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To:	Ms. Annette Weissbach Wisconsin Department of Natural Resources 2984 Shawano Avenue Green Bay, WI 54313-6727	**Date:** **Project No:** **Project Name:**	March 14, 2012 186467 Phase 000003 WDNR – Kewaunee Marsh

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Annette,

Enclosed is the final Documentation Report and Baseline Performance Monitoring for the Arsenic Hot Spot In-Situ Remediation – Kewaunee Marsh Arsenic Spill Restoration Project.

Please contact me at 608-826-3658 if you have any questions.

Sincerely,

Alyssa Sellwood, P.E.
Project Manager

Arsenic Source Area In-Situ Remediation Documentation Report and Baseline Performance Monitoring

Kewaunee Marsh Historic Arsenic Spill Restoration Project

March 2012

Arsenic Source Area In-Situ Remediation Documentation Report and Baseline Performance Monitoring

Kewaunee Marsh Historic Arsenic Spill Restoration Project

March 2012

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Executive Summary

Approximately 15 acres of water and sediment in the Buzz Besadny Fish and Wildlife Area (also known as the Kewaunee Marsh), in Kewaunee, Wisconsin, are contaminated with arsenic. The source of the arsenic is attributed to a spill from an overturned railroad car on the now inactive railroad adjacent to the site. The inactive rail line has been converted to part of the Ahnapee Trail network.

Site investigations completed between 2002 and 2005 defined the extent of the arsenic impacts in the groundwater, surface water, and sediment in the marsh, and led to the Wisconsin Department of Natural Resources (WDNR) establishing a site specific arsenic cleanup standard of 19 mg/kg for sediment and 0.148 mg/L for groundwater/surface water (STS, 2004 and STS, 2006).

The results of additional site investigations completed between 2005 and 2010 confirmed that a an area of highly impacted dissolved-phase arsenic was present below the trail and to the east of the trail in the marsh (RMT, 2007 and RMT, 2010). The WDNR selected to remediate the arsenic source area using an in situ stabilization approach designed from site specific treatability studies. Sediment with compositional arsenic concentrations greater than 2,000 mg/kg at the time of RMT's 2009/ 2010 source area investigations (correlated to leach above the hazardous waste criteria of 5 mg/L) were defined as the extent of the source area to be subjected to in situ stabilization. This material was present under a 70-foot length of the trail and extended 80 feet into the marsh. The in situ stabilization was designed to render the source area material non-hazardous, and limit the migration of arsenic in the marsh.

The in situ remediation was completed in October 2011 by Orin Technologies, Inc. (ORIN). Hydrogen peroxide, granular ferric sulfate, crushed limestone, and bentonite were incorporated into 3,000 cubic yards of sediment, in series, to stabilize arsenic in the source area and mitigate the on-going release of dissolved-phase arsenic impacts to the marsh.

TRC Environmental Corporation (TRC), formerly RMT, Inc. (RMT), was retained by the WDNR to oversee and document the in-situ remediation, to complete sediment performance verification sampling and baseline groundwater sampling, and to evaluate the sampling results. ORIN completed the in situ remediation of the arsenic source area and subsequent site restoration in accordance with the specifications (WDNR, 2011). The performance verification results for the treated sediment indicate that arsenic stabilization was achieved throughout the bulk of the treatment area at the time of treatment. The average SPLP arsenic concentration in

the source area prior to treatment was approximately 31 mg/L, and was reduced to approximately 0.2 mg/L as a result of the in situ stabilization.

The results from the baseline monitoring event are inconclusive with respect to the water quality in the treatment area. The arsenic concentrations in the water samples collected from within the treatment zone were between 100 and 300 mg/L, which is higher than anticipated. We expected the arsenic concentrations to be less than 5 mg/L based on SPLP results from the treated sediment. TRC believes the elevated arsenic concentrations in the treatment area may be a result of colloidal solids passing through the filter used to differentiate dissolved and particulate metals, rather than actual aqueous phase concentrations of arsenic. If the arsenic is associated with colloids, then the arsenic detected in the treatment area is not mobile, and will likely settle out of suspension through time. TRC recommends further evaluation of the potential for colloidal particles being present in the water in the treatment area. Specifically, we recommend completing a water sampling event in the spring of 2012 to evaluate low-flow sampling techniques and smaller filter sizes that may be used during sampling. Following analysis of the spring 2012 sampling results, TRC will propose necessary modifications to the June 2011 Performance Monitoring Plan.

Section 1
Introduction

1.1 Background

Approximately 15 acres of water and sediment in the Buzz Besadny Fish and Wildlife Area (also known as the Kewaunee Marsh), in Kewaunee, Wisconsin, are contaminated with arsenic. The source of the arsenic is attributed to a spill from an overturned railroad car that likely occurred between 1938 and 1950 on the now inactive railroad adjacent to the site. In 1996, following discovery of the contamination, 4 acres of the marsh were capped and all 15 acres were enclosed in a fence as in interim action to limit direct contact with the arsenic impacts. The cap and fence remain in place at the site, and the inactive rail line has been converted to a hiking, biking, and snowmobile trail as part of the Ahnapee Trail network (Figure 1).

Between 2002 and 2005, STS Consultants (STS) completed site investigation activities to define the distribution of arsenic in the sediment, surface water, and groundwater at the site (STS, 2004 and STS, 2006). Based on the results of the STS investigation, the Wisconsin Department of Natural Resources (WDNR) established site specific cleanup standards of 19 mg/kg for sediment and 0.148 mg/L for groundwater/surface water.

Between 2005 and 2007, following the site investigation, RMT, Inc. (RMT), completed a treatability study and a remedial options analysis for the marsh to evaluate alternatives for achieving the site-specific cleanup standards (RMT, 2007). During the study, RMT noted that an area of elevated arsenic concentrations (2,200 mg/L) was present in groundwater near the former railroad ballast at monitoring well MW04-10. RMT completed an additional groundwater investigation near MW04-10 to test the hypothesis that a source area of dissolved-phase arsenic was present within the railroad ballast (Figure 2). The results of the additional investigation confirmed that an area of highly impacted dissolved-phase arsenic was present below the railroad ballast and to the east of the ballast in the marsh.

1.2 Purpose and Scope

Treatability and feasibility studies were completed to evaluate the remedial options for the source area (RMT, 2010). The WDNR selected to implement in situ remediation of the arsenic source area, with the remedial objective of stabilizing the arsenic in the source area and eliminating the on-going release of dissolved arsenic impacts to the marsh.

The in situ stabilization remedy was completed for the source area in October 2011. The purpose of this report is to document the in situ remediation and analyze the performance verification results for the treated sediment and baseline groundwater samples. The scope of this report includes the following:

- Summary of the remedial design
- Documentation of the remediation
- Analysis of performance verification sampling
- Analysis of baseline groundwater monitoring
- Conclusions and recommendations for post-remedial activities moving forward

Section 2
Remedial Design

2.1 Source Area Definition

Between 2009 and 2010, RMT completed focused source area investigations (RMT, 2010). Material with compositional arsenic concentrations greater than 1,000 mg/kg was found to potentially leach arsenic at concentrations greater than 5 mg/L in a TCLP test. The material with compositional arsenic concentrations greater than 1,000 mg/kg was present under a 70 foot length of the ballast and extended approximately 200 feet northeasterly into the marsh, and was present five to 15 feet below grade in the ballast and zero to seven feet below grade in the marsh. An organic silt layer was evaluated to be impeding further downward migration of the arsenic under the ballast and in the marsh. The arsenic concentrations and cross-sections from the source area investigation are included in Appendix E for reference.

Evaluation of time series data collected from the marsh showed that the concentration of compositional arsenic has decreased through time. The rate of decrease observed in the historical data was projected into the future. From this, we estimated that material with compositional arsenic concentrations less than 2,000 mg/kg would decrease to levels that are below 1,000 mg/kg in less than five years. Thus, the area targeted for remediation, was defined to be areas containing material with compositional arsenic concentrations greater than 2,000 mg/kg at the time of the 2009/ 2010 investigation (RMT, 2010). The extent of the source area targeted for remediation is shown in plan view and cross-sectional view in Figures 2 and 3, respectively. The material containing compositional arsenic greater than 2,000 mg/kg was present under a 70-foot length of the ballast, extended 80 feet into the marsh, and contained an estimated 2,400 cubic yards of material.

2.2 Remedial Approach and Description

The 2,400 cubic yards of source area material containing compositional arsenic concentrations greater than 2,000 mg/kg were targeted for in situ treatment. The remedy was designed using treatability studies completed on samples of material collected from the source area at the site (RMT, 2007 and RMT, 2010). The in situ remedy called for incorporating hydrogen peroxide, granular ferric sulfate, and crushed limestone, in series, into the source area material to stabilize the arsenic in this area. The hydrogen peroxide was first incorporated to convert arsenic present in the form of arsenite to arsenate. Next, the ferric sulfate was added to precipitate the arsenic as ferric arsenate, a non-leachable form of arsenic under standard geochemical conditions. (Ferric sulfate addition also forms ferric hydroxide, which can absorb additional

arsenate.) Finally, the limestone was added as a buffering agent to neutralize the acid generated from the previous chemical reactions. Following the application of the treatment chemicals, granular bentonite was blended into the treated marsh sediment to reduce the permeability of the material, and improve the long-term performance of the treatment (restrict the flow of groundwater in the area).

2.3 Remedial Objectives

The objective of the remediation was to stabilize the arsenic in the source area and mitigate the on-going release of dissolved-phase arsenic impacts to the marsh, with the long-term objective of achieving the site-specific clean-up level of 0.148 mg/L arsenic in the groundwater and surface water at the site. To meet this long-term objective, a remediation goal of SPLP arsenic concentrations less than 0.148 mg/L for the treated sediment as evaluated during implementation of the remedy, was established for the treated material in the source area. However, flexibility was incorporated into the design to allow acceptance of higher individual SPLP concentrations, up to 5 mg/L, in the performance verification process. In a controlled lab setting the treatment was able to reduce the SPLP arsenic concentrations in the sediments collected from the source area to below 0.148 mg/L; however, at the field scale it was understood that site specific constraints may limit achieving this specific numeric goal, and modifications to the numeric treatment goal were allowed.

Section 3
Remediation Documentation

The in situ remediation of the arsenic source area, as defined in the plans and specifications (WDNR, 2011), was completed at the site between October 2 and October 24, 2011. The subcontractors and remediation activities are summarized below.

3.1 Contractor and Subcontractors

ORIN Remediation Technologies, LLC, of McFarland, WI (ORIN) was the contractor retained by the WDNR to implement the in situ remediation in the marsh and trail areas. ORIN was responsible for managing the in situ remediation and site restoration, and overseeing their subcontractors.

Veolia ES Industrial Services, Inc. of Brokaw, WI (Veolia) was subcontracted by ORIN to provide and operate the earthmoving equipment and site construction features. Veolia's work included, but was not limited to the following; install temporary fences and signs; remove portions of permanent fence for marsh access; construct an access road and access ramp; apply and mix the ferric sulfate, limestone, and bentonite during the in situ treatment; restore the disturbed marsh areas with topsoil, mulch, and seed; restore disturbed trail areas; install a permanent access gate; and restore the site to pre-construction conditions.

On-Site Environmental Services, Inc. of Sun Prairie, WI (On-Site) was subcontracted by ORIN to construct five permanent monitoring wells and provide well construction forms.

Technical Engineering Support Services of Green Bay, WI (TESS) was subcontracted by ORIN to survey the elevations of the five newly installed permanent monitoring wells.

3.2 In Situ Mixing Products Used

MSDSs and product information sheets for in situ mixing products and ORIN's summary of the quantities of each chemical applied to the treatment area are presented in Appendix A.

3.2.1 Hydrogen Peroxide

A total of 330 gallons of 50% standard grade aqueous hydrogen peroxide solution from the Hydrite Chemical Company was delivered to the site in six 55-gallon plastic drums. Hydrogen peroxide was diluted and applied in a 5% solution during the remediation. Batches of 5% hydrogen peroxide solution were made by adding 10 gallons of 50%

solution to 90 gallons of water for a total of 100 gallons. All 330 gallons of 50% hydrogen peroxide delivered to the site were mixed into the treatment area.

3.2.2 Ferric Sulfate

Approximately 70.5 tons of Kemiron Ferix-3 granular ferric sulfate from Kemira was delivered to the site in sixty-four 2,204-pound (1.1 ton) super sacks. All 70.5 tons of ferric sulfate was mixed into the treatment area.

3.2.3 Limestone

Approximately 60 tons of limestone (100% passing 3/8" sieve, 95.5% passing No. 4 sieve, and 18.7% passing No. 100 sieve) from Daanen & Janssen, Inc. of De Pere, WI (D&J) was delivered to the site in dump trucks and stockpiled on the trail. All 60 tons of limestone was mixed into the treatment area.

3.2.4 Bentonite

A total of 120 tons of Sorbond UG granular bentonite from Cetco® was delivered to the site in 2,000-pound (1 ton) super sacks. All 120 tons of bentonite was mixed into the treatment area.

3.3 Site Preparation

The in situ treatment area was located along the Ahnapee State Trail, and the trail was used as the access road to the site and staging area during the remediation. In order to restrict public access to the construction area, the trail was closed during remediation at the locations shown on Figure 4. In addition, an access road through the private property adjacent to the trail, was constructed at the site entrance, in order to support construction traffic between River Road and the trail (Figures 4 and 5). The activities associated with the site preparations and access to the site are summarized below.

3.3.1 Access Restriction and Signs

Trail barricades, constructed of eight-foot high chain link fence, as shown in Photo 1 of Appendix B (Photo 1), were installed at the locations shown on Figure 4, to prevent the public from accessing the construction work zone. Signs were installed at the barricades and other trail locations, as shown on Figure 4.

Construction of a lockable swing gate across the access road was called for in the specifications. However, this gate would have restricted truck access for deliveries and

was therefore omitted from the site preparation. Construction of the permanent gate was delayed until site restoration (Photo 42).

3.3.2 Fence Removal

To allow access to the marsh for remedial construction equipment and personnel, a portion of the existing chain link fence adjacent to the trail was cut to the northwest of the treatment area and rolled back southeast of the treatment area (Photos 4 and 5). Fence posts within the treatment area were pulled from the ground and stored on-site for eventual fence re-construction.

3.3.3 Access Road and Ramp

Approximately 150 tons of gravel from D&J was delivered to the access point on private property, and was graded and compacted to construct an access road connecting River Road to the trail (Figure 5 and Photo 3). Topsoil stripping was not required to construct the access road.

Approximately 220 tons of limestone gravel from D&J was delivered to the treatment area, and was graded to construct an access ramp connecting the trail to the marsh for remedial construction equipment and personnel (Photo 6). The approximate location of the ramp is shown on Figure 6.

3.3.4 Contamination Reduction and Storage of Mixing Products

All construction and well-drilling equipment was washed in accordance with the specifications, prior to delivery to the site, to prevent the spread of exotic invasive organisms.

A contaminant reduction zone was established around the in situ treatment area to prevent the transport of contaminated media off the site. Erosion control fencing and decontamination stations were set up within the contaminant reduction zone (Figure 6 and Photo 7). Personal protective equipment (PPE) staging areas, wash stations, and a hazardous waste disposal drum were located at the access point to the treatment zone (Photo 16).

Dedicated staging areas for hydrogen peroxide, ferric sulfate, and bentonite were established as shown on Figure 6. Hydrogen peroxide was stored on the trail in 55-gallon plastic drums (Photo 5) and bentonite and ferric sulfate were stored in super sacks placed in the marsh adjacent to the treatment area (Photos 8 and 19), as well as on

the trail. Super sacks were covered with a tarp when not in use to keep dry. Limestone was stored in stockpiles on the trail and on the site access ramp (Photo 20).

3.3.5 Monitoring Well Abandonment

Monitoring well MW04-10, was located within the treatment area, and therefore was specified to be abandoned prior to in situ mixing. To abandon well MW04-10, Veolia wrapped a strap around the well casing, attached it to the backhoe, and then pulled it up using the backhoe to remove the casing from the ground. The same method was used to remove the PVC well from the ground. The outer casing was sprayed with a pressure washer and disposed off-site as solid waste, and the PVC well and pre-packed screen were disposed as hazardous materials (Section 3.8). The borehole was not abandoned with bentonite or other sealant, because the forthcoming mixing for the remediation would homogenize the sediment at the location of the well. A well abandonment form for MW04-10 is included in Appendix C.

3.4 Field Trial – In Situ Stabilization

3.4.1 Purpose

On October 5, 2011, a field trial was conducted within the treatment area prior to implementing the full-scale remedy. The purpose of the field trial was to evaluate the means and methods selected by ORIN, and the effectiveness of the treatment chemistry when implemented at the field scale. The specific treatment goal described in Section 2 was also evaluated during the field trial, in order to develop treatment criteria that was achievable for full scale implementation of the in situ stabilization, and that met the remedial objective for arsenic stabilization.

3.4.2 Site Grid

Previous investigations have shown that the vertical extent of the source area is contained in the peat and ballast sand, and that significant impacts of arsenic do not extend into in the underlying low permeability organic silt layer (Figure 3 and Appendix E). Previous investigations have also estimated the thickness of the peat layer in the marsh to be approximately seven feet. The initial target area of material to be treated in the marsh measured approximately 80 feet by 80 feet, making the target volume of material to be treated in the marsh approximately 1,600 cubic yards. For ease of tracking work and chemical dosage and application, ORIN established a site grid consisting of sixteen 100-cubic yard cells, each measuring approximately 20 feet by 20 feet in the marsh. As discussed later, two additional cells (cell 14 and cell 17) were

added to the marsh treatment during construction, for a total of eighteen 100 cubic yard cells in the marsh. Eight larger volume cells measuring 20 feet by 20 feet, and depth between 10 and 15 feet were established for the trail and sideslopes to the trail.

The location and number assigned to the twenty-six treatment cells (numbered in sequential order as completed during remediation) are shown in Figure 7, and the estimated treatment volume of each cell is summarized in Table 1. The field trial was completed on cell #1 and cell #2, which is described in further detail below.

3.4.3 Field Trial – Cell #1

The field trial was conducted in cell #1 to evaluate the means and methods selected by ORIN, and the effectiveness of the full scale remedy. Cell #1 was located at the western edge of the marsh treatment area adjacent to the trail embankment (Figure 8 and Photo 9). A mark was made on the backhoe seven feet above the bottom tip of the bucket to indicate approximately when the organic silt layer would be reached. As marsh material was excavated from this cell with a backhoe and placed on the cap within the treatment area, it was sprayed with 5% hydrogen peroxide solution (Photo 11). Approximately one gallon of solution was applied to every cubic yard of material excavated. Excavation stopped once the top of the organic silt layer was observed in the bottom of the excavation (Photo 10). The depth to the organic silt layer was confirmed (with the mark made on the backhoe) to be approximately seven feet below ground surface.

The walls of the excavation remained stable with no sloughing of the peat. The fibrous peat held up well structurally and did not release water when excavated, despite being saturated. The excavation remained dry for approximately, 10 minutes, after which time, groundwater did begin to enter after the open excavation; however, the excavation was backfilled prior to accumulation of groundwater.

After the target depth was reached across the excavation, the excavation was backfilled with approximately half of the excavated material that had been treated with hydrogen peroxide (50 cubic yards). One super sack (1.1 tons) of ferric sulfate was then connected to the backhoe, raised above the first lift of backfilled material, cut open with a utility knife, and spread on the surface of the first lift (Photo 12). The ferric sulfate was then mixed into the first lift with the backhoe bucket (Photo 13). The peat had no cohesion and the backhoe was able to uniformly mix the ferric sulfate into the peat by scooping and spreading these materials throughout the treatment cell. The ferric sulfate began to dissolve upon contact, but there was a delay such that ferric sulfate granules could be observed mixing into the peat, verifying uniform mixing.

