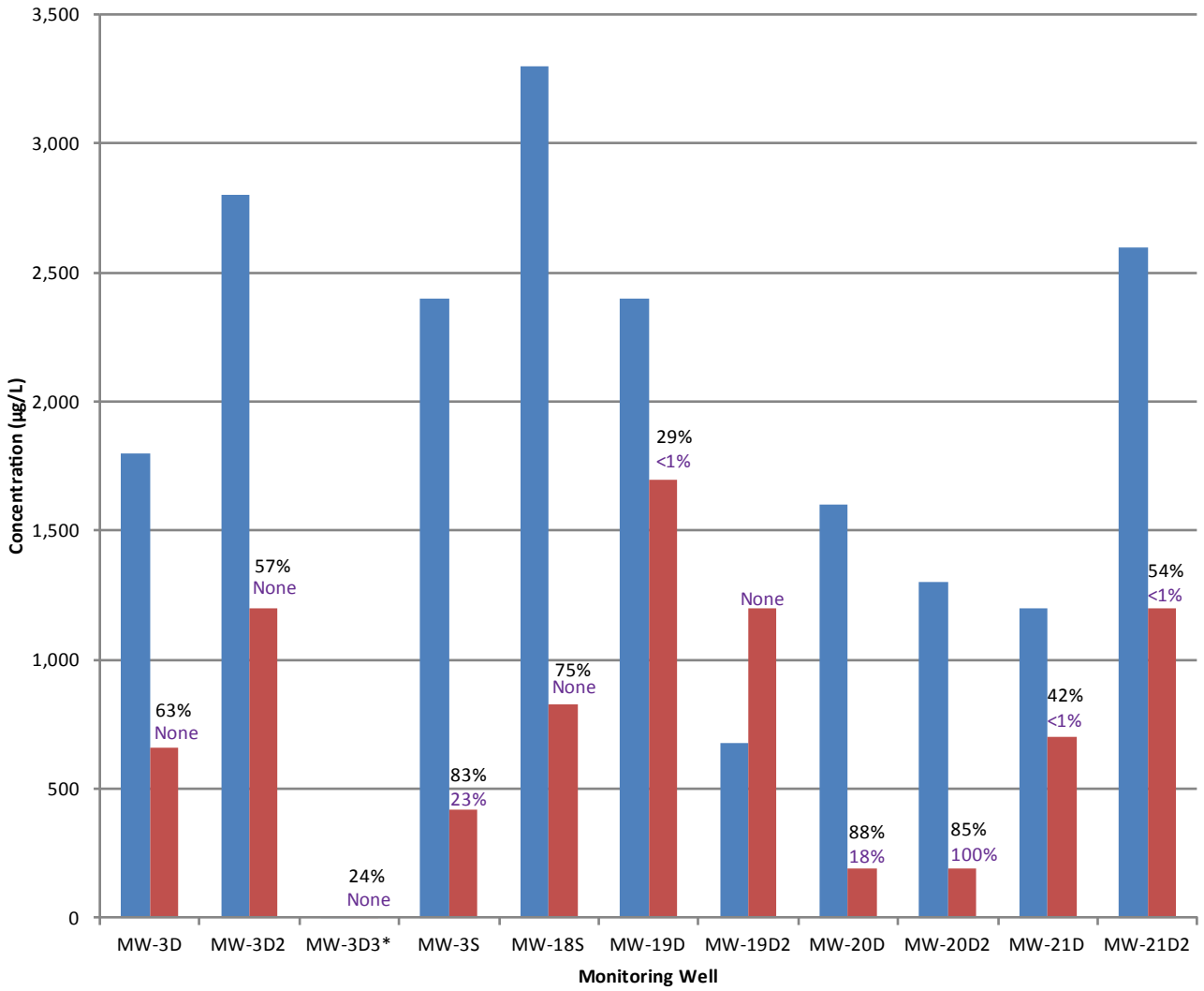
IMPLEMENTATION SUMMARY OF THE ISCO PILOT TEST - MW-18S SHALLOW UNCONSOLIDATED INTERVAL 20-30 FEET BGS

ARCADIS

FIGURE
10

15FEB13\ENVIRONMENT\RR\LMB
MADISONKPP\WI001283\GRAPHICS\INSITY CHEMICAL OXIDATION GROUNDWATER PILOT TEST MW-18SAI



Baseline

Post-Injection

88% Interim Percent Reduction

<1% Percent Breakthrough of sodium permanganate

µg/L micrograms per liter

* MW-3D3 Baseline Concentration 1.7 µg/L; Post-Injection Concentration 1.3 µg/L

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INTERIM PERCENT REDUCTION TETRACHLORETHENE (PCE)

ARCADIS

FIGURE
11

14FEB13\ENVIRONMENT\RR\LMB
MADISONKPP\WI001283\GRAPHICS\INTERIM PERCENT REDUCTION.AI

Appendix A

Colormetric Test Procedure

Determination of RemOx® ISCO Reagent Residual Using the Hach DR 890 Colorimeter

FACT SHEET

OBJECTIVE

This method can be used to determine the residual permanganate in water using standard spectrophotometric methods.

NOTE

If the instrument is being used for the first time, a calibration curve needs to be stored in the instrument. The absorbance is measured at 520 nm. A minimum of three standards should be used to generate this curve. (See instructions in the DR 890 instruction manual).

PROCEDURE

1. Obtain a water sample of unknown permanganate concentration and filter through a 0.45 um oxidant-resistant syringe filter (recommended examples are Whatman 0.45 um syringe filters or Millipore Millex GV syringe filters). This is to remove any turbidity and MnO_2 that may be present.

2. The sample may need to be diluted at this time. The acceptable range for reading residual permanganate on the DR 890 is approximately 1-50 mg/L. The sample should be diluted with deionized water to read within this range.

3. Enter program number 102 for the stored program on the instrument.

4. Zero the colorimeter using either deionized water or filtered, untreated groundwater. Fill the vial to the 25 mL mark and face the diamond shape on the sample cell towards the keypad. Note: Be sure to wipe the vial so it is clean, free of streaks, and dry. Place the light shield over the sample cell and press zero on the instrument.

5. Fill a second vial to the 25 mL mark with filtered groundwater containing an unknown concentration of permanganate. Note: Be sure to wipe the vial so it is clean, free of streaks, and dry. Place the light shield over the sample cell and press read on the instrument. The program will give the result in mg/L as either $KMnO_4$ or $NaMnO_4$. All Carus rental units read the results as $KMnO_4$. If a dilution was used, multiply the colorimeter reading by the dilution factor.

CALCULATION

If analyzing for RemOx® L ISCO reagent (sodium permanganate) use the following equation to convert: mg/L $KMnO_4$ X 0.895 = mg/L $NaMnO_4$

RETURN INFORMATION

Please be sure all vials are empty and clean before shipping the kit back to Carus. No liquids should be shipped. Please send colorimeter back to the address listed below and insure shipment for $1,500. Thank you!

Carus Corporation
Attention: CRT
315 5th Street
Peru, IL 61354

Carus Corporation
Peru, IL U.S.A.
Tel. + 1 815 223 1500
1 800 435 6856 (Toll free US Only)
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