The backhoe then scooped approximately 2,150 pounds (1.1 tons) of limestone from a stockpile on the trail and spread it on the surface of the first lift. The limestone was then mixed into the first lift with a backhoe bucket. The lack of cohesion of the peat allowed the backhoe to uniformly mix the limestone into the peat by scooping and spreading these materials throughout the treatment cell. Following the limestone mixing step in the first lift, TRC collected a representative sample of treated material from the backhoe bucket (Photo 14). The sample was submitted to Pace Analytical Laboratories, Inc. of Green Bay, WI (Pace) for SPLP arsenic analysis.

The excavation was then backfilled with the remaining 50 cubic yards of excavated material and mixed using the same approach as the first lift. Bentonite was not added to cell #1 during the field trial in order to verify the chemical stabilization of the treated material prior to introducing additives to limit the sediment's hydraulic conductivity.

3.4.4 Field Trial – Cell #2

The field trial in cell #2 was completed to evaluate the effect of bentonite addition immediately following chemical stabilization. The project specifications called for adding bentonite after treatment chemistry had been verified because it was assumed that the bentonite would increase the cohesion of the marsh materials and reduce the ability for chemicals to be uniformly mixed into a cell if additional treatment was needed. However, upon initiation of the work at the site, it became apparent that access to cells would be restricted following chemical stabilization because the disturbed marsh would no longer support the mixing equipment, such that adding the bentonite in sequence with the treatment chemicals was preferred. The second field trial was conducted on the northern edge of the marsh, in the area of lowest arsenic concentrations, where treatment goals were expected to be easiest to achieve (Figure 7). This location was selected to limit the potential of additional chemical mixing being required following bentonite addition.

Excavation for the treatment of cell #2 extended to the top of the organic silt layer, which was observed approximately seven feet below ground surface. The same process described above used to treat cell #1 was used to treat cell #2; with the exception that bentonite was also mixed into the cell #2. Following the limestone mixing step in the first lift, 2.5 super sacks of bentonite were spread on the surface of the first 50 cubic yard lift. The sacks were connected to the backhoe in series, raised above the first lift, cut open with a utility knife, and spread on the surface of the first lift. The bentonite was then mixed into the first lift with a backhoe bucket. The peat in cell #2 had no cohesion and the backhoe was able to uniformly mix the bentonite (as well as ferric sulfate and

limestone) into the peat by scooping and spreading these materials throughout the treatment cell. Bentonite granules mixing into the peat were observed visually.

TRC collected two samples of treated first-lift material from the backhoe bucket. One sample was collected following chemical stabilization, but prior to bentonite addition, and one sample was collected following bentonite addition. The samples were submitted to Pace for SPLP arsenic analysis. The excavation was then backfilled with the remaining 50 cubic yards of excavated material and mixed using the same approach as the first lift.

3.4.5 Field Trial Results and Conclusions

SPLP arsenic testing on the sample collected from cell #1 was completed by Pace on October 7, 2011. Laboratory reports for samples are presented in Appendix D and summarized in Table 1. The concentration from the SPLP arsenic analysis for the sample of treated material from cell #1 was 0.26 mg/L. The target remediation goal concentration set in the specifications was 0.148 mg/L; however, the specifications allowed for flexibility in the numeric concentration achieved during the full scale remedy based on the results of the field trial. Previous analysis has shown that untreated materials in the source area can have SPLP arsenic concentrations up to 93 mg/L. The three order of magnitude reduction in the SPLP arsenic levels achieved by the in situ mixing in cell #1 and the achievement of SPLP arsenic concentration below the hazardous waste criteria (5 mg/L), met the remedial objectives for the in situ treatment. Therefore, the effectiveness of the full scale remedy was determined to be sufficient by TRC and the WDNR.

SPLP arsenic testing on the samples collected from cell #2 pre- and post-bentonite addition were completed by Pace on October 10, 2011. Arsenic was not detected in either sample (limit of detection 0.025 mg/L). The reduction in the SPLP arsenic levels achieved by the in situ mixing in cell #2 was evaluated to be successful by TRC and WDNR, but the effect of bentonite addition on SPLP arsenic concentrations could not be quantitatively evaluated following analysis of cell #2 field trial results since arsenic was not detected in either sample.

The field trial demonstrated that the means and methods selected by ORIN were effective at uniformly mixing the treatment chemicals with the marsh sediment, and that the approach met the remedial objectives for the source area sediment. The field trial also showed that incorporating the bentonite in series with the treatment chemicals did not affect the stabilization of the arsenic, and did not create conditions that would limit additional mixing of chemicals into the marsh sediment if verification results indicated

more treatment was needed during full scale implementation. Based on evaluation of the field trial means and methods and effectiveness, TRC and the WDNR directed ORIN to begin full scale in-situ stabilization using the same means, methods, and chemical dosage applied during the field trial in cell #2.

3.5 Full Scale – In Situ Stabilization

3.5.1 Marsh

Full-scale in situ stabilization of the marsh began on Monday, October 10th and was completed on Friday, October 14th. The marsh included cells #3 – #18, which were numbered in chronological order (Figure 7). A summary of the quantities of materials mixed into each lift, as prepared by ORIN (with footnotes added by TRC), is presented in Appendix A, and the approximate volume treated in each cell is summarized in Table 1. Each cell in the marsh was approximately 20-foot by 20-foot and 7-feet deep and included approximately 100 cubic yards of material.

The same mixing procedure used during the cell #2 field trial was generally followed (Photo 18). One exception to this is that bentonite was spread on top of cell #1 and cells #11 - #14, and was mixed in all at once instead of being mixed in two lifts following chemical stabilization (Photo 20). Bentonite addition was delayed in cell #1 because the field trial was designed to verify the effectiveness of the treatment chemistry prior to reducing the hydraulic conductivity of the peat. Bentonite addition was delayed in cells #11 - #14 because of a delayed bentonite shipment.

It was assumed that sloughing would occur during the excavations, and benching of perimeters marsh materials would be required to reach the base of the targeted source area location. Based on these assumptions, the project was bid assuming 25 percent more than the 2,400 cubic yard targeted volume, or a total of 3,000 cubic yards of material to be treated However, little to no sloughing occurred and benching was not required. Therefore, the 2,400 cubic yards of material targeted for in situ stabilization could be treated by excavating less than the bid volume of 3,000 cubic yards, and this resulted in a surplus of chemicals and bentonite. In order to achieve a treatment volume similar to the bid volume and use the surplus chemicals, two additional cells (#14 and #17) were added in the marsh (Figure 7 and Photo 23). These cells covered marsh material with compositional arsenic concentrations greater than 1,000 mg/kg.

Because only minimal groundwater entered the treatment cells during excavations, dewatering the excavations was not required to implement the full scale remedy at the site.

Pieces of the cap previously installed over the marsh (geotextile and Styrofoam), were excavated during the treatment of the marsh cells. These scrap pieces of cap where replaced into the bottom of the cell excavations and covered with treated material (Photo 17).

3.5.2 Trail

Full-scale in situ stabilization of the trail (i.e., former railroad ballast) and trail sideslope began on Monday, October 17th and was completed on Tuesday, October 18th. This included cells #19 - #24 (Figure 7). ORIN's summary of the treatment for each cell is included in Appendix E, and the approximate volume treated in each cell is summarized in Table 1. The cells treated near the trail were approximately 20-foot by 20-foot and varied in depth up to 15 feet.

A mixing procedure similar to what was used in the marsh was generally followed; however, clean ballast material, from approximately 0 to 5 feet above the surface elevation of the marsh (Figure 3), was removed from the trail and stockpiled on plastic sheeting within the treated marsh area (Photo 25). Arsenic-contaminated ballast sand, present from approximately 0 to 7 feet below the surface elevation of the marsh (Figure 3), was sprayed with hydrogen peroxide solution as it was excavated from the cells and placed within the treated marsh area (Photos 26 and 30). Arsenic-contaminated peat, from approximately 7 to 10 feet below the surface elevation of the marsh (Figure 3), was sprayed with hydrogen peroxide solution while being mixed within the cells (Photos 26 and 30). The peat and ballast material were moist, but water did not enter any cell excavations beneath the trail or sideslope.

Ferric sulfate, limestone, and bentonite were mixed into the peat beneath the trail and sideslope following the same procedure that was used to mix lifts in the treated marsh area. Only one lift of peat was treated for cells on the trail and sideslope. The peat layer in these cells had compressed over time due to railroad traffic on the trail, and therefore, had a thickness of approximately 3 feet, with a layer of organic silt (also observed in the treated marsh area) beneath. Excavations did not penetrate into the silt layer or into the underlying gravel layer (observed during the source area investigation) during the remediation (Figure 3).

Ferric sulfate and limestone were mixed into the contaminated ballast beneath the trail and sideslope using the same procedure that was used to mix lifts treated in the marsh area. The contaminated ballast beneath the sideslope was treated in one lift and the contaminated ballast beneath the trail was treated in two lifts due to a greater quantity of ballast being located beneath the trail. Additionally, bentonite was not mixed into the

ballast material, in accordance with the project's specifications, to provide for better compaction of the ballast during restoration.

Off-gassing was anticipated to occur during the in-situ mixing of the peroxide, ferric sulfate, and limestone. Off-gassing was not observed in the field, but was observed in some of the samples collected in plastic 1-gallon bags from the treated material. Of note, the production of gas generation following treatment was observed to be significantly lower in the peat than in the ballast, which suggests that the peat has a greater buffering capacity than the ballast material (Photo 32).

3.6 Monitoring Well Construction

The specifications called for the installation of five new wells during construction. These wells would be used to evaluate the long-term performance of the in situ stabilization of the source area material (Figure 7). On Monday, October 17th, On-Site installed monitoring wells MW11-2, MW11-3, and MW11-3i (Photo 28). On Tuesday, October 18th, On-Site installed monitoring wells MW11-1 and MW11-1i. Wells MW11-2, MW11-3 and MW11-3i were developed by TRC on Wednesday, October 19th, and wells MW11-1 and MW11-1i were developed by TRC on Thursday, October 20th. Well construction and development logs are presented in Appendix C. All wells were drilled with a tracked Geoprobe auger attachment and installed with pre-pack well screens (Photo 27). Protective casings were installed over each well and 10-foot-long PVC location poles were installed next to each well (Photo 40).

Wells MW11-1 and MW11-1i were installed near the location of abandoned well MW04-10 (Figure 7), which historically had the highest dissolved arsenic concentrations at the site. MW11-1 was screened within the treated peat material, from 4.5 to 7 feet below the surface, and MW11-1i was screened from 10 to 12.5 feet below the surface in the organic silt layer below the treated zone.

Well MW11-2 was installed near the northeastern edge of the treatment area and screened within the extent of treated sediment, from 4.5 to 7 feet below the surface of the marsh. The location and screening interval of well MW11-2 was chosen to evaluate water quality downgradient from former location of MW04-10, but still within the treatment area.

Wells MW11-3 and MW11-3i were installed just outside of the eastern corner (downgradient) of the treatment area. MW11-3 was screened 4.5 to 7 feet beneath the surface of the marsh, at similar elevations to wells MW11-1 and MW11-2, to evaluate the difference in water quality within the treatment zone and downgradient from the treatment area. Well MW11-3i was screened from 10 to 12.5 feet below the surface of the treated marsh, in the organic silt layer, at a similar elevation to MW11-1i.

3.7 Site Restoration

3.7.1 Marsh Restoration

The marsh restoration called for removal of the access ramp, and blending the disturbed areas to existing grades. The limestone-gravel used to build the access ramp into the marsh was gradually incorporated into the cells during treatment as these portions of the access ramp were no longer needed as the remediation generally progressed from the marsh back towards the trail. The limestone in the access ramp was similar to the limestone that was used for buffering during the treatment. In addition, some treated ballast was graded into the top foot of the treated marsh prior to seeding. The volume of ballast material increased following treatment (Photo 29), and in order to maintain five feet of clean material between the top of the treated ballast and the top of the trail, and to maintain pre-remedial grades of the trail, excess treated ballast had to be graded into the marsh immediately adjacent to the sideslope of the trail.

A six-inch layer of topsoil was spread across all disturbed marsh areas, which primarily consisted of the treatment area and access ramp (Photos 22 and 24). Following topsoil spreading, straw mulch and a seed mixture were applied to these disturbed areas in accordance with the project specifications (Photo 36).

3.7.2 Trail and Sideslope Restoration

The trail restoration required reconstructing the trail to meet or exceed the pre-remedial conditions, and providing for erosion control on the sideslopes. Following mixing, treated ballast beneath the trail was compacted with the bucket of the backhoe. A six-inch layer of select aggregate fill was placed on top of the treated ballast beneath the trail (Photo 31). Clean ballast previously stockpiled on plastic sheeting within the marsh area was placed back on the trail in four 1-foot lifts. Each lift was compacted with a smooth drum roller (Photo 33). Limestone screenings were delivered to the site, placed on top of the clean ballast on the trail in a 1-foot lift, and compacted with the smooth drum roller (Photo 34). All disturbed trail areas within the construction limits were graded at the end of construction to match site conditions prior to the project start (Photo 38).

The clean ballast previously stockpiled on plastic sheeting within the marsh area was placed on the sideslope of the trail and graded. A six-inch layer of topsoil was then spread on the trail sideslope and graded (Photo 21). A seed mixture was applied to the trail sideslope and covered with an erosion control and revegetation mat that was anchored with biodegradable stakes, in accordance with the project specification (Photo 37).

3.7.3 Final Site Barriers

The temporary barriers and signs (Figure 4) were removed from the trail at the completion of the site restoration. In addition, the chain link fence adjacent to the trail that was removed at the start of the project to allow access to the marsh during the remediation, was reconstructed using the salvaged fence. The fence prevents public access to the contaminated marsh area (Photos 38 – 41).

The access road constructed on private property (Figure 5) was left in place at the end of construction per the specification. To restrict access to the trail through the private property, a lockable swing gate was installed near the trail across the access road (Figure 42) in accordance with the specifications.

3.7.4 Equipment Decontamination

All construction equipment and well drilling equipment used within the treatment zone was decontaminated in accordance with the specification. The two backhoes used for mixing were decontaminated with a pressure washer on top of the topsoil layer placed on the trail sideslope (Photo 35). The backhoes then tracked over clean topsoil, onto the restored trail, and over the existing trail to the trail entrance for pickup. The Geoprobe® used for well installation only tracked over clean topsoil placed within the treatment area and the vegetation on top of the capped area outside of the treatment area. The tracks of the Geoprobe® were clean upon exiting the treatment and capped areas. The augers used to drill the well holes were wiped clean within the treatment area and soil cuttings were collected and incorporated into the cells that had yet to be treated. The other pieces of equipment used in the treatment area included: a dozer that only tracked over clean ballast and only moved clean ballast, limestone, and topsoil; a skid steer that only tracked over clean ballast and access ramp gravel and only moved clean ballast, limestone, topsoil, and pallets; and a compactor that only tracked over clean ballast and only compacted clean ballast.

3.8 Waste Disposal

Minimal waste was generated during the remediation, and all waste was disposed off-site at licensed disposal facilities. The waste included one 55-gallon drum of hazardous material, one roll-off dumpster of general refuse, and one 55-gallon drum of ballast material impacted with a minor leak of hydraulic fluid. The hazardous waste that required off-site disposal included PPE worn in the treatment area (disposable gloves and Tyvek suits), and components from abandoned monitoring well MW04-10. The PPE and well were placed in a plastic 55-gallon drum and disposed of by Veolia Environmental Services through their hazardous materials contract with the State of Wisconsin (Photo 43).

A general refuse roll-off dumpster was provided by Blue Water Services of Kewaunee, WI (BWS). Items placed in the roll-off dumpster included, but were not limited to, the casing for monitoring well MW04-10 (following pressure washing), plastic wrap, and empty super sacks. BWS hauled and disposed of the contents of the dumpster off site as solid waste.

During the remediation, less than one gallon of hydraulic fluid leaked from a backhoe and contacted treated ballast material in cells #21 and #22 (Figure 8). The backhoe was immediately turned off to stop the leak and was repaired. The ballast that was impacted with the hydraulic fluid was immediately removed with shovels and placed in a 55-gallon drum. The contents of this drum were disposed at a WDNR-licensed landfill by Veolia as non-hazardous waste.

3.9 Post Construction Walk-through

A site walk over was completed on Monday, October 24, 2011. Representatives from Kewaunee County (Matt Payette), WDNR (Annette Weissbach), Veolia (Kris Gunderson), ORIN (Scott Craig), and TRC (Alyssa Sellwood) participated in the walk over. The private property access road owner, could not attend, but previously communicated to WDNR that he was satisfied with the final condition of the access road and gate on his property. The County was satisfied with the final condition of the trail and did not require any additional restorative work. WDNR and TRC agreed that final restoration of the site had been completed in accordance with the specification and no additional work was required at that time. WDNR and the County will evaluate the site in the spring/summer of 2012 to determine if additional final trail restoration is required per the project specifications.

3.10 Deviations from Specifications

Deviations from the specifications are summarized below.

- **Specification:** Section 01530, Part 3.5 A – Maintain barricades, signs, and access haul road gate during construction to restrict public access to the construction work zone.

  Deviation: The installation of the access haul road gate was delayed until site restoration. Installing the gate during site preparations prior to construction would have restricted truck access for deliveries.

- **Specification:** Section 02315, Part 3.2 B – CONTRACTOR to survey to document the depth of excavation in four locations.

  Deviation: Surveying was not required to document the depth of excavation. The peat layer has a uniform thickness of 7 feet throughout the marsh area. The transition from peat to organic silt was visually observed and the 7-foot excavation depth was visually confirmed with the 7-foot line marked on the mixing backhoe. Similar visual observation and bench mark confirmation was used during the treatment of the trail and sideslope.

Contaminated ballast material ranged from 0 to 7 feet below the surface elevation of the marsh and contaminated peat ranged from 7 to 10 feet below the surface elevation of the marsh with organic silt underlying the peat layer.

- **Specification:** Section 02320, Part 1.1 A and Part 2.1 A – 440 gallons of 35 percent hydrogen peroxide solution will be applied to the treatment area.

  Deviation: 330 gallons of 50 percent hydrogen peroxide solution were applied to the treatment area. The specification called for 1.4 gallons of 35 percent solution to be applied to every 10 cubic yards. The 50 percent solution delivered to the site was diluted down to a 5 percent solution and 1 gallon was applied to every cubic yard, achieving the same ratio that was called for in the specifications.

- **Specification:** Section 02526, Part 3.2 B – Seal [removed well MW04-10] borehole by filling with bentonite granules to the surface.

  Deviation: Because the mash material was to be disturbed and mixed during treatment, the addition of bentonite to the borehole was determined not to be necessary.

Section 4
Performance Verification Sampling

4.1 Pace Analytical SPLP Results

In addition to the three field trial samples discussed in section 3.4.5, TRC collected additional verification samples per every 500 cy of treated sediment in accordance with the specifications. Performance verification samples were collected from treated material in cells #7, #12, #19, #22, and #23 for SPLP arsenic testing by Pace during the remediation. Laboratory reports for performance verification samples are presented in Appendix D, and results are summarized in Table 1 and Figure 8.

The SPLP arsenic concentrations from the samples collected from cells #7, #12, #19, and #22, were 0.22 mg/L, 0.067 mg/L, 0.46 mg/L, and 0.19 mg/L, respectively. The arsenic concentrations in these cells met the target cleanup goal (as described in Section 3.4-Field trial). These four samples, and the samples collected during the field trial, verified that the in situ mixing met the performance criteria for approximately 2,400 cy of the treated sediment (see Table 1, cell #1 through cell #22).

The arsenic concentration of the last sample collected from cell #23 was 17.6 mg/L. This concentration was higher than the target clean up goal. The same mixing procedure and chemical dosage evaluated as effective from the other verification samples was used to treat the sediment in cell #23. Because in situ treatment was evaluated to be effective for the 2,400 cubic yards of sediment treated prior to cell #23, we concluded that the sample collected from cell #23 was not likely representative of treated material. Although care was taken to collect representative samples of the treated material, it is possible that the sample collected from cell #23 was taken from a small section of sediment that did not contain a representative amount of treatment additives. Based on this analysis, TRC and WDNR agreed that the elevated arsenic concentration in the sample from cell #23 was an artifact of the sample collection and did not represent the treated conditions in this cell. Based on this conclusion, we did not require ORIN to complete additional treatment in cell #23.

4.2 TRC Screening SPLP Results

In addition to the performance verification completed during construction, TRC screened samples collected from each of the 26 treatments cells for SPLP arsenic concentrations approximately one week after construction, to validate achievement of in situ stabilization of arsenic in each treatment cell. One sample was collected from the treated peat material in each

cell, and one sample was also collected of treated ballast material when ballast material was present (trail and sideslope samples). For those cells where samples were submitted to Pace, the samples were split with TRC's screening samples. TRC completed a SPLP arsenic screening analysis on each sample in TRC's applied chemistry laboratory. The results from TRC's screening SPLP analysis are summarized in Table 1 and Figure 8.

TRC's screening SPLP arsenic results from each of the 26 cells confirmed that stabilization of arsenic was achieved in the 3,000 cubic yards of treated sediment. The highest concentration is from the ballast in cell #23. This sample was split from the sample submitted to Pace, and the elevated arsenic concentration is likely an artifact of sample collection, as described in Section 4.1.

In general, higher concentrations of arsenic were generally observed in the zone nearest to the former railroad tracks. The higher arsenic concentrations may be due to this area's proximity to the historic spill, and/or the potential difference in the treatability of the ballast versus peat material at the field scale.

The arsenic concentrations in the samples analyzed by TRC are similar to the concentrations in the samples analyzed by Pace, but are generally lower. The difference in concentrations is likely a result of difference in laboratory equipment and procedures, but could suggest improved stabilization over time. TRC samples were analyzed approximately one week after treatment; whereas, the Pace samples were analyzed within one day after treatment. To further evaluate the potential for improved stabilization over time, TRC selected ten of the screening samples to be analyzed approximately two weeks after treatment. The results of the additional SPLP screening analysis are presented in Appendix F. The results from the two-week delay samples are generally consistent with the one-week delay samples, with some variability shown for samples where duplicates were run. Comparison of the SPLP results for samples analyzed one-week and two-weeks after treatment, were inconclusive with respect to increased stabilization achieved over time. Because the SPLP results from each cell supported achievement of arsenic stabilization for treated source area material and a long-term water monitoring plan has been established for the site, additional lab studies into time effect on material treated in the field are not warranted.

4.3 Evaluation of Treatment Effectiveness

The Pace performance verification samples and TRC screening samples indicate that the treatment goal for the arsenic stabilization was achieved throughout the bulk of the treatment area. The SPLP arsenic concentrations prior to treatment were estimated from the compositional arsenic results from samples collected within the treatment area during the December 2009/March 2010 Geoprobe® Investigation. The calculation to convert compositional

arsenic to SPLP arsenic are included in Appendix G. The results are summarize in Table 1 and presented on Figure 8. The average SPLP arsenic concentration for the material within the treatment area was estimated to be approximately 31 mg/L prior to treatment. Excluding the sample collected from the treated ballast material of cell #23, which was not likely representative of treated material in this cell (see discussion under Section 4.1), the average post-treatment SPLP arsenic concentrations for samples analyzed by Pace and TRC were 0.20 mg/L and 0.16 mg/L, respectively. The results indicate that in situ stabilization reduced the average SPLP arsenic concentration by over 99 percent in the treatment area, and achieved SPLP arsenic concentrations well below hazardous waste criteria (5 mg/L), and near the site specific groundwater/surface water goal of 0.148 mg/L.

Section 5
Baseline Performance Monitoring

5.1 Baseline Water Sampling

A performance monitoring program was established to evaluate the long-term effect of the in situ stabilization on the groundwater quality of the site (RMT, 2011). The wells included in the performance monitoring well program are shown on Figure 9, and include eleven existing monitoring wells, and the five new monitoring wells constructed during the remedy (see Section 3.6). The eleven existing wells in the performance monitoring program include background/upgradient wells (MW02-1, MW02-1i, MW02-1d, and MW04-11), sidegradient/downgradient wells (MW02-8, MW02-8i, and MW04-9), and downgradient wells (GW01-2, MW02-3, MW02-3i, and MW02-3d). The five new monitoring wells include treatment area wells (MW11-1, MW11-1i, and MW11-2) and wells directly downgradient from the treatment area (MW11-3 and MW11-3i).

The sampling protocol used for the performance monitoring is summarized as follows:

- Water levels were recorded in each well prior to sampling.
- After water levels were recorded, each well was purged using dedicated bailers. A minimum of four well volumes were removed, or the wells were purged until the well went dry, whichever came first. If a well that went dry recovered quickly, additional volume was removed to achieve the targeted four well volumes.
- Following purging, the groundwater was allowed to recover in each well. Water samples were then collected using the dedicated bailers, and containerized temporarily in single use containers for transport back to field vehicle.
- Samples were then collected for laboratory analysis from the single-use containers. Laboratory sample bottles were filled using a peristaltic pump and disposable Tygon tubing, and were filtered using a 0.45 micron disposable barrel filter.
- Samples from each of the wells were submitted to Pace for arsenic analysis, and samples from 12 select wells were also submitted for sulfate, iron, and calcium analysis.
- Field parameters (pH, conductivity, DO, ORP, and temperature) were measured for each well in the sample remaining in each single use container.

5.2 Results

The 2011 baseline groundwater arsenic concentrations, as well as historic arsenic concentrations, are summarized in Table 2. The results for the complete list of 2011 baseline parameters are summarized in Table 3. Arsenic was detected in wells MW11-1 and MW11-2, which are screened within the peat in source area treatment area, at concentrations of 304 mg/L and 108 mg/L, respectively. Arsenic concentrations in abandoned well MW04-10 (previously located within the source area near MW11-1) historically ranged from approximately 1,400 to 2,800 mg/L. The baseline monitoring results at wells MW11-1 and MW11-2 indicate that arsenic concentrations in water have decreased by one order of magnitude throughout the treatment area. However, the arsenic concentrations are higher than anticipated based on the SPLP arsenic concentrations observed in the source area treated materials following the in situ stabilization (average SPLP concentration of 0.2 mg/L). These concentrations may not be representative of the dissolved phase arsenic concentrations in this well, which is discussed in more detail below in Section 5.3.

Arsenic was detected in well MW11-3 at a concentration of 360 mg/L. Well MW11-3 is located just outside of the eastern corner of the treatment area and screened within the same interval as wells MW11-1 and MW11-2. Well MW11-3 is located within the peat evaluated to have total arsenic concentrations above 1,000 mg/kg at the time of the 2010 source area investigations (Appendix E). The elevated concentration of arsenic in the water at MW-3 is considered to be representative of the current conditions in this well.

Wells MW11-1i and MW11-3i are nested with MW11-1 and MW11-3, and screened 10 to 12.5 feet below grade, primarily in the organic silt layer below the treated zone. Baseline groundwater arsenic concentrations in MW11-1i and MW11-3i were 121 and 153 mg/L, respectively. These concentrations suggest that the elevated arsenic impacts to groundwater extend into the organic silt layer near the source area. The historical results for wells screened within the organic silt downgradient from the source area suggest that the impacts present in the shallow organic silt below the source area are sufficiently contained and do not extend at depth into the organic silt or further downgradient into the marsh within this zone (STS, 2002; STS, 2004; RMT, 2010).

Baseline arsenic concentrations in the existing wells located upgradient, sidegradient/downgradient, and downgradient of the treatment area are generally consistent with historic concentrations and are generally below the site-specific clean-up goal of 0.148 mg/L.

The trends in the concentrations of arsenic in each of the performance monitoring wells will be evaluated, and the concentrations of arsenic are expected to decrease through time in response to the in situ stabilization of the source area.

5.3 Analysis

As discussed above, the arsenic concentrations in the November 2011 samples collected from water in contact with treated materials were higher than anticipated, but may not be representative of the water quality within the treatment zone. A detailed memorandum of the evaluation of the water results is presented in Appendix H, and a summary of the memorandum follows.

Wells MW11-1 and MW11-2 are screened within the treatment zone. The samples collected from these wells had relatively high concentrations of sulfate and calcium, which are added to the water by the treatment process (sulfate from ferric sulfate addition and calcium from limestone addition). The high concentration of treatment chemicals in the water samples collected within the treatment zone indicate that the unexpectedly high arsenic concentrations also present in these samples is not a result of incomplete treatment.

The most likely explanation for the high arsenic concentrations in the samples collected from within the treatment zone is that colloidal solids passed through the 0.45 micron filter used to differentiate dissolved and particulate metals. Through the treatment process, arsenic adsorbed to particulate ferric iron. Particulate ferric iron is a solid that often occurs in the colloidal size range (0.001 to 1 micron) and can pass through a 0.45 micron filter, which was used to filter the November 2011 water samples. The pH values and dissolved iron concentrations of the samples, the oxidation state of the iron added for treatment (ferric), and the addition of a bicarbonate (limestone) during treatment, all suggest that the iron is not truly dissolved and that particulate ferric iron, and thus arsenic, passed through the filter used during sampling. The groundwater flow in the marsh is slow and the mobility of colloids in most groundwater systems is generally low. If the high arsenic concentrations in the November 2011 groundwater samples collected within the treatment zone is due to colloids passing through the filters, it is not likely that the arsenic at the site is mobile. Furthermore, colloidal concentrations should decrease over time as colloids settle out.

5.4 Recommendations

TRC recommends completing a phase II baseline water sampling event in spring 2012. The objective will be to improve our understanding of the elevated arsenic concentrations in the water in the treatment area, and determine if changes are needed in the sampling protocol to

obtain representative samples of the dissolved phase arsenic concentrations at the Kewaunee Marsh.

The proposed sampling program is described in further detail in Appendix I. In general, the proposed sampling will follow the scope outlined in the Performance Monitoring Plan (RMT, 2011), but will evaluate low flow purging techniques and filtering samples with multiple filter sizes. The use of low-flow sampling techniques will minimize disturbance to the samples, and use of multiple filter sizes will be used to evaluate the presence of colloids at the site. Following analysis of the spring 2012 sampling results, TRC will propose necessary modifications to the Performance Monitoring Plan.

Section 6
Conclusions and Recommendations

6.1 In Situ Stabilization

TRC was retained by the WDNR to oversee and document the in situ remediation of 3,000 cubic yards of material with compositional arsenic concentrations greater than 2,000 mg/kg (source area) in the Buzz Besadny Fish and Wildlife Area (also known as the Kewaunee Marsh), in Kewaunee, Wisconsin. The in situ stabilization was completed by ORIN in October 2011, in accordance with the design specifications for the project (WDNR, 2011). Hydrogen peroxide, granular ferric sulfate, crushed limestone, and bentonite were incorporated into the treatment area, in series, to stabilize arsenic in the source area and mitigate the on-going release of dissolved-phase arsenic into the marsh.

The performance verification samples collected from the treated marsh sediment and ballast show that arsenic stabilization was achieved throughout the bulk of the source area as a result of the in situ remediation. The average SPLP arsenic concentration in the source area prior to treatment was approximately 31 mg/L, and was reduced to approximately 0.2 mg/L as a result of the in situ stabilization

6.2 Baseline Performance Monitoring

The long-term objective of the in situ treatment is to achieve the site-specific arsenic clean-up level of 0.148 mg/L in the groundwater and surface water at the site. The results from the November 2011 baseline monitoring event are inconclusive with respect to water quality in the treatment area. The arsenic concentrations in the samples collected from within the treatment zone were higher than anticipated. Currently, TRC believes that these elevated concentrations are a result of colloidal solids passing through the filter used to differentiate dissolved and particulate metals, rather than actual aqueous phase concentrations of arsenic. If the arsenic is associated with colloids, than the arsenic detected in water in the treatment area is not mobile, and will likely settle out of suspension through time.

To improve our understanding of the elevated arsenic concentrations in water in the treatment area, TRC recommends completing another sampling event in the spring of 2012 using the sampling protocol described in Appendix I. Following analysis of the spring 2012 sampling results, TRC will propose necessary modifications to the current Performance Monitoring Plan (RMT, 2011).

6.3 Site Restoration

Restoration of the trail, sideslopes, and marsh were completed in October 2011 following completion of the in situ stabilization. The restoration was completed in accordance with the specifications, and to the satisfaction of the stakeholders for the properties within the construction limits (Kewaunee County, WDNR, and the private property owner). A final site walkthrough will be completed by the WDNR, ORIN, and Kewaunee County prior to October 2012 to identify any erosion, settlement, or other deficiencies within the construction limits that require final correction prior to close-out of the construction contract.

Section 7
References

RMT, Inc. 2007. WDNR Kewaunee Marsh Treatability Study. Prepared for Wisconsin Department of Natural Resources, Kewaunee, Wisconsin. August 2007.

RMT, Inc. 2010. Hot Spot Investigation Documentation and Remedial Options Analysis Report. Prepared for Wisconsin Department of Natural Resources, Kewaunee, Wisconsin. May 2010.

RMT, Inc. 2011. Performance Monitoring Plan. Prepared for Wisconsin Department of Natural Resources, Kewaunee, Wisconsin. June 2011.

STS. 2004. Site Assessment and Remedial Action Alternatives Report. Prepared for Wisconsin Department of Natural Resources, Kewaunee, Wisconsin. March 2004.

STS. 2006. Site Assessment and Remedial Action Alternatives Report Addendum. Prepared for Wisconsin Department of Natural Resources, Kewaunee, Wisconsin. September 2006.

WDNR. 2011. Contract document: Kewaunee marsh in situ stabilization of Source area arsenic contamination. Project No. REBA 11. June 2011.

Table 1
In Situ Treatment Results
Kewaunee Marsh Arsenic Source Area In-Situ Remediation

CELL		SPLP ARSENIC CONCENTRATION (mg/L)			ESTIMATED VOLUME OF CELL (cy)
			POST-TREATMENT		
ID	MEDIA	PRE-TREATMENT [1]	PACE	TRC[2]	
Marsh					
1 (Field Trial)	Peat	--	0.26	0.016	100
2 (Field Trial)	Peat	8.4	<0.025 / <0.025[3]	<0.013	100
3	Peat	22	--	<0.013	100
4	Peat	--	--	0.016	100
5	Peat	--	--	0.035	100
6	Peat	61	--	0.041	100
7	Peat	38	0.22	<0.013	100
8	Peat	22	--	0.088	100
9	Peat	--	--	<0.013	100
10	Peat	30	--	0.059	100
11	Peat	--	--	<0.013	100
12	Peat	--	0.067	0.014	100
13	Peat	--	--	0.015	100
14	Peat	--	--	<0.013	100
15	Peat	--	--	0.092	100
16	Peat	--	--	0.015	100
17	Peat	--	--	<0.013	100
18	Peat	25	--	<0.013	100
Trail and Sideslope					
19	Ballast	--	0.46	0.19	50
	Peat	57	--	--	100
20	Ballast	--	--	0.028	50
	Peat	20	--	0.063	100
21	Ballast	5.4	--	0.052	50
	Peat	16	--	0.16	100
22	Ballast	7.6	--	0.19	50
	Peat	16	0.19	0.095	100
23	Ballast	12	18	2.6[5]	100
	Peat	93	--	0.89	50
24	Ballast	6.3	--	0.28	100
	Peat	--	--	0.059	50
25	Ballast	--	--	0.47	100
	Peat	91	--	1.3	50
26	Ballast	--	--	0.29	100
	Peat	--	--	0.59	50
Average Concentration (Peat + Ballast) [4, 5]		**31**	**0.20**	**0.16**	--
				Total Volume (cy)	**3000**

Notes:

-- = Sample not collected and/or not analyzed.

Footnotes:

(1) Pre-treatment estimates calculated using compositional arsenic results from December 2009/March 2010 Hotspot Geoprobe Investigation. Compositional arsenic concentrations were converted to SPLP arsenic concentrations. Data and conversions are presented in Appendix G.

(2) SPLP test completed in TRC's Applied Chemistry Laboratory. The results from TRC are screening level results, but have been shown previously to be consistent with results from Certified laboratory (Pace).

(3) First result represents pre-bentonite addition, and second results from post-bentonite addition.

(4) Samples with arsenic concentrations less than the detection limit were estimated to have arsenic concentrations equal to half of the detection limit.

(5) The sample collected from the treated ballast material of cell #23 was not likely representative of treated material in that cell, and is not included in the average concentration for the treated samples.

Table 2
Water Arsenic Concentrations – 2002 through 2011
Kewaunee Marsh Arsenic Source Area In-Situ Remediation

WELL ID	WELL DEPTH (ft)	ARSENIC CONCENTRATIONS (mg/L)									
		8/13/2002	11/21/2002	2/26/2003	6/11/2003	11/2/2004	4/27/2005	7/14/2005	11/1/2005	5/4/2010	11/14/2011
MW02-1	7	0.0041	0.0016	0.0015	<0.0013	--	--	0.0032	--	0.0033J	0.012J
MW02-1i	12	0.0021	0.0014	0.0019	<0.0013	--	--	<0.0012	--	0.0016J	0.011J
MW02-1d	22	0.0070	0.0056	<0.0013	0.0017	--	--	0.0065	--	0.0068J	0.0067J
MW02-2	5.4	0.0057	0.0014	--	0.0016	--	--	0.0019	--	0.0030J	--
MW02-2i	10	0.0014	<0.0013	--	<0.0013	--	--	0.0015	--	0.010J	--
MW02-3	5.1	**0.26**	**0.20**	0.093	0.095	0.034	0.019	0.027	0.037	**1.4**	0.091
MW02-3i	10	0.040	0.0062	0.0073	0.020	0.018	0.010	0.0099	0.013	0.013J	0.016J
MW02-3d	18.8	0.0049	0.0049	0.0013	0.0026	0.0060	<0.0012	0.0012	<0.0012	0.0053J	0.0040J
MW02-4	5	**0.59**	**0.50**	**0.21**	**0.96**	**1.3**	**1.9**	**1.1**	**3.1**	**4.4**	--
MW02-4i	10	**0.17**	0.047	0.010	0.013	0.0015	0.0090	0.0085	0.013	0.011J	--
MW02-4d	20	--	--	0.068	0.017	0.038	0.024	0.024	0.044	0.038	--
MW02-5	5	**0.37**	**0.75**	**0.18**	**1.2**	**1.9**	**0.86**	**0.67**	**5.4**	**2.3**	--
MW02-5i	10	0.0050	--	0.0033	<0.0013	0.0061	0.0097	0.0070	0.0058	0.0068J	--
MW02-6	5	**0.50**	**0.14**	--	**0.53**	**1.1**	**0.38**	**0.66**	**1.6**	**2.3**	--
MW02-6i	10	0.092	0.041	0.0069	0.013	0.0163	0.0108	0.0074	0.0063	0.032	--
MW02-7	5	0.077	0.021	0.0099	0.034	0.0754	0.0553	0.0019	0.0570	0.076	--
MW02-7i	10	0.0022	0.0023	<0.0013	<0.0013	0.0017	0.0012	0.0510	0.0015	<0.0013	--
MW02-7d	20	0.0024	0.0016	<0.0013	<0.0013	--	--	<0.0012	--	<0.0013	--
MW02-8	5	--	--	--	0.086	**0.19**	**0.11**	**0.15**	0.082	**0.14**	**0.18**
MW02-8i	10	--	--	--	<0.0013	--	--	0.0036	--	0.013J	0.012J
MW04-9	7	--	--	--	--	**0.61**	**0.12**	**0.11**	**0.11**	0.043	0.043
MW04-10[(1)]	7	--	--	--	--	**1,380**	**1,770**	**1,630**	**1,950**	**2,840**	--
MW04-11	7	--	--	--	--	0.0051	0.0048	0.0096	0.0024	0.0039J	0.0068J
MW04-12	7	--	--	--	--	0.0020	0.0026	0.0029	0.011	0.0044J	--
MW04-13	7	--	--	--	--	0.0019	0.0015	0.0018	0.030	0.0018J	--
MW11-1	7.2	--	--	--	--	--	--	--	--	--	**304**
MW11-1i	12.5	--	--	--	--	--	--	--	--	--	**121**
MW11-2	7.2	--	--	--	--	--	--	--	--	--	**108**
MW11-3	7.2	--	--	--	--	--	--	--	--	--	**360**
MW11-3i	12.5	--	--	--	--	--	--	--	--	--	**153**
GW01-1	NA	--	0.0084	--	<0.0013	--	--	<0.0012	--	0.051	--
GW01-2	NA	--	0.031	--	0.037	0.030	0.015	0.026	0.056	0.24	0.14

Table 2 (continued)
Water Arsenic Concentrations – 2002 through 2011
Kewaunee Marsh - Kewaunee, Wisconsin

WELL ID	WELL DEPTH (ft)	ARSENIC CONCENTRATIONS (mg/L)									
		8/13/2002	11/21/2002	2/26/2003	6/11/2003	11/2/2004	4/27/2005	7/14/2005	11/1/2005	5/4/2010	11/14/2011
GW01-3	NA	--	0.043	0.014	0.032	0.034	**0.49**	**0.15**	0.088	**0.25**	--
GW01-4	NA	--	0.0049	<0.0013	0.0120	--	--	0.0077	--	0.044	--
GW01-5	NA	--	0.036	0.020	**0.41**	0.069	0.14	0.058	**0.20**	**0.17**	--
GW01-6	NA	--	**2.0**	**0.6**	**4.8**	**4.2**	**4.4**	**2.5**	**5.5**	**5.0**	--
GW01-7	NA	--	--	--	--	--	--	--	--	0.10	--
GW01-8	NA	--	0.050	--	**0.16**	0.086	**0.50**	0.091	**0.17**	0.63	--
GW01-10	NA	--	<0.0013	--	<0.0013	--	--	<0.0012	--	<0.0013	--
GW01-11	NA	--	--	--	--	--	--	--	--	0.23	--
GW-D	NA	--	--	--	--	--	--	--	--	0.0021J	--
GW-E	NA	--	--	--	--	--	--	--	--	<0.0013	--

Notes:

1. Samples from 1992 through 2005 were collected by STS. The samples from May 2010 were collected by RMT. The samples collected from November 2011 were collected by TRC.
2. The results are from filtered samples.

J = Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

-- = Not sampled.

BOLD = concentration exceeds the site specific goal of 0.148 mg/L.

Footnotes:

(1) Well MW04-10 was abandoned in October 2011 during the hot spot remediation.

Table 3
2011 Baseline Performance Monitoring Results
Kewaunee Marsh Arsenic Source Area In-Situ Remediation

WELL ID	SAMPLE DATE	DTW (ft)	pH	TEMP. (°C)	CONDUCTIVITY (µmhos/cm)	ORP (mV)	ARSENIC (mg/L)	CALCIUM (mg/L)	IRON (mg/L)	SULFATE (mg/L)
MW02-1	11/14/11	6.55	6.38	10.39	938	54.3	0.012J	135	5.0	NA
MW02-1i	11/14/11	4.3	6.83	9.66	844	27.6	0.011J	115	1.1	NA
MW02-1d	11/14/11	4.12	7.16	8.87	811	-7.9	0.0067J	92	1.3	NA
MW02-3	11/14/11	3.82	6.68	10.85	1187	-22.8	0.091	137	2.4	9.5
MW02-3i	11/14/11	3.83	6.82	10.17	1020	-61.2	0.016J	160	5.9	< 2
MW02-3d	11/15/11	3.95	7.21	7.62	680	104.3	0.0040J	71	0.23	2.5J
GW01-2	11/14/11	2.26	6.67	9.09	691	-6.8	0.143	97	1.1	< 2
MW02-8	11/14/11	2.12	6.75	9.57	888	11.8	**0.178**	134	0.88	NS
MW02-8i	11/14/11	2.42	6.78	9.5	945	-20	0.012J	150	2.7	NS
MW04-9	11/14/11	2.58	NA	NA	NA	NA	0.043	148	0.57	< 2
MW04-11	11/15/11	2.15	6.37	6.99	1273	218.3	0.0068J	152	0.43	2.1J
MW11-1	11/15/11	3.61	6.41	11	6462	-83.9	**304**	590	112	3,340
MW11-1i	11/15/11	3.61	6.99	9.71	1209	-73.5	**121**	128	3.9	124
MW11-2	11/15/11	3.47	6.88	9.8	5322	-46.7	**108**	429	165	3120
MW11-3	11/14/11	3.39	7.12	9.42	2197	-24.8	**360**	285	1.3	<2
MW11-3i	11/14/11	3.58	7.12	9.08	1299	-71.7	**156**	154	3.7	15.9

Notes:

1. pH, temperature, conductivity, DO, and ORP were measured in the field. Sampling method introduces oxygen into sample. DO concentrations are not representative of groundwater conditions. Therefore DO is omitted from summary table.
2. The results for arsenic, calcium, and iron are from filtered samples, and results for sulfate are from non-filtered samples.

J = Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

DTW = depth to water.

BOLD = concentration exceeds the site specific goal of 0.148 mg/L.

LEGEND

CAPPED AREA

CHAIN LINK FENCE

NOTES

1. AERIAL IMAGE FROM KEWAUNEE COUNTY, 2010.

0 1,000 2,000 FEET

1 " = 1,000 '
1:12,000

PROJECT:	WISCONSIN DEPARTMENT OF NATURAL RESOURCES KEWAUNEE MARSH		
SHEET TITLE:	SITE LOCATION		
DRAWN BY: PAPEZ J		SCALE:	PROJ. NO. 186467-003
CHECKED BY: WALTER M		AS NOTED	FILE NO. 186467.005.F1.mxd
APPROVED BY: SELLWOOD A		DATE PRINTED:	FIGURE 1
DATE: JANUARY 2012			

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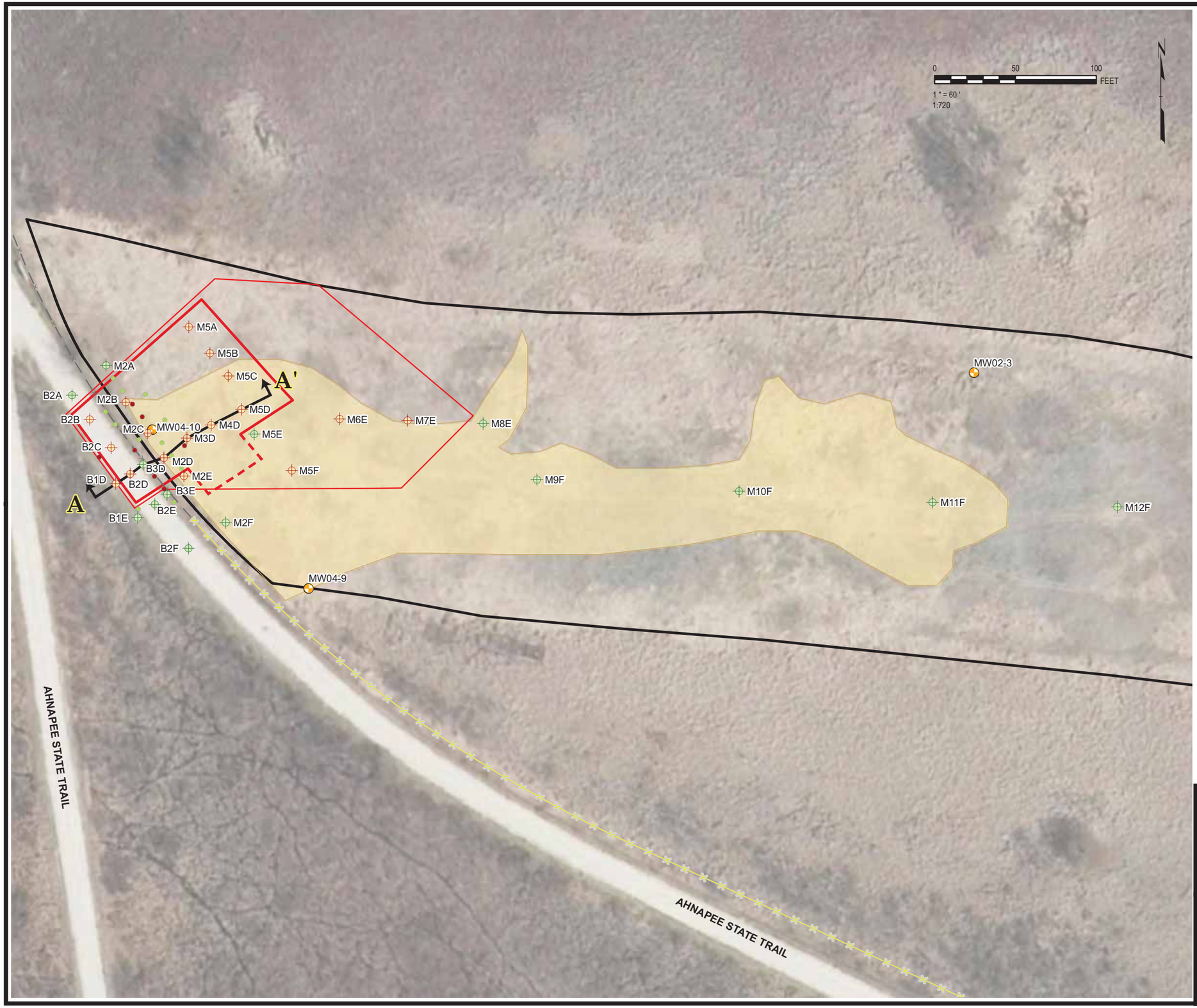

LEGEND

- CAPPED AREA
- RMT SOURCE AREA SAMPLE (2009/2010)
  - ARSENIC > 1,000 mg/kg
  - ARSENIC < 1,000 mg/kg
  - } M-SERIES = MARSH (8-12 FT); B-SERIES = BALLAST (15-30 FT)
- RMT TEMPORARY WELL LOCATION (APRIL 2007) (ARSENIC CONCENTRATION COLOR CODE)
  - < 100,000 µg/L
  - > 100,000 µg/L
- FENCE
- MONITORING WELL LOCATION
- APPROXIMATE AREA OF PREVIOUSLY DISTRESSED VEGETATION
- EXTENT OF TOTAL ARSENIC CONCENTRATION > 1,000 mg/kg (SEE NOTE 2)
- EXTENT OF SOURCE AREA TARGETED FOR REMEDIATION (>2,000 mg/kg) (SEE NOTES 3 AND 4)
- CROSS-SECTION TRANSECT

NOTES:

1. ALL GEOPROBE BORINGS WERE LOCATED USING A TRIMBLE GEOXH GPS UNIT.
2. COMPOSITIONAL ARSENIC CONCENTRATIONS GREATER THAN 1,000 mg/kg CORRELATES TO POTENTIALLY HAZARDOUS MATERIAL (TCLP > 5 mg/kg).
3. THE SOURCE AREA TARGETED FOR REMEDIATION COVERS THE AREA THAT WILL LIKELY HAVE ARSENIC > 1,000 mg/kg IN 2015 BASED ON THE OBSERVED RATE OF DECREASE IN CONCENTRATION OVER THE LAST 15 YEARS IN THE MARSH.
4. DASHED LINE SHOWS ADDITIONAL TREATMENT AREA INCLUDED IN THE FINAL REMEDY BUT NOT TARGETED FOR TREATMENT IN THE ORIGINAL PLAN.

PROJECT: **WISCONSIN DEPARTMENT OF NATURAL RESOURCES KEWAUNEE MARSH**

SHEET TITLE: **PRE-REMEDIAL SOURCE AREA LOCATION MAP**

DRAWN BY:	PAPEZ J	SCALE:		PROJ. NO.	186467-003
CHECKED BY:	WALTER M		AS NOTED	FILE NO.	186467.006.F2.mxd
APPROVED BY:	SELLWOOD A	DATE PRINTED:			**FIGURE 2**
DATE:	MARCH 2012				

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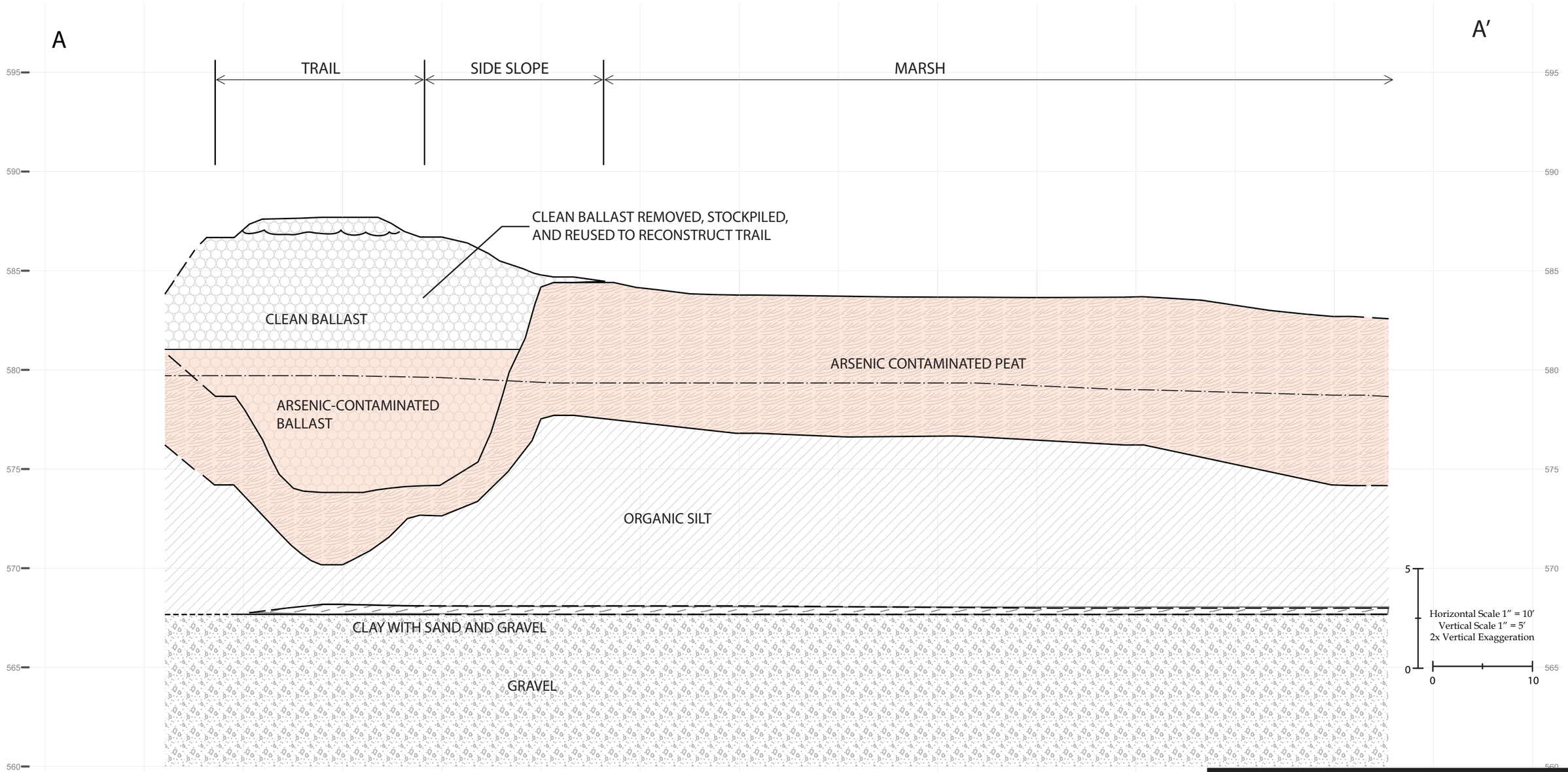

LEGEND

- Stratigraphic Boundary (Dashed Where Inferred)
- Groundwater Elevation (Estimated)
- Source Area Material Targeted for Treatment (Contains Arsenic >2,000 mg/kg)

NOTES

1. Additional cross-sections that include the concentration data are included in Appendix E.

PROJECT:	WISCONSIN DEPARTMENT OF NATURAL RESOURCES KEWAUNEE MARSH
SHEET TITLE:	PRE-REMEDIAL CONCEPTUAL SOURCE AREA CROSS-SECTION

DRAWN BY:	OCONNELL T	SCALE:		PROJ. NO.	186467-003
CHECKED BY:	WALTER M		AS NOTED	FILE NO.	186467AI02.ai
APPROVED BY:	SELLWOOD A	DATE PRINTED:			FIGURE 3
DATE:	MARCH 2012				

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LEGEND

- CAPPED AREA
- CHAIN-LINK FENCE BARRICADE ACROSS TRAIL
- TRAIL CLOSURE SIGN
- CONSTRUCTION WORK ZONE

NOTES

1. AERIAL IMAGE FROM KEWAUNEE COUNTY, 2010.

N

0 1,000 2,000 FEET

1 " = 1,000 '
1:12,000

PROJECT: **WISCONSIN DEPARTMENT OF NATURAL RESOURCES KEWAUNEE MARSH**

SHEET TITLE: **SITE ACCESS CONTROL DURING REMEDIATION**

DRAWN BY:	PAPEZ J	SCALE:	AS NOTED	PROJ. NO.	186467-003
CHECKED BY:	WALTER M			FILE NO.	186467.008.F4.mxd
APPROVED BY:	SELLWOOD A	DATE PRINTED:		**FIGURE 4**	
DATE:	JANUARY 2012				

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LEGEND

- LOCKABLE GATE
- CHAIN LINK FENCE
- APPROXIMATE EXTENT OF ACCESS ROAD

NOTES

1. AERIAL IMAGE FROM KEWAUNEE COUNTY 2010.

0 50 100 FEET

1 " = 50 '
1:600

PROJECT:	WISCONSIN DEPARTMENT OF NATURAL RESOURCES KEWAUNEE MARSH
SHEET TITLE:	TRAIL ACCESS DETAIL

DRAWN BY:	PAPEZ J	SCALE:	PROJ. NO. 02085.24.001
CHECKED BY:	WALTER M	AS NOTED	FILE NO. 186467.009.F5.mxd
APPROVED BY:	SELLWOOD A	DATE PRINTED:	FIGURE 5
DATE:	MARCH 2012		

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LEGEND

- CAPPED AREA
- TREATMENT AREA, HORIZONTAL LIMITS AT BASE OF EXCAVATION
- FENCE (NOTE 2)

NOTES

1. AERIAL IMAGE FROM KEWAUNEE COUNTY, 2010.
2. GREYED OUT SECTION OF THE FENCE WAS REMOVED AND SALVAGED TO PROVIDE ACCESS TO TREATMENT AREA IN THE MARSH.
3. TEMPORARY ACCESS RAMP AND STAGING AREA WERE REMOVED AS THE REMEDIATION PROGRESSED TO PROVIDE ACCESS TO THE TREATMENT AREA.

N

0 50 100 FEET

1 " = 50 '
1:600

PROJECT: WISCONSIN DEPARTMENT OF NATURAL RESOURCES KEWAUNEE MARSH

SHEET TITLE: TARGETED INSITU REMEDIATION

DRAWN BY:	PAPEZ J	SCALE:		PROJ. NO.	186467-003
CHECKED BY:	WALTER M		AS NOTED	FILE NO.	186467.010.F6.mxd
APPROVED BY:	SELLWOOD A	DATE PRINTED:			
DATE:	JANUARY 2012				

FIGURE 6

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LEGEND

- CAPPED AREA
- APPROXIMATE TREATMENT CELL
- TREATMENT AREA, HORIZONTAL LIMITS AT BASE OF EXCAVATION
- FENCE (NOTE 2)
- MONITORING WELL
- ABANDONED MONITORING WELL

NOTES

1. BASE MAP IMAGERY FROM KEWAUNEE COUNTY, 2010.
2. GREYED OUT SECTION OF THE FENCE WAS REMOVED AND REPLACED TO PROVIDE ACCESS TO TREATMENT AREA IN THE MARSH.
3. TREATMENT AREA COORDINATES (WISCONSIN TRANSVERSE MERCATOR-METERS):

POINT	X	Y
A	717445	447685
B	717469	447707
C	717486	447688
D	717457	447668

N

0 30 60 FEET

1 " = 30 '
1:360

PROJECT: **WISCONSIN DEPARTMENT OF NATURAL RESOURCES KEWAUNEE MARSH**

SHEET TITLE: **TREATMENT CELL MAP AND MONITORING WELL LOCATION MAP**

DRAWN BY: PAPEZ J	SCALE:	PROJ. NO.	186467-003
CHECKED BY: WALTER M	AS NOTED	FILE NO.	186467.011.F7.mxd
APPROVED BY: SELLWOOD A	DATE PRINTED:	**FIGURE 7**	
DATE: MARCH 2012			

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LEGEND

- CAPPED AREA
- APPROXIMATE TREATMENT CELL
- TREATMENT AREA, HORIZONTAL LIMITS AT BASE OF EXCAVATION
- FENCE (NOTE 2)

PRE-REMEDIATION GEOPROBE SAMPLE (2009/2010)

- ARSENIC > 1,000 mg/kg
- ARSENIC < 1,000 mg/kg

} M-SERIES = MARSH (8-12 FT)
B-SERIES = BALLAST (15-30 FT)

CELL NUMBER
PRE-TREATMENT SPLP As RESULT
POST-TREATMENT SPLP As RESULT
} PEAT SAMPLES

CELL NUMBER
PRE-TREATMENT SPLP As RESULT
POST-TREATMENT SPLP As RESULT
} BALLAST SAMPLES

NOTES

1. BASE MAP IMAGERY FROM KEWAUNEE COUNTY, 2010.
2. GREYED OUT SECTION OF THE FENCE WAS REMOVED AND REPLACED TO PROVIDE ACCESS TO TREATMENT AREA IN THE MARSH.
3. PRE-TREATMENT ESTIMATES CALCULATED USING COMPOSITIONAL ARSENIC RESULTS FROM DECEMBER 2009/MARCH 2010 INVESTIGATION. COMPOSITIONAL ARSENIC CONCENTRATIONS WERE CONVERTED TO SPLP ARSENIC CONCENTRATIONS. DATA AND CONVERSIONS ARE PRESENTED IN APPENDIX G.
4. POST-TREATMENT RESULTS ARE TRC SCREENING LEVEL RESULTS.

0 30 60 FEET

1 " = 30 '
1:360

PROJECT: **WISCONSIN DEPARTMENT OF NATURAL RESOURCES KEWAUNEE MARSH**

SHEET TITLE: **PERFORMANCE VERIFICATION RESULTS**

DRAWN BY:	PAPEZ J	SCALE:	AS NOTED	PROJ. NO.	186467-003
CHECKED BY:	WALTER M			FILE NO.	186467.013.F8.mxd
APPROVED BY:	SELLWOOD A	DATE PRINTED:		**FIGURE 8**	
DATE:	MARCH 2012				

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2616250 2616500 2616750 2617000 2617250 2617500 2617750

244500 244250 244000 243750 243500 243250

GW01-1
MW02-2i
MW02-2
GW01-2
GW01-3
GW01-4
GW01-5
MW02-7
MW02-7d
MW02-7i
MW04-11
MW11-2
MW11-3
MW11-3i
MW04-10
MW11-1
MW11-1i
MW04-9
GW01-9
MW02-3i
MW02-3
MW02-3d
MW02-5
MW02-5i
MW02-4
MW02-4i
MW02-4d
GW01-6
MW04-13
MW04-12
MW02-1d
MW02-1
MW02-1i
MW02-8
MW02-8i
MW02-6
MW02-6i
GW01-8
GW01-11
GW01-7
GW-D
GW01-10
GW-E
KEWAUNEE RIVER
SLOUGHS

LEGEND

- CAPPED AREA
- MW02-3 — EXISTING SITE WELLS NOT INCLUDED IN THE PERFORMANCE MONITORING PLAN
- GW01-2 — WELLS INCLUDED IN PERFORMANCE MONITORING PLAN
- *MW04-10* — ABANDONED WELL
- FENCE
- TREATMENT AREA

NOTES

1. BASE MAP IMAGERY FROM KEWAUNEE COUNTY, 2010.
2. WELL LOCATIONS ARE APPROXIMATE.
3. MAP PROJECTION AND GRID COORDINATES ARE NAD83 STATE PLANE WISCONSIN CENTRAL, US SURVEY FEET.

N

0 150 300 FEET

1 " = 150 '
1:1,800

PROJECT:
WISCONSIN DEPARTMENT OF NATURAL RESOURCES KEWAUNEE MARSH

SHEET TITLE:
IN SITU REMEDIATION PERFORMANCE MONITORING WELL NETWORK

DRAWN BY:	PAPEZ J	SCALE:	PROJ. NO. 186467-003
CHECKED BY:	O'CONNELL T	AS NOTED	FILE NO. 186467.012.F9.mxd
APPROVED BY:	SELLWOOD A	DATE PRINTED:	**FIGURE 9**
DATE:	MARCH 2012		

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Appendix A
Product MSDS and Information Sheets and ORIN's Mixing Quantity Summary

In Situ Mixing Summary - Kewaunee Marsh Arsenic Spill Clean-up
Kewaunee, Wisconsin
Prepared by ORIN Technologies, Inc.

DATE	CELL #	DEPTH[(1)]	BATCH VOL. (yd3)	TIME ON	TIME OFF	5% PEROXIDE VOLUME (gal)	FERRIC SULFATE (lbs.)	LIMESTONE (lbs.)	BENTONITE (lbs.)	COMMENTS
10/5/11	1	3.5' - 7.0'	50	11:10	11:23	50				Water entering hole
				11:35	11:48		2350			
				11:49	11:55			2150		
	1	0 - 3.5'	50	12:04	12:16	50				
				12:20	12:27		2350			
				12:28	12:40			2150		
10/11/11	1	0 - 7.0'	100	early morning					8000	
10/5/11	2	0 - 7.0'	100	13:50	14:15	100				Water entering hole
	2	3.5' - 7.0'	50	14:27	14:35		2350			
				14:37	14:41			2150		
				15:00	15:15				4000	
	2	0 - 3.5'	50	15:18	15:27		2350			
				15:38	15:49			2150		
				15:55	16:05				4000	
10/10/11	3	0 - 7.0'	100	9:00	9:20	100				
	3	3.5' - 7.0'	50	9:23	9:30		2350			
				9:31	9:40			2150		
				9:41	9:54				4000	
	3	0 - 3.5'	50	10:02	10:08		2350			
				10:09	10:14			2150		
				10:15	10:27				4000	
10/10/11	4	0 - 7.0'	100	10:50	11:20	100				Starting to see Styrofoam under barrier liner
	4	3.5' - 7.0'	50	11:25	11:36		3700			
				11:37	11:46			2150		
				11:50	12:01				4000	
	4	0 - 3.5'	50	12:09	12:16		2350			
				12:17	12:20			2150		
				12:21	12:34				4000	
10/10/11	5	0 - 7.0'	100	13:40	14:08	100				Styrofoam
	5	3.5' - 7.0'	50	14:08	14:16		2350			
				14:17				2150		
					14:35				4000	
	5	0 - 3.5'	50	14:41	14:51		2350			
				14:53				2150		
					14:58				4000	

In Situ Mixing Summary - Kewaunee Marsh Arsenic Spill Clean-up (continued)
Kewaunee, Wisconsin
Prepared by ORIN Technologies, Inc.

DATE	CELL #	DEPTH[1]	BATCH VOL. (yd3)	TIME ON	TIME OFF	5% PEROXIDE VOLUME (gal)	FERRIC SULFATE (lbs.)	LIMESTONE (lbs.)	BENTONITE (lbs.)	COMMENTS
10/10/11	6	0 - 7.0'	100	15:08	15:36	100				Styrofoam
	6	3.5' - 7.0'	50	15:37	15:42		2350			
				15:43				2150		
					15:53				4000	
	6	0 - 3.5'	50	15:59	16:06		2350			
				16:07				2150		
					16:15				4000	
10/11/11	7	0 - 7.0'	100	7:43	8:12	100				
	7	3.5' - 7.0'	50	8:13	8:21		2350			
				8:22				2150		
					8:32				4000	
	7	0 - 3.5'	50	8:42	8:55		2350			
				9:01				2150		
					9:10				4000	
10/11/11	8	0 - 7.0'	100	9:23	9:39	100				
	8	3.5' - 7.0'	50	9:43	9:53		2350			
				9:55				2150		
					10:01				4000	
	8	0 - 3.5'	50	10:08	10:17		2350			
				10:19				2150		
					10:30				4000	
10/11/11	9	0 - 7.0'	100	10:57	11:11	100				
	9	3.5' - 7.0'	50	11:13	11:20		2350			
				11:23				2150		
					11:30				4000	
	9	0 - 3.5'	50	11:31	11:36		2350			
				11:37				2150		
					11:56				4000	
10/11/11	10	0 - 7.0'	100	13:23	13:43	100				
	10	3.5' - 7.0'	50	13:44	13:54		2350			
				14:01				2150		
					14:15				4000	
	10	0 - 3.5'	50	14:19	14:25		2350			
				14:30				2150		
					14:41				4000	
10/12/11	11	0 - 7.0'	100	8:16	8:34	100				
	11	3.5' - 7.0'	50	8:37	8:46		2350			
				8:48	8:57			2150		
	11	0 - 3.5'	50	9:01	9:08		2350			
				9:09	9:15			2150		

In Situ Mixing Summary - Kewaunee Marsh Arsenic Spill Clean-up (continued)
Kewaunee, Wisconsin
Prepared by ORIN Technologies, Inc.

DATE	CELL #	DEPTH[1]	BATCH VOL. (yd3)	TIME ON	TIME OFF	5% PEROXIDE VOLUME (gal)	FERRIC SULFATE (lbs.)	LIMESTONE (lbs.)	BENTONITE (lbs.)	COMMENTS
10/14/11	11	0 - 7.0'	100	7:57	8:16				10000	
10/12/11	12	0 - 7.0'	100	9:32	9:47	100				
	12	3.5' - 7.0'	50	9:48	9:52		2350			
				9:53	9:57			2150		
	12	0 - 3.5'	50	10:01	10:06		2350			
				10:07	10:11			2150		
10/14/11	12	0 - 7.0'	100	8:20	8:40				10000	
10/12/11	13	0 - 7.0'	100	10:19	10:33	100				
	13	3.5' - 7.0'	50	10:37	10:41		2350			
				10:42	10:45			2150		
	13	0 - 3.5'	50	10:49	10:54		2350			
				10:55	11:00			2150		
10/14/11	13	0 - 7.0'	100	8:42	9:00				10000	
10/12/11	14	0 - 7.0'	100	15:15	15:35	100				Additional cell to the SE
	14	3.5' - 7.0'	50	15:37	15:42		2350			
				15:43	15:47			2150		
	14	0 - 3.5'	50	15:53	16:02		2350			
				16:03	16:08			2150		
10/14/11	14	0 - 7.0'	100	7:20	7:35				10000	
10/14/11	15	0 - 7.0'	100	10:17	10:33	100				
	15	3.5' - 7.0'	50	10:34	10:39		3525			
				10:40				2150		
					10:52				5000	
	15	0 - 3.5'	50	10:55	10:59		3525			
				11:00				2150		
					11:16				5000	
10/14/11	16	0 - 7.0'	100	11:43	12:00	100				
	16	3.5' - 7.0'	50	12:01	12:14		3525			
				12:16				2150		
					12:28				5000	
	16	0 - 3.5'	50	12:34	12:40		3525			
				12:42				2150		
					13:00				5000	
10/14/11	17	0 - 7.0'	100	13:58	14:15	100				Additional cell to the SE
	17	3.5' - 7.0'	50	14:20	14:25		3525			
				14:27				2150		
					14:38				10000	
	17	0 - 3.5'	50	14:45	14:52		3525			
				14:54				2150		
					15:07				10000	

In Situ Mixing Summary - Kewaunee Marsh Arsenic Spill Clean-up (continued)
Kewaunee, Wisconsin
Prepared by ORIN Technologies, Inc.

DATE	CELL #	DEPTH[1]	BATCH VOL. (yd3)	TIME ON	TIME OFF	5% PEROXIDE VOLUME (gal)	FERRIC SULFATE (lbs.)	LIMESTONE (lbs.)	BENTONITE (lbs.)	COMMENTS
10/14/11	18	0 - 7.0'	100	15:22	15:36	100				
	18	3.5' - 7.0'	50	15:41	15:49		3525			
				15:50				2150		
					16:02				8000	
	18	0 - 3.5'	50	16:05	16:14		3525			
				16:16				2150		
					16:27				8000	
10/17/11	19	0 - 10.0'	100	9:44	10:01	100				
	19	3.5' - 10.0'	50	11:50	12:00		2350			Peat
				12:08				2150		
					12:20				8000	
	19	0 - 3.5'	50	12:27	12:42		3700			Ballast
				12:43	12:50			2150		
10/17/11	20	0 - 10.0'	100	12:53	13:13	100				
	20	3.5' - 10.0'	50	13:14	13:23		2350			Peat
				13:24				2150		
					13:44				8000	
	20	0 - 3.5'	50	13:54	14:05		3700			Ballast
				14:06	14:10			2150		
10/17/11	21	5' - 19.0'	100	14:27	14:50	100				
	21	15' - 19.0'	50	14:56	15:02		2350			Peat
				15:04				2150		
					15:25				8000	
	21	5' - 15.0'	50	15:33			3700			Too much ballast. Did in two lifts.
					15:58			2150		
10/17/11	22	5' - 19.0'	100	16:55	17:15	100				
10/18/11	22	15' - 19.0'	50	7:31	7:36		2350			Peat
				7:37				2150		
					7:51				8000	
10/18/11	22	5' - 15.0'	50	7:52			3700			Too much ballast. Did in two lifts.
					10:33			4300		
10/18/11	23	5' - 19.0'	100	11:47	12:07	100				
	23	15' - 19.0'	50	12:09	12:20		2350			Peat
				12:21				2150		
					12:36				8000	
	23	5' - 15.0'	50	13:08			3700			Too much ballast. Did in two lifts.
					13:38			4300		

In Situ Mixing Summary - Kewaunee Marsh Arsenic Spill Clean-up (continued)
Kewaunee, Wisconsin
Prepared by ORIN Technologies, Inc.

DATE	CELL #	DEPTH[1]	BATCH VOL. (yd3)	TIME ON	TIME OFF	5% PEROXIDE VOLUME (gal)	FERRIC SULFATE (lbs.)	LIMESTONE (lbs.)	BENTONITE (lbs.)	COMMENTS
10/18/11	24	5 '- 19.0'	100	13:44	14:00	100				
	24	15' - 19.0'	50	14:01	14:10		2350			Peat
				14:11				2150		
					14:39				8000	
	24	5' - 15.0'	50	14:42			3700			Too much ballast. Did in two lifts.
					15:10			4300		
10/18/11	25[2]	0 - 10.0'	200	16:20	17:07	200				
	25[2]	3.5' - 10.0'	100	17:08	17:21		4700			Peat
				17:23				4300		
					17:54				10000	
	25[2]	0 - 3.5'	100	17:56			4700			Too much ballast. Did in two lifts.
					18:04			4300		
				18:05	18:16				6000[3]	

Notes:

1. Orin submitted this table to TRC as seen above without footnotes. TRC added footnotes described below.

Footnotes:

(1) Depth of excavation in marsh cells (#1 - #18) measured from marsh surface. Depth of excavation in sideslope and trail cells (#19 - #25) measured from trail surface (5 feet above marsh surface). TRC estimated that sideslope and trail cells contained clean (untreated) ballast from 0' - 5' bgs, contaminated ballast from 5' - 12' bgs, and contaminated peat from 12' - 15' bgs.

(2) TRC designated this area as cells #25 and #26. Cell #26 (last cell treated) ended up significantly smaller than the rest, so it was treated simultaneously with cell #25. Appropriate quantities of chemicals were used for mixing.

(3) Bentonite mixed with contaminated ballast and mixed into the treated marsh area. Mixing created bulking effect in trail and sideslope cells. Contaminated ballast mixed into marsh area so clean ballast previously removed could be placed on trail sideslope.

Material Safety Data Sheet

.Hydrogen Peroxide 30-50%

ACC# 11189

Section 1 - Chemical Product and Company Identification

MSDS Name: .Hydrogen Peroxide 30-50%
Catalog Numbers: AC9470941, S74876, S74876-1, S748761, S74879, S74882, H323-500, H323500, H325 100, H325 4, H325 500, H325-100, H325-30GAL, H325-4, H325-500, H325100, H32530GAL, H3254, H325500, H325500001, H327 500, H327-500, H327500, H327500LC, H341 500, H341-500, H341500, NC9839610, S748761MF, WESH325500, ZZH3253015
Synonyms: Carbamide Peroxide; Hydrogen Dioxide; Peroxide; Hydroperoxide; Urea Peroxide; Hydrogen Peroxide 100 Volumes.
Company Identification:

Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410

For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
7722-84-1	Hydrogen peroxide	30-50	231-765-0
7732-18-5	Water	Balance	231-791-2

Hazard Symbols: O C
Risk Phrases: 34 8

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: clear, colorless. **Danger!** Strong oxidizer. Contact with other material may cause a fire. Eye contact may result in permanent eye damage. May cause central nervous system effects. Causes eye and skin irritation and possible burns. Corrosive. May cause severe respiratory tract irritation with possible burns. May cause severe digestive tract irritation with possible burns. Mutagen. Light sensitive. May be harmful if swallowed. May cause blood abnormalities.
Target Organs: Blood, central nervous system.

Potential Health Effects

Eye: Contact with liquid is corrosive to the eyes and causes severe burns. Contact with the eyes may cause corneal damage.
Skin: Causes severe skin irritation and possible burns. May cause discoloration, erythema (redness), swelling, and the formation of papules and vesicles (blisters).

Ingestion: Causes gastrointestinal irritation with nausea, vomiting and diarrhea. Causes gastrointestinal tract burns. May cause vascular collapse and damage. May cause damage to the red blood cells. May cause difficulty in swallowing, stomach distension, possible cerebral swelling and death. Ingestion may result in irritation of the esophagus, bleeding of the stomach and ulcer formation.
Inhalation: Causes chemical burns to the respiratory tract. May cause ulceration of nasal tissue, insomnia, nervous tremors with numb extremities, chemical pneumonia, unconsciousness, and death. At high concentrations, respiratory effects may include acute lung damage and delayed pulmonary edema.
Chronic: Prolonged or repeated skin contact may cause dermatitis. Laboratory experiments have resulted in mutagenic effects. Repeated contact may cause corneal damage.

Section 4 - First Aid Measures

Eyes: Get medical aid immediately. Do NOT allow victim to rub or keep eyes closed. Extensive irrigation with water is required (at least 30 minutes).
Skin: Get medical aid immediately. Immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Destroy contaminated shoes.
Ingestion: Do NOT induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately. Wash mouth out with water. Vomiting may occur spontaneously. If vomiting occurs and the victim is conscious, give water to further dilute the chemical.
Inhalation: Get medical aid immediately. Remove from exposure to fresh air immediately. If breathing is difficult, give oxygen. Do NOT use mouth-to-mouth resuscitation. If breathing has ceased apply artificial respiration using oxygen and a suitable mechanical device such as a bag and a mask.
Notes to Physician: Treat symptomatically and supportively. Attempts at evacuating the stomach via emesis induction or gastric lavage should be avoided. In the event of severe distension of the stomach or esophagus due to gas formation, insertion of a gastric tube may be required. To treat corneal damage, careful ophthalmologic evaluation is recommended and the possibility of local corticosteroid therapy should be considered.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Water runoff can cause environmental damage. Dike and collect water used to fight fire. Strong oxidizer. Contact with combustible materials may cause a fire. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Use water spray to keep fire-exposed containers cool. Substance is noncombustible. Use water with caution and in flooding amounts. Vapors may be heavier than air. They can spread along the ground and collect in low or confined areas. Some oxidizers may react explosively with hydrocarbons(fuel). May decompose explosively when heated or involved in a fire. May accelerate burning if involved in a fire.
Extinguishing Media: Use water only! Do NOT use carbon dioxide. Do NOT use dry chemical. Do NOT get water inside containers. Contact professional fire-fighters immediately. Cool containers with flooding quantities of water until well after fire is out. For large fires, flood fire area with large quantities of water, while knocking down vapors with water fog.

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Avoid runoff into storm sewers and ditches which lead to waterways. Clean up spills immediately, observing precautions in the Protective Equipment section. Use water spray to disperse the gas/vapor. Remove all sources of ignition. Absorb spill using an absorbent, non-combustible material such as earth, sand, or vermiculite. Do not use combustible materials such as saw dust. Flush spill area with water. Provide ventilation. Do not get water inside containers. Keep combustibles (wood, paper, oil, etc.,) away from spilled material.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use only in a well-ventilated area. Contents may develop pressure upon prolonged storage. Do not get in eyes, on skin, or on clothing. Keep container tightly closed. Avoid contact with clothing and other combustible materials. Do not ingest or inhale. Store protected from light. Discard contaminated shoes. Unused chemicals should not be returned to the container. Rinse empty drums and containers thoroughly with water before discarding.
Storage: Keep away from heat, sparks, and flame. Do not store near combustible materials. Keep container closed when not in use. Store in a cool, dry, well-ventilated area away from incompatible substances. Store protected from light. Keep away form alkalies, oxidizable materials, finely divided metals, alcohols, and permanganates. Store below 35°C. Store only in light-resistent containers fitted with a safety vent.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Use explosion-proof ventilation equipment. Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Hydrogen peroxide	1 ppm TWA	1 ppm TWA; 1.4 mg/m3 TWA 75 ppm IDLH	1 ppm TWA; 1.4 mg/m3 TWA
Water	none listed	none listed	none listed

OSHA Vacated PELs: Hydrogen peroxide: 1 ppm TWA; 1.4 mg/m3 TWA Water: No OSHA Vacated PELs are listed for this chemical.
Personal Protective Equipment
Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: A respiratory protection program that meets OSHA's 29 CFR §1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant a respirator's use.

Section 9 - Physical and Chemical Properties

Physical State: Liquid
Appearance: clear, colorless
Odor: slight acid odor
pH: 3.3 (30% solution)
Vapor Pressure: 23 mm Hg @ 30C
Vapor Density: 1.10
Evaporation Rate:>1.0 (Butyl acetate=1)
Viscosity: 1.25 cP
Boiling Point: 108 deg C @ 760 mmHg
Freezing/Melting Point:-33 deg C
Autoignition Temperature: Noncombustible
Flash Point: Noncombustible
Decomposition Temperature: Not available.
NFPA Rating: (estimated) Health: 3; Flammability: 0; Reactivity: 1
Explosion Limits, Lower:40 vol %
Upper: 100 vol %
Solubility: Miscible in water.
Specific Gravity/Density:1.1-1.2 (30-50%)
Molecular Formula:H2O2
Molecular Weight:34.0128

Section 10 - Stability and Reactivity

Chemical Stability: Decomposes slowly to release oxygen. Unstable when heated or contaminated with heavy metals, reducing agents, rust, dirt or organic materials. Stability is reduced when pH is above 4.0.
Conditions to Avoid: Mechanical shock, incompatible materials, light, ignition sources, dust generation, excess heat, combustible materials, reducing agents, alkaline materials, strong oxidants, rust, dust, pH > 4.0.
Incompatibilities with Other Materials: Strong oxidizing agents, strong reducing agents, acetic acid, acetic anhydride, alcohols, brass, copper, copper alloys, finely powdered metals, galvanized iron, hydrazine, iron, magnesium, nitric acid, sodium carbonate, potassium permanganate, cyanides (e.g. potassium cyanide, sodium cyanide), ethers (e.g. dioxane, furfuran, tetrahydrofuran (THF)), urea, chlorosulfonic acid, alkalies, lead, nitrogen compounds, triethylamine, silver, nickel, palladium, organic matter, charcoal, sodium borate, aniline, platinum, formic acid, cyclopentadiene, activated carbon, tert-butyl alcohol, hydrogen selenide, manganese dioxide, mercurous chloride, rust, ketones, carboxylic acids, glycerine, sodium fluoride, sodium pyrophosphate, soluble fuels (acetone, ethanol, glycerol), wood, wood, asbestos, hexavalent chromium compounds, salts of iron, copper, chromium, vanadium, tungsten, molybdeum, and platinum.
Hazardous Decomposition Products: Oxygen, hydrogen gas, water, heat, steam.
Hazardous Polymerization: Will not occur.

Section 11 - Toxicological Information

RTECS#:
CAS# 7722-84-1: MX0887000; MX0890000; MX0899000; MX0899500; MX0900000

CAS# 7732-18-5: ZC0110000
LD50/LC50:
CAS# 7722-84-1:
Inhalation, rat: LC50 = 2 gm/m3/4H;
Oral, mouse: LD50 = 2 gm/kg;
Oral, rabbit: LD50 = 820 mg/kg;
Oral, rat: LD50 = 1518 mg/kg;
Oral, rat: LD50 = 910 mg/kg;
Oral, rat: LD50 = 376 mg/kg;
Skin, rat: LD50 = 3 gm/kg;
Skin, rat: LD50 = 4060 mg/kg;
CAS# 7732-18-5:
Oral, rat: LD50 = >90 mL/kg;
Carcinogenicity:
CAS# 7722-84-1:
ACGIH: A3 - Animal Carcinogen
IARC: Group 3 carcinogen CAS# 7732-18-5: Not listed by ACGIH, IARC, NIOSH, NTP, or OSHA.
Epidemiology: No information available.
Teratogenicity: No information available.
Reproductive Effects: No information available.
Neurotoxicity: No information available.
Mutagenicity: CAS#: 7722-84-1 Mutation in Microorganisms: Salmonella typhimurium = 100 ug/plate.; Hyman, embryo = 50 umol/L.; Cytogenetic Analysis: Human, embryo = 20 umol/L. Mutation in Mammalian Somatic Cells: Hamster, lung = 1mmol/L.
Other Studies: No data available.

Section 12 - Ecological Information

Ecotoxicity: Fish: Carp: LC50 = 42 mg/L; 48 Hr; Unspecified Fathead Minnow: LC50 = 16.4 mg/L; 96 Hr; Fresh water Fathead Minnow: NOEC = 5 mg/L; 96 Hr; Fresh water flea Daphnia: EC50 = 2.4 mg/L; 48 Hr; Fresh water Channel catfish: LC50 = 37.4 mg/L; 96 Hr; Fresh water No data available.
Environmental: Rain washout is expected due to condensation of hydrogen peroxide on contact with water droplets. In the atmosphere, indirect photooxidation is perdicted with a half-life of 10 to 20 hours. Non-significant evaporation and adsorption from water surfaces and soil/sediments is expected. Rapid and cosiderable aerobic biodegradation was determined with a half-life < 1 minute (biological treatment sludge) and 0.3 to 2 days (fresh water). Hydrogen peroxide is non-bioaccumulable.
Physical: No information available.
Other: No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	IATA	RID/ADR	IMO	Canada TDG
Shipping Name:	HYDROGEN PEROXIDE, AQUEOUS SOLUTIONS 30%				HYDROGEN PEROXIDE
Hazard Class:	5.1				5.1(8)
UN Number:	UN2014				UN2014
Packing Group:	II				II

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 7722-84-1 is listed on the TSCA inventory.
CAS# 7732-18-5 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
SARA

Section 302 (RQ)
None of the chemicals in this material have an RQ.
Section 302 (TPQ)
CAS# 7722-84-1: concentration > 52%: TPQ = 1000 pounds; RQ = 1000 poun ds
SARA Codes
CAS # 7722-84-1: acute, flammable.
Section 313
No chemicals are reportable under Section 313.
Clean Air Act:
This material does not contain any hazardous air pollutants. This material does not contain any Class 1 Ozone depletors. This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
None of the chemicals in this product are listed as Hazardous Substances under the CWA. None of the chemicals in this product are listed as Priority Pollutants under the CWA. None of the chemicals in this product are listed as Toxic Pollutants under the CWA.
OSHA:
CAS# 7722-84-1 is considered highly hazardous by OSHA.
STATE
CAS# 7722-84-1 can be found on the following state right to know lists: California, New Jersey, Florida, Pennsylvania, Minnesota, Massachusetts.
CAS# 7732-18-5 is not present on state lists from CA, PA, MN, MA, FL, or NJ.
California No Significant Risk Level: None of the chemicals in this product are listed.

European / International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

O C

Risk Phrases:

R 34 Causes burns.
R 8 Contact with combustible material may cause fire.

Safety Phrases:

S 28 After contact with skin, wash immediately with...
S 3 Keep in a cool place.
S 36/39 Wear suitable protective clothing and eye/face protection.
S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

WGK (Water Danger / Protection)

CAS# 7722-84-1: 0
CAS# 7732-18-5: No information available.

Canada

CAS# 7722-84-1 is listed on Canada's DSL List. CAS# 7722-84-1 is listed on Canada's DSL List.
CAS# 7732-18-5 is listed on Canada's DSL List. CAS# 7732-18-5 is listed on Canada's DSL List.

This product has a WHMIS classification of C, E, D2A.
CAS# 7722-84-1 is listed on Canada's Ingredient Disclosure List.
CAS# 7732-18-5 is not listed on Canada's Ingredient Disclosure List.

Exposure Limits

CAS# 7722-84-1: OEL-AUSTRALIA:TWA 1 ppm (1.5 mg/m3) OEL-BELGIUM:TWA 1 ppm (1.4 mg/m3) OEL-DENMARK:TWA 1 ppm (1.4 mg/m3) OEL-FINLAND:TWA 1 ppm (1.4 mg/m3);STEL 3 ppm (4.2 mg/m3) OEL-FRANCE:TWA 1 ppm (1.5 m g/m3) OEL-GERMANY:TWA 1 ppm (1.4 mg/m3) OEL-THE NETHERLANDS:TWA 1 pp m (1.4 mg/m3) OEL-THE PHILIPPINES:TWA 1 ppm (1.4 mg/m3) OEL-SWITZERL AND:TWA 1 ppm (1.4 mg/m3);STEL 2 ppm (2.8 mg/m3) OEL-TURKEY:TWA 1 ppm (1.4 mg/m3) OEL-UNITED KINGDOM:TWA 1 ppm (1.5 mg/m3);STEL 2 ppm (3 m g/m3)

Section 16 - Additional Information

MSDS Creation Date: 4/21/1999
Revision #4 Date: 8/02/2000

MSDS: 0075000
Print Date: 12/07/2010
Revision Date: 12/07/2010

MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name: **Kemira FERIX-3**
Synonyms: Iron (III) Sulfate
Formula $Fe_2(SO_4)_3*9H_2O$
Product Description: Granulated and compounded Iron III hydrates
Intended/Recommended Use: Water treating chemical

Supplied By: KEMIRA WATER SOLUTIONS CANADA, INC., 3405 BLVD. MARIE VICTORIN, VARENNES, QUEBEC, CANADA J3X 1T6 1-800/ 465-6171, 1-450/652-0665, 1-800/450-7352 - Polymers
EMERGENCY PHONE: In CANADA: 613/996-6666 In USA: 1-800/424-9300 or 1-703/527-3887.

Manufactured By: KEMIRA WATER SOLUTIONS, INC., 316 BARTOW MUNICIPAL AIRPORT, BARTOW, FLORIDA 33830, USA -1-785/842-7424

2. COMPOSITION/INFORMATION ON INGREDIENTS

WHMIS REGULATED COMPONENTS

Component / CAS No.	% (w/w)	OSHA (PEL):	ACGIH (TLV)	Carcinogen
Ferric sulfate 10028-22-5	66 - 74 (dry weight: 69 - 77%)	1 mg/m^3 Fe (TWA)	0.1 mg/m^3 as persulfate (TWA) 1 mg/m^3 as Fe (TWA)	-

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

APPEARANCE AND ODOR:

Color:	yellow-tannish-gray
Appearance:	granular
Odor:	slight

STATEMENTS OF HAZARD:

WARNING! HARMFUL IF SWALLOWED OR INHALED
IRRITATING TO EYES, SKIN, RESPIRATORY AND DIGESTIVE TRACTS

POTENTIAL HEALTH EFFECTS

EFFECTS OF EXPOSURE:
Refer to Section 11 for toxicology information on the regulated components of this product. Skin or eye contact with solutions of this product may cause moderate skin and eye irritation.

4. FIRST AID MEASURES

4. FIRST AID MEASURES

Ingestion:
Never give anything by mouth to an unconscious person. Obtain medical attention. Do not induce vomiting. Administer 250 - 300 ml water to dilute material in the stomach.

Skin Contact:
In case of skin contact, wash affected areas of skin with soap and water. If skin irritation persists, call a physician.

Eye Contact:
Rinse immediately with plenty of water for at least 15 minutes. Obtain medical advice if there are persistent symptoms.

Inhalation:
If breathing has stopped, trained personnel should administer artificial respiration. If the heart has stopped, trained personnel should administer cardio-pulmonary resuscitation. Remove to fresh air. If breathing is difficult, give oxygen. Obtain medical advice if there are persistent symptoms.

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5. FIRE-FIGHTING MEASURES

Suitable Extinguishing Media:
Use an extinguishing media appropriate for the surrounding fire. This material will not burn readily.

Protective Equipment:
Wear full firefighting protective clothing. See MSDS Section 8 (Exposure Controls/Personal Protection). Firefighters, and others exposed, wear self-contained breathing apparatus.

Special Hazards:
Keep unnecessary people away.

Mechanical/Static Sensitivity Statements:
None

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6. ACCIDENTAL RELEASE MEASURES

Personal precautions:
Where exposure level is not known, wear approved, positive pressure, self-contained respirator. Where exposure level is known, wear approved respirator suitable for level of exposure. Refer to Section 8 (Exposure Controls/Personal Protection) for appropriate personal protective equipment.

Methods For Cleaning Up:
Sweep up into containers for disposal. Dispose of contaminated material as prescribed

Environmental Precautions:
Use appropriate containment to avoid environmental contamination. Prevent water contaminated with this product from entering drains, sewers or streams, growng crops/keeping animal areas, and sites of native flora and fauna.

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7. HANDLING AND STORAGE

HANDLING

Precautionary Measures: Do not get in eyes. Handle with caution. Wash thoroughly after handling. See MSDS for details.

Special Handling Statements: Review the label, this MSDS and any other applicable information before use. Keep separated from incompatible substances. Use appropriate Personal Protective Equipment per Section 8. Handle only with equipment, materials and supplies specified by their manufacturer as being compatible and appropriate for use with this product.

STORAGE
Prevent material from coming in contact with common metals. Ensure that al storage vessels are labeled. Avoid skin and eye contact. Wear appropriate protective clothing. Store only in dry rubber-lined, plastic, FRP or stainless steel (304, 316). Keep storage temperatures between 10o and 30o C. Store away from incompatible materials such as alkalis. Keep smaller containers as drums and totes tightly closed when not in use or when empty. Product should be used within one year. Storage facilities should have secondary containment as required by law or regulation. Storage tanks, piping and offloading points should be labeled with appropriate signage to avoid accidents.
Containers of this material may be hazardous when empty, since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Measures:
Engineering controls are not necessary if good hygiene practices are followed.

Respiratory Protection:
Where exposures are below the established exposure limit, no respiratory protection is required. Where exposures exceed the established exposure limit, use respiratory protection recommended for the material and level of exposure.

Eye Protection:
Wear eye/face protection. Prevent eye and skin contact.

Skin Protection:
Wear suitable protective clothing.

Additional Advice:
Before eating, drinking, or smoking, wash face and hands thoroughly with soap and water. Food, beverages, and tobacco products should not be carried, stored, or consumed where this material is in use.

9. PHYSICAL AND CHEMICAL PROPERTIES

Color:	yellow-tannish-gray
Appearance:	granular
Odor:	slight
Boiling Point:	Not applicable
Melting Point:	>300 °C
Vapor Pressure:	Not applicable
Specific Gravity/Density:	3.1
Vapor Density:	Not available
Percent Volatile (% by wt.):	None
pH:	Not applicable
Saturation In Air (% By Vol.):	Not available
Evaporation Rate:	Similar to water
Solubility In Water:	soluble
Volatile Organic Content:	Not available
Flash Point:	Not applicable
Flammable Limits (% By Vol):	Not applicable
Autoignition Temperature:	Not applicable
Decomposition Temperature:	Not applicable
Partition coefficient (n-octanol/water):	Not available
Odor Threshold:	Not available

10. STABILITY AND REACTIVITY

Stability:	Stable

Conditions To Avoid:	To avoid product degradation and equipment corrosion, do not use iron, copper, or aluminum containers or equipment. Avoid contact with strong acids or bases and excessive heat.
Polymerization:	Will not occur
Conditions To Avoid:	None known
Hazardous Decomposition Products:	oxides of sulfur (includes sulfur di and tri oxides)

11. TOXICOLOGICAL INFORMATION

Toxicological information for the product is found under Section 3. HAZARDS IDENTIFICATION.
Toxicological information on the regulated components of this product is as follows:

Ferric Sulfate

Available TOXICOLOGICAL DATA:

LD50 (intraperitoneal mouse): 168 mg/kg

LD50 (oral, rat) = 500 mg/kg

Mutagenicity: Not available

Reproductive Effects: Not available

Teratogenicity and Fetotoxicity: Not available

Synergistic Materials: Not available

12. ECOLOGICAL INFORMATION

The test values shown for this product are actually the results for studies conducted on anhydrous ferric sulfate.

ALGAE TEST RESULTS

Test: Acute toxicity, freshwater

Duration: 7 day.
Species: Green Algae (Scenedesmus subspicatus)

10000 ug/l	Toxicity endpoint not reported.	Based on the anhydrous material. 1978 Journal: Egypt.J.Bot. 21(2):121-130

FISH TEST RESULTS

Test: Acute toxicity, freshwater
Duration: 24 hr. **Procedure:** Static.
Species: Mosquitofish (Gambusia affinis)

37,200 ug/l	LC50	Based on the anhydrous material. 1957 Journal: Sewage Ind.Wastes 29(6):695-711

Test: Acute toxicity, freshwater
Duration: 96 hr **Procedure:** Static
Species: Mosquitofish (Gambusia affinis)

37,200 ug/l	LC50	Based on the anhydrous material. 1957 Journal: Sewage Ind.Wastes 29(6):695-711

OTHER TEST RESULTS

Test: Acute toxicity, freshwater
Duration: 48 hr
Species: Rock Oyster (Saccostrea commercialis)

100 - 200 ug/l	NOEC	Based on the anhydrous material. 1997 Journal: Ectoxicol.Environ.Saf. 37:30-36

13. DISPOSAL CONSIDERATIONS

Kemira encourages the recycle, recovery and reuse of materials, where permitted, as an alternative to disposal as a waste. Kemira recommends that organic materials classified as hazardous waste according to the relevant local or national regulations be disposed of by thermal treatment or incineration at approved facilities. All local and national regulations should be followed.

14. TRANSPORT INFORMATION

14. TRANSPORT INFORMATION

This section provides basic shipping classification information. Refer to appropriate transportation regulations for specific requirements.

US DOT

Proper Shipping Name: Environmentally hazardous substance, solid, n.o.s.
Hazard Class: 9
Packing Group: III
UN/ID Number: UN3077
Transport Label Required: Class 9
Technical Name (N.O.S.): Contains ferric sulfate
Hazardous Substances:

Component / CAS No.	Reportable Quantity of Product (lbs)
Ferric sulfate	~1299 lbs. (Ferric Sulfate RQ = 1000 lbs)

Comments: Hazardous Substances/Reportable Quantities - DOT requirements specific to Hazardous Substances only apply if the quantity in one package equals or exceeds the reportable quantity.

TRANSPORT CANADA

Proper Shipping Name: Not applicable/Not regulated

ICAO / IATA

Proper Shipping Name: Environmentally hazardous substance, solid, n.o.s.
Hazard Class: 9
Packing Group: III
UN Number: UN3077
Packing Instructions/Maximum Net Quantity Per Package:
Passenger Aircraft: No Limit
Cargo Aircraft: No Limit
Technical Name (N.O.S.): Contains ferric sulfate

IMO

Proper Shipping Name: Environmentally hazardous substance, solid, n.o.s.
Hazard Class: 9
UN Number: UN3077
Packing Group: III
Technical Name (N.O.S.): Contains ferric sulfate

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15. REGULATORY INFORMATION

This product has been classified in accordance with the hazard criteria of the Controlled products Regulations and this Material Safety Data Sheet contains all the information required by the Controlled Products Regulations.

WHMIS CLASSIFICATION:
Class D2B Toxic

INVENTORY INFORMATION

United States (USA): This product is manufactured in compliance with all provisions of the Toxic Substances Control Act, 15 U. S. C. 2601 et. seq.

Canada: Components of this product have been reported to Environment Canada in accordance with Sections 66 and/or 81 of the Canadian Environmental Protection Act (1999), and are included on the Domestic Substances List.

European Union (EU): All components of this product are included in the European Inventory of Existing Chemical Substances (EINECS) in compliance with Council Directive 67/548/EEC and its amendments.

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16. OTHER INFORMATION

NFPA Hazard Rating (National Fire Protection Association)

Health: 2 - Materials that, under emergency conditions, can cause temporary incapacitation or residual injury.

Fire: 0 - Materials that will not burn.

Reactivity: 0 - Materials that in themselves are normally stable, even under fire exposure conditions.

Reasons For Issue: Revised Section 9

Prepared By: Richard Moye, Product Regulatory 1-251-662-1581
12/07/2010

PRODUCT INFORMATION

KEMIRON FERIX-3

Granular Ferric Sulfate

KEMIRON FERIX-3 is an effective primary coagulant in dry granulated form based on trivalent iron (Fe^{3+}). KEMIRON FERIX-3 can be easily dissolved with suitable equipment into a 10 - 11.8% Fe solution. It functions very well for both potable and wastewater clarification over a wide range of pH and can be used for color removal, phosphate removal, heavy metal removal and lime softening applications.

PRODUCT SPECIFICATIONS

Appearance	Grayish granule
Total Iron (Fe^{tot})	20.5 ± 2%
Fe (III)	19.5 ± 1%
Fe (II)	≤ 1.0%
Free H_2SO_4	< 1.5%
Water-Insoluble Matter	< 1%
Bulk Density	70 lb / ft^3

(Above analysis according to AWWA B406-92)

Particle Size Distribution:

50%	< 2-3 mm
100%	< 7 mm
Dust (< 0.2 mm)	max 3%
Angle of repose	37°

CERTIFICATION / APPROVAL

KEMIRON FERIX-3 meets or exceeds all **AWWA** standards and is **ANSI/NSF Standard 60** certified for use in potable water treatment up to 275 mg/l.

DOSING AND DISSOLVING

KEMIRON FERIX-3 can be dissolved in water and dosed via suitable chemical metering pumps.

STORAGE

The dry granules are mildly hygroscopic and therefore should be stored in dry conditions.

HANDLING / SAFETY

The handling of any chemical requires care. Anyone responsible for using or handling KEMIRON FERIX-3 should familiarize themselves with the full safety precautions outlined in our Material Safety Data Sheet

DELIVERY

In bulk, by rail car or hopper truck. Bags (50#) and Super Sacks (2,000#) are also available. Environmentally, Hazardous Substance, Solid, n.o.s. (Ferric Sulfate), 9, UN 3077, P.G.III

PRODUCTION / DISTRIBUTION

KEMIRON FERIX-3 is produced in Finland by Kemira Oy. US distribution through Kemira Water Solutions.

CUSTOMER SERVICE

If you have any questions concerning this material, please contact our Customer Service Department.

US:

Lawrence, KS	(800) 879-6353

Canada

Varennes, QC	(800) 465-6171

KEMIRON Water - www.KEMIRON.com
US Sales Office, 3211 Clinton Parkway Ct, Suite 1, Lawrence, KS, 66047,Tel (800) 879-6353, Fax (785) 842-3150.
Canada Sales Office, 3405 Blvd Marie-Victorin, Varennes, QC J3X 1T6, Tel (800) 465-6171, Fax (450) 652-7343

CLEAN WATER IS OUR LIFE

55 Industrial Street
Toronto, Ontario M4G 3W9
Phone: 416-423-1300

MATERIAL SAFETY DATA SHEET
LIMESTONE

SECTION I - MATERIAL IDENTIFICATION AND USE

Material Name/Identifier:	Limestone
Chemical Name:	Limestone
Chemical Family:	Carbonate Rock
Chemical Formula:	Complex mixture (naturally variable)
Trade Name and Synonyms:	Aglime, manufactured sand, aggregate, dolomite, crushed stone
Molecular Weight:	Not available
Material Use:	Construction, ready mix concrete, concrete products, asphalt, agriculture.

SECTION II - HAZARDOUS INGREDIENTS OF MATERIAL

Limestone:	A complex mixture (naturally variable composition of primarily Calcium and Magnesium Carbonates.
C.A.S., N.A., or U.N. Number:	1317 – 65 - 3
L.D.:	Not available
L.C.:	Not available

***Limestone may contain varying concentrations of Quartz (Crystalline Silica) C.A.S., N.A., or U.N. Number:** 14808-60-7

Note: This MSDS is applicable to limestone only when the Quartz concentration is greater than 0.1 (%) percent.

SECTION III - PHYSICAL DATA FOR MATERIAL

Physical State:	Solid
Odour and Appearance:	No odour; angular grey/brown/ white particles of varying sizes.
Odour Threshold (P.P.M.):	Not applicable
Specific Gravity:	2.6 – 2.8
Vapour Pressure (MM):	Not applicable
Vapour Density (Air=1):	Not applicable
Evaporation Rate:	0
Solubility in Water (20°C):	Negligible
Boiling Point (°C):	Not applicable
Freezing Point (°C):	Not applicable
pH:	Not applicable
Percentage Volatile (By volume):	0
Coefficient of Water/Oil Distribution:	Not applicable

SECTION IV - FIRE AND EXPLOSION HAZARD OF MATERIAL

Section not applicable

ST MARYS CBM

SECTION V - REACTIVITY DATA

Chemical Stability: Yes

Incompatibility to Other Substances: No

Reactivity and Under What Conditions: Neutralizing agent for strong acids.

Hazardous Decomposition Products: CO_2 may be released on contact with strong acids

SECTION VI - TOXICOLOGICAL PROPERTIES OF MATERIAL

Route of Entry: Inhalation

Effects of Acute to Material: Exposure to dust may irritate respiratory system.

Effects of Chronic Exposure to Material:

1. Chronic exposure to respirable limestone dust at levels exceeding exposure limits has caused pneumoconiosis.
2. Chronic exposure to respirable limestone dust at levels exceeding exposure limits has caused silicosis, a serious and progressive pneumoconiosis that can be disabling, and lead to death. Symptoms may appear at any time; even years after exposure has ceased. Symptoms of silicosis may include shortness of breath, difficulty in breathing, coughing, diminished work capacity, diminished chest expansion, reduction of lung volume and right heart enlargement and or failure. The only reliable method of detecting silicosis is through a chest X-ray. Silicosis may aggravate other chronic pulmonary conditions and may increase the risk of pulmonary tuberculosis infection. Smoking aggravates the effects of silica exposure.

L.D. of Material (Specify Species and Route): Not available

L.C. of Material (Specify Species and Route): Not available

Exposure Limites (Ontario):
1. Limestone (Total Dust) 10mg/metre^3 (TWAEV[1])
2. Respirable Silica Dust 0.2mg/metre^3 (TWAEV)

For additional informaiton on the above exposure limits, consult Ontario Regulations 654/86 and 769/83, amended 23/87.

Irritancy of Material: Respiratory system, eyes, skin.

Sensitization of Material: Not available

Synergisitc Material: None known

Carcinogenicity, Reproducitve Effects, Teratogenicity, Mutagenicity:

As date of preparation of this MSDS:

1. Limestone is not included on the ACGIH, NTP or OSHA lists of potential carcinogens.
2. Silica, in the form of crystalline Quartz, and as a component of this material, is listed as a potential carcingoen by IARC. **IARC (Intarnational Agency for Research on Cancer)** has determined that there is limited evidence of carcinogenicity to humans. Limited evidence of carcinogencity indicates that casual interpretation is credible, but alternate explanations such as chance, bias or confounding factors could not adequately be excluded. There is no evidence that limestone is a teratogen, a mutagen or has a reproductive effect.

SECTION VII - PREVENTATIVE MEASURES

Personal Protective Equipment: Respiratory protection should be used whenever dust is generated. Refer to the Ontario Regulation 769/83 as amended for respiratory equipment specified for various respirable silica dust levels.

Engineering Controls (Ventilation, Enclosed Process): Where feasible, dust levels should be reduced through wet suppression, dust collection, ventilation,

[1] Time Weighted Average Exposure Value

	process enclosure and enclosed pressurized employee work stations.
Leak and Soil Procedure:	Spilled materials, where dust can be generated, may expose clean up personnel to respirable dust. Wetting of spilled materials and/or use of protective respiratory equipment may be necessary.
Waste Disposal:	Re-use clean materials; dispose of waste materials only in accordance with applicable federal, provincial and local laws and regulations.
Handling Procedures and Equipment:	Respirable dust may be generated during processing, handling and storage-avoid inhalation. Refer to "Personal Protective Equipment-Respiratory".
Storage Requirements:	Not applicable
Special Shipping Information:	Not applicable

SECTION VIII - FIRST AID MEASURES

Dust in Eyes:	Flush out eyes with running water for 15 minutes. Contact a physician if irritation persists.
Dust on Skin:	Wash with soap and water. Contact a physician if irritation is aggravated.
Dust Inhalation:	Remove to fresh air. Dust in throat and nasal passage should clear spontaneously. Contact a physician if irritation persists.

SECTION IX - PREPARATION DATE OF MSDS

Prepared by:	
Manufacturer's Name:	**CBM Aggregates**
Address:	**55 Industrial Street**
Telephone:	**416-426-1300**
Date:	**July 2008**

SECTION X - LABEL INFORMATION

Labeling of bulk products is not required, however, label information is as follows:

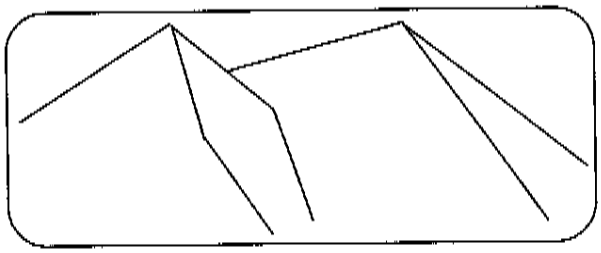
LIMESTONE

CAUTION
DUST INHALATION HAZARD

- Avoid inhalation of dust
- Wear appropriate personal protection equipment

Additional Notes or References: Physical irritation may result from handling limestone. Work gloves and work clothing are recommended.

The company believes that the information contained herein is factual. The data and information presented are without warranty, guarantee or liability on our part, and are presented to the customer for his own consideration, investigation, and verification.



Daanen & Janssen, Inc.

Serving Northeast Wisconsin for

1925 86 2011

years

Quotation # 8727 **Date:** 07/29/11

CUSTOMER: Orin Remediation **Phone** 608-838-6699
CONTACT: Tyler Emerson **Fax** 608-838-6695
PROJECT: Remediation Project
LOCATION: **Start**
CITY/TOWN: Kewaunee

QTY	MEAS	PRODUCT	SPEC	FACILITY	F.O.B	DELIVERED
	Tons	Crusher Dust		D&J		$10.25

* Requires Specification
Net 30 days with approved credit
Prices do not include sales tax
Quote # must accompany pickup

2000 Enterprise Dr. P.O. Box 176 DePere, Wi. 54115 (920)336-4149

AECOM

Report of Sieve Analysis of Aggregates

AECOM Project No.: 60194132

Client Project No.:

Architect / Engineer:

Project: Daanen & Janssen

Report of Test of: WDOT B.3.2 Backfill

Date: 6/13/2011

Report No.:

Contractor: Daanen & Janssen

Source: Chase Quarry

Sieve Size or No.	Weight Retained	% Retained	% Passing	Specifi-cations
3-Inch				
2-Inch				
1 1/4-Inch				
1-Inch	0	0	100	100
3/4-Inch				
1/2-Inch				
3/8-Inch	0	0	100	
No. 4	113	4.5	95.5	
No. 8				
No. 10	942	37.8	57.7	
No. 16				
No. 20				
No. 30				
No. 40	469	30.8	26.9	0-60
No. 50				
No. 80				
No. 100	204	8.2	18.7	
No. 200	112	4.5	14.2	0-15
Pan	353	14.2		
Fineness Modulus				

Received at Laboratory: 06/10/11

Quantity Represented: 2,493 grams

Submitted By: Pat Schrader

Sampled From: Stockpile

Identification: Crushed Stone

Date Sampled: 6/10/2011

Intended Use: Backfill

Remarks:

Organic matter, colorimetric:

Coal and Lignite:

Clay Lumps:

Chert:

Soft Particles:

Percent Absorption:

Specific Gravity:

Dry Rodded Weight:

Washed Gradation:

Percent Passing No. 200 Sieve: 14.2

Checked by:

Tested By: Robert J. Peeters

MATERIAL SAFETY DATA SHEET

1. Product and Company Identification

Material name SORBOND® UG

Version # 01

Revision date 22-January-2009

CAS # 1302-78-9

Synonym(s) SMECTITE CLAY

Manufacturer

CETCO Oilfield Services Company
Industrial Wastewater Products
2870 Forbs Avenue
Hoffman Estates, IL 60192 US
safetydata@amcol.com
http://www.cetcooilfieldservices.com/
General Information (800) 527-9948
Emergency (800) 424-9300

2. Hazards Identification

Emergency overview Material can be slippery when wet.

Potential health effects

Routes of exposure Inhalation. Eye contact.

Eyes Dust or powder may irritate eye tissue. Symptoms include itching, burning, redness and tearing.

Skin Non-irritating to the skin.

Inhalation Inhalation of dusts may cause respiratory irritation. Repeated or prolonged inhalation may cause toxic effects. For additional information on inhalation hazards, see Section 11 of this safety data sheet.

Ingestion No significant adverse effects are expected upon ingestion of the product.

Target organs Lungs.

Chronic effects This product has the potential for generation of respirable dust during handling and use. Dust may contain respirable crystalline silica. Overexposure to dust may result in pneumocononiosis, a respiratory disease caused by inhalation of mineral dust, which can lead to fibrotic changes to the lung tissue, or silicosis, a respiratory disease caused by inhalation of silica dust, which can lead to inflammation and fibrosis of the lung tissue.

3. Composition / Information on Ingredients

The manufacturer lists no ingredients as hazardous according to OSHA 29 CFR 1910.1200.

Composition comments Bentonite contains naturally occurring crystalline silica (not listed in Annex I of Directive 67/548/EEC) in quantities less than 6%. Occupational Exposure Limits for impurities are listed in Section 8.

4. First Aid Measures

First aid procedures

Eye contact Flush eyes immediately with large amounts of water. Get medical attention if irritation develops or persists.

Skin contact No special measures required. Get medical attention if irritation develops or persists.

Inhalation If symptoms are experienced, remove source of contamination or move victim to fresh air. If the affected person is not breathing, apply artificial respiration. If breathing is difficult, give oxygen. Call a physician if symptoms develop or persist.

Ingestion No special measures required. If ingestion of a large amount does occur, seek medical attention.

Notes to physician Provide general supportive measures and treat symptomatically.

General advice If you feel unwell, seek medical advice (show the label where possible).

5. Fire Fighting Measures

Flammable properties The product is not flammable. This material will not burn.

Extinguishing media

Suitable extinguishing media Dry chemical, CO2, water spray or regular foam. Use any media suitable for the surrounding fires.

Protection of firefighters

Protective equipment and precautions for firefighters Material can be slippery when wet.

Hazardous combustion products None known.

6. Accidental Release Measures

Personal precautions Material can be slippery when wet. Forms smooth, slippery surfaces on floors, posing an accident risk. Wear a dust mask if dust is generated above exposure limits.

Environmental precautions No special environmental precautions required.

Methods for containment None necessary.

Methods for cleaning up Avoid the generation of dusts during clean-up. Collect dust or particulates using a vacuum cleaner with a HEPA filter. Reduce airborne dust and prevent scattering by moistening with water.

7. Handling and Storage

Handling Keep formation of airborne dusts to a minimum. Provide appropriate exhaust ventilation at places where dust is formed. In case of insufficient ventilation, wear suitable respiratory equipment.

Material can be slippery when wet. Forms smooth, slippery surfaces on floors, posing an accident risk.

Storage Guard against dust accumulation of this material. No special storage conditions required. No special restrictions on storage with other products.

8. Exposure Controls / Personal Protection

Occupational exposure limits

ACGIH

Impurities	Type	Value	Form
INERT OR NUISANCE DUST (SEQ250)	TWA	10 mg/m3	Inhalable particles.
		3 mg/m3	Respirable particles.
QUARTZ (14808-60-7)	TWA	0.025 mg/m3	Respirable fraction.

U.S. - OSHA

Impurities	Type	Value	Form
INERT OR NUISANCE DUST (SEQ250)	PEL	15 mg/m3	Total dust.
		5 mg/m3	Respirable fraction.
	TWA	5 mg/m3	Respirable fraction.
		50 mppcf	Total dust.
		15 mppcf	Respirable fraction.
		15 mg/m3	Total dust.
QUARTZ (14808-60-7)	TWA	2.4 mppcf	Respirable.
		0.3 mg/m3	Total dust.
		0.1 mg/m3	Respirable.
		0.1 mg/m3	Respirable dust.

Exposure guidelines Occupational exposure to nuisance dust (total and respirable) and respirable crystalline silica should be monitored and controlled.

Engineering controls If material is ground, cut, or used in any operation which may generate dusts, use appropriate local exhaust ventilation to keep exposures below the recommended exposure limits. If engineering measures are not sufficient to maintain concentrations of dust particulates below the OEL, suitable respiratory protection must be worn.

Personal protective equipment

Eye / face protection Wear dust goggles.

Skin protection No special protective equipment required.

Respiratory protection	Use a particulate filter respirator for particulate concentrations exceeding the Occupational Exposure Limit.
General hygeine considerations	Eye wash fountain is recommended. Use good industrial hygiene practices in handling this material.

9. Physical & Chemical Properties

Appearance	Not available.
Color	Various.
Odor	None.
Odor threshold	Not available.
Physical state	Solid.
Form	Various.
pH	8 - 11
Melting point	Not available.
Freezing point	Not available.
Boiling point	Not available.
Flash point	Non-flammable
Evaporation rate	Not available.
Flammability	Not available.
Flammability limits in air, upper, % by volume	Non-explosive
Flammability limits in air, lower, % by volume	Non-explosive
Vapor pressure	Not available.
Vapor density	Not available.
Specific gravity	Not available.
Relative density	Not available.
Solubility (water)	Negligible
Partition coefficient (n-octanol/water)	Not available.
Auto-ignition temperature	Not available.
Decomposition temperature	Not available.
VOC	0 % estimated
Percent volatile	0 % estimated
Molecular formula	UNKNOWN

10. Chemical Stability & Reactivity Information

Chemical stability	Stable at normal conditions.
Conditions to avoid	None known.
Incompatible materials	None known.
Hazardous decomposition products	None known.
Possibility of hazardous reactions	Will not occur.

11. Toxicological Information

Acute effects	Mild irritant to eyes (according to the modified Kay & Calandra criteria).

Chronic effects

In 1997, IARC (the International Agency for Research on Cancer) concluded that crystalline silica inhaled from occupational sources can cause lung cancer in humans. However in making the overall evaluation, IARC noted that "carcinogenicity was not detected in all industrial circumstances studied. Carcinogenicity may be dependent on inherent characteristics of the crystalline silica or on external factors affecting its biological activity or distribution of its polymorphs." (IARC Monographs on the evaluation of the carcinogenic risks of chemicals to humans, Silica, silicates dust and organic fibres, 1997, Vol. 68, IARC, Lyon, France.)

In June 2003, SCOEL (the EU Scientific Committee on Occupational Exposure Limits) concluded that the main effect in humans of the inhalation of respirable crystalline silica dust is silicosis. "There is sufficient information to conclude that the relative risk of lung cancer is increased in persons with silicosis (and, apparently, not in employees without silicosis exposed to silica dust in quarries and in the ceramic industry). Therefore, preventing the onset of silicosis will also reduce the cancer risk..." (SCOEL SUM Doc 94-final, June 2003)

According to the current state of the art, worker protection against silicosis can be consistently assured by respecting the existing regulatory occupational exposure limits. Occupational exposure to nuisance dust (total and respirable) and respirable crystalline silica should be monitored and controlled.

Carcinogenicity

IARC Monographs on Occupational Exposures to Chemical Agents: Overall evaluation

QUARTZ (14808-60-7) 1 Human carcinogen.

US ACGIH Threshold Limit Values: A2 carcinogen

QUARTZ (14808-60-7) Group A2 Suspected human carcinogen.

US NTP Report on Carcinogens: Known carcinogen

QUARTZ (14808-60-7) Known carcinogen.

12. Ecological Information

Ecotoxicological data

Product	Test Results
SORBOND® UG (1302-78-9)	LC50 Fish: 19000 mg/l 96.00 Hours estimated

* Estimates for product may be based on additional component data not shown.

Ecotoxicity This material is not expected to be harmful to aquatic life.

Environmental effects Based on the physical properties of this product, significant environmental persistence and bioaccumulation would not be expected.

Persistence and degradability Not available.

13. Disposal Considerations

Disposal instructions Dispose in accordance with all applicable regulations. Material should be recycled if possible.

14. Transport Information

DOT

Not regulated as dangerous goods.

IATA

Not regulated as dangerous goods.

IMDG

Not regulated as dangerous goods.

15. Regulatory Information

US federal regulations OSHA Process Safety Standard: This material is not known to be hazardous by the OSHA Highly Hazardous Process Safety Standard, 29 CFR 1910.119.

CERCLA (Superfund) reportable quantity

None

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories	Immediate Hazard - No Delayed Hazard - Yes Fire Hazard - No Pressure Hazard - No Reactivity Hazard - No
Section 302 extremely hazardous substance	No
Section 311 hazardous chemical	Yes

Food and Drug Administration (FDA)

Total food additive
Direct food additive
GRAS food additive

Inventory status

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of New and Existing Chemicals (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	No
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)

State regulations

WARNING: This product contains a chemical known to the State of California to cause cancer.

US - California Proposition 65 - Carcinogens & Reproductive Toxicity (CRT): Listed substance

QUARTZ (14808-60-7) Listed.

US - California Proposition 65 - CRT: Listed date/Carcinogenic substance

QUARTZ (14808-60-7) Listed: October 1, 1988 Carcinogenic.

US - Pennsylvania RTK - Hazardous Substances: Listed substance

QUARTZ (14808-60-7) Listed.

16. Other Information

Further information

This safety datasheet only contains information relating to safety and does not replace any product information or product specification.

Recommended restrictions

Workers (and your customers or users in the case of resale) should be informed of the potential presence of respirable dust and respirable crystalline silica as well as their potential hazards. Appropriate training in the proper use and handling of this material should be provided as required under applicable regulations.

HMIS ratings

NFPA ratings

Health: 1
Flammability: 0
Instability: 0

Disclaimer	The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The manufacturer expressly does not make any representations, warranties, or guarantees as to its accuracy, reliability or completeness nor assumes any liability, for its use. It is the user's responsibility to verify the suitability and completeness of such information for each particular use. Third party materials: Insofar as materials not manufactured or supplied by this manufacturer are used in conjunction with, or instead of this product, it is the responsibility of the customer to obtain, from the manufacturer or supplier, all technical data and other properties relating to these and other materials and to obtain all necessary information relating to them. No liability can be accepted in respect of the use of this product in conjunction with materials from another supplier. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.
Issue date	22-January-2009
Other information	CETCO is an AMCOL International company.

CETCO® WASTEWATER GROUP
800.527.9948 www.cetco.com

Technical Data

Sorbond® UG

Sorbond UG is a granular, clay based stabilization media used for the fixation of free liquids in sludge. **Sorbond UG** is made from a non-biodegradable mineral that is designed for use on waste that fails the Paint Filter Liquids Test (PFT).

Color: Beige

Toxicity Analysis:

	EPA Standard ppm	Typical 2001 ppm
Arsenic	5.0	0.005
Barium	100.0	0.4
Cadmium	1.0	0.005
Chromium	5.0	0.005
Lead	5.0	0.05
Mercury	0.2	0.02
Selenium	1.0	0.02
Silver	5.0	0.005

pH (5% dispersion)**:** 9.0 - 11.0

Moisture Content: 6 - 9 %

Particle Size:

U.S. Std. Sieve Size	% Retained
30 mesh	60.3
50 mesh	30.1
70 mesh	3.5
100 mesh	1.5
200 mesh	2.1
- 200 mesh	2.5

Bulk Density (lbs/ft^3)**:** 70 ± 2

Specific Gravity: 2.5 ± 0.5

Sorbond UG Benefits

- Absorbs 7.5 times its own weight in water.
- Sets up in 24—72 hours.
- Helps waste pass Toxicity Characteristic Leach Procedure (EPA Method 3015).
- Minimal humidity effects.

1500 West Shure Drive, Arlington Heights, Illinois 60004 USA | +1.800.527.9948 | tel: 847.392.5800 | fax: +1.847.506.6150

Appendix B
Photographs

Photographic Log

Client Name:	Site Location:	Project No.:
Wisconsin Department of Natural Resources	Kewaunee Marsh Arsenic Hot Spot Kewaunee, Wisconsin	186467.0000.0000

Photo No.	Date
1	10/4/2011

Description
Temporary fence and signs constructed to limit access to the site during construction.

Photo No.	Date
2	10/4/2011

Description
Project identification sign. Note that WDNR requested that the title of project be changed from Kewaunee Marsh Arsenic Spill to Kewaunee Marsh Historic Arsenic Spill Clean-up.

Photographic Log

Client Name:	Site Location:	Project No.:
Wisconsin Department of Natural Resources	Kewaunee Marsh Arsenic Hot Spot Kewaunee, Wisconsin	186467.0000.0000

Photo No.	Date
3	10/4/2011

Description
Looking north at the access road constructed between the trail and River Road on Maynard Kuehl's property.

Photo No.	Date
4	10/4/2011

Description
Chain link fence is removed beginning at the gate. Fence is rolled up and stored on trail. Project information sign is left in place.

Photographic Log

Client Name:	Site Location:	Project No.:
Wisconsin Department of Natural Resources	Kewaunee Marsh Arsenic Hot Spot Kewaunee, Wisconsin	186467.0000.0000

Photo No.	Date
5	10/4/2011

Description
Looking south at the field trailer and clean water supply tank staging area. The salvaged chain link fence and drums of 50% hydrogen peroxide solution also visible.

Photo No.	Date
6	10/4/2011

Description
Veolia constructs access ramp in the capped area of the marsh from crushed limestone. The limestone material is later incorporated into the treatment area.

Photographic Log

Client Name:	Site Location:	Project No.:
Wisconsin Department of Natural Resources	Kewaunee Marsh Arsenic Hot Spot Kewaunee, Wisconsin	186467.0000.0000

Photo No.	Date
7	10/5/2011

Description
Silt fence constructed around treatment area.

Photo No.	Date
8	10/5/2011

Description
Off-loading the 1.1-ton super sacks of ferric sulfate. Bentonite and ferric sulfate are stored on the capped area of the marsh. Bentonite also in super sacks and covered with black tarp to keep dry.

Photographic Log

Client Name:	Site Location:	Project No.:
Wisconsin Department of Natural Resources	Kewaunee Marsh Arsenic Hot Spot Kewaunee, Wisconsin	186467.0000.0000

Photo No.	Date
9	10/5/2011

Description
Start of excavation for Cell #1.

Photo No.	Date
10	10/5/2011

Description
Bottom of excavation in Cell #1. Water temporarily stays out of excavation and walls hold up without sloughing. The clay silt layer target as the base of the excavation is visible.

Photographic Log

Client Name:	Site Location:	Project No.:
Wisconsin Department of Natural Resources	Kewaunee Marsh Arsenic Hot Spot Kewaunee, Wisconsin	186467.0000.0000

Photo No.	Date
11	10/5/2011

Description
Spraying hydrogen peroxide solution onto soil as it is excavated.

Photo No.	Date
12	10/5/2011

Description
Placement of ferric sulfate onto the top of the lower lift of soil treated with hydrogen peroxide solution. One 2,204 lb (1.1 ton) super sack of ferric sulfate per 50 cy (one lift) meets the specified dosage.

Photographic Log

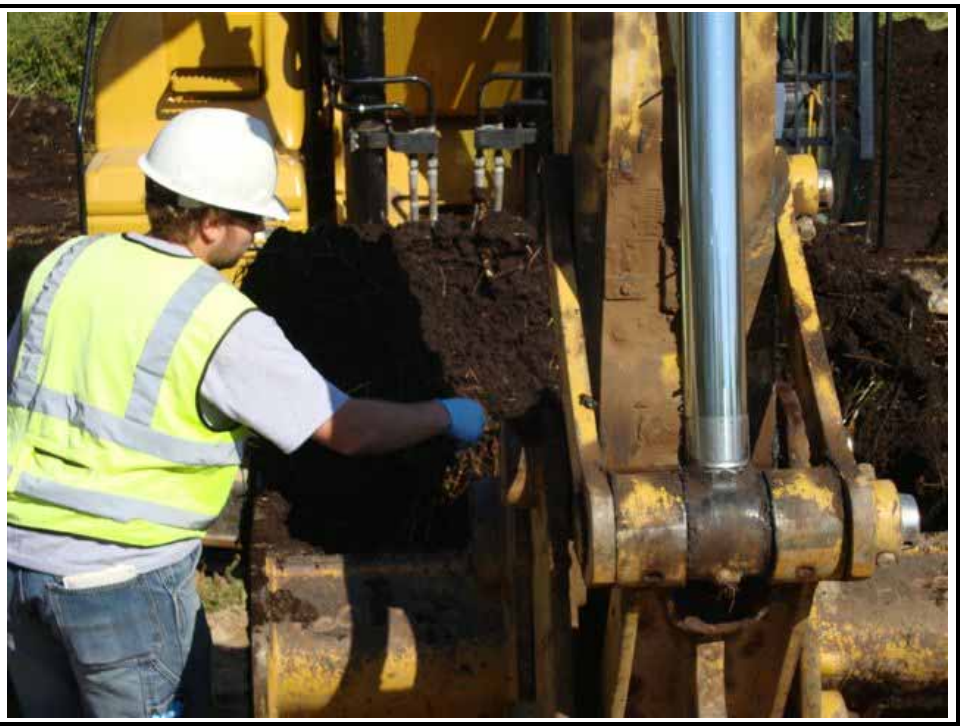
Client Name:	Site Location:	Project No.:
Wisconsin Department of Natural Resources	Kewaunee Marsh Arsenic Hot Spot Kewaunee, Wisconsin	186467.0000.0000

Photo No.	Date
13	10/5/2011

Description
Mixing ferric sulfate into the lower lift using a backhoe bucket.

Photo No.	Date
14	10/5/2011

Description
TRC collecting a performance verification sample from Cell #1 following mixing of hydrogen peroxide solution, ferric sulfate, and limestone.



Photographic Log

Client Name:	Site Location:	Project No.:
Wisconsin Department of Natural Resources	Kewaunee Marsh Arsenic Hot Spot Kewaunee, Wisconsin	186467.0000.0000

Photo No.	Date
15	10/5/2011

Description
Cell #1 visible in foreground as complete. Cell #2 started in background. The stockpile of soil is that excavated from Cell #2 and to be placed back into excavation in two 50 cy lifts.

Photo No.	Date
16	10/5/2011

Description
Health and safety and contamination reduction achieved. Example shown here of boot storage area kept in the contamination reduction zone.

Photographic Log

Client Name:	Site Location:	Project No.:
Wisconsin Department of Natural Resources	Kewaunee Marsh Arsenic Hot Spot Kewaunee, Wisconsin	186467.0000.0000

Photo No.	Date
17	10/10/2011

Description
Pieces of Styrofoam in cap excavated during treatment, then buried in bottom of cell excavation.

Photo No.	Date
18	10/10/2011

Description
Hydrogen peroxide solution applied to soil excavated from Cell #5.

Photographic Log

Client Name:	Site Location:	Project No.:
Wisconsin Department of Natural Resources	Kewaunee Marsh Arsenic Hot Spot Kewaunee, Wisconsin	186467.0000.0000

Photo No.	Date
19	10/10/2011

Description
Bentonite applied to lower lift of Cell #5.

Photo No.	Date
20	10/11/2011

Description
Bentonite applied to upper lift of Cell #1.

Photographic Log

Client Name:	Site Location:	Project No.:
Wisconsin Department of Natural Resources	Kewaunee Marsh Arsenic Hot Spot Kewaunee, Wisconsin	186467.0000.0000

Photo No.	Date
21	10/11/2011

Description
Delivery of topsoil to the site for placement over disturbed areas in the marsh.

Photo No.	Date
22	10/11/2011

Description
Placement of topsoil to restore disturbed areas in the marsh following in situ mixing.

Photographic Log

Client Name:	Site Location:	Project No.:
Wisconsin Department of Natural Resources	Kewaunee Marsh Arsenic Hot Spot Kewaunee, Wisconsin	186467.0000.0000

Photo No.	Date
23	10/12/2011

Description
Completing in situ treatment in Cell #14, which is one of two cells added to meet the target treatment volume of sediment. Additional cells added because minimal sloughing occurred in the marsh sediment excavations.

Photo No.	Date
24	10/12/2011

Description
Topsoil placed and raked on disturbed areas of the marsh as part of the site restoration.

Photographic Log

Client Name:	Site Location:	Project No.:
Wisconsin Department of Natural Resources	Kewaunee Marsh Arsenic Hot Spot Kewaunee, Wisconsin	186467.0000.0000

Photo No.	Date
25	10/17/2011

Description
Clean ballast placed on plastic sheeting within treated marsh area.

Photo No.	Date
26	10/17/2011

Description
Hydrogen peroxide solution applied to peat and ballast excavated from Cell #19.

Photographic Log

Client Name:	Site Location:	Project No.:
Wisconsin Department of Natural Resources	Kewaunee Marsh Arsenic Hot Spot Kewaunee, Wisconsin	186467.0000.0000

Photo No.	Date
27	10/17/2011

Description
Pre-packed screen for well MW11-3.

Photo No.	Date
28	10/17/2011

Description
Installation of well MW11-2.

Photographic Log

Client Name:	Site Location:	Project No.:
Wisconsin Department of Natural Resources	Kewaunee Marsh Arsenic Hot Spot Kewaunee, Wisconsin	186467.0000.0000

Photo No.	Date
29	10/17/2011

Description
Observation of bulking of material that occurred in the ballast (Cell #21).

Photo No.	Date
30	10/17/2011

Description
Hydrogen peroxide solution applied to peat and ballast excavated from Cell #22.

Photographic Log

Client Name:	Site Location:	Project No.:
Wisconsin Department of Natural Resources	Kewaunee Marsh Arsenic Hot Spot Kewaunee, Wisconsin	186467.0000.0000

Photo No.	Date
31	10/18/2011

Description
Select aggregate fill to be placed over the treated ballast to provide stable base course for compaction of material during restoration of the trail.

Photo No.	Date
32	10/18/2011

Description
Observation of off-gassing within samples collected from treated sediment in Cell #22. Peat material is shown on the left, and ballast material is shown on the right. The difference in the amount of gas, is a result of the peat having a stronger buffering capacity than the ballast sand.

Photographic Log

Client Name:	Site Location:	Project No.:
Wisconsin Department of Natural Resources	Kewaunee Marsh Arsenic Hot Spot Kewaunee, Wisconsin	186467.0000.0000

Photo No.	Date
33	10/19/2011

Description
Compaction of clean sand along the trail.

Photo No.	Date
34	10/19/2011

Description
Compaction of limestone screenings delivered to site and placed on top of clean ballast as part of the restoration of the trail.

Photographic Log

Client Name:	Site Location:	Project No.:
Wisconsin Department of Natural Resources	Kewaunee Marsh Arsenic Hot Spot Kewaunee, Wisconsin	186467.0000.0000

Photo No.	Date
35	10/20/2011

Description
Decontamination of the backhoe at the end of the in situ mixing.

Photo No.	Date
36	10/20/2011

Description
Spreading of mulch and seed over the disturbed areas in the marsh as part of the site restoration.

Photographic Log

Client Name:	Site Location:	Project No.:
Wisconsin Department of Natural Resources	Kewaunee Marsh Arsenic Hot Spot Kewaunee, Wisconsin	186467.0000.0000

Photo No.	Date
37	10/20/2011

Description
Placement of erosion control and revegetation mat along the sideslope of the trail during site restoration.

Photo No.	Date
38	10/24/2011

Description
Looking northwest at treatment area on trail, following restoration.

Photographic Log

Client Name:	Site Location:	Project No.:
Wisconsin Department of Natural Resources	Kewaunee Marsh Arsenic Hot Spot Kewaunee, Wisconsin	186467.0000.0000

Photo No.	Date
39	10/24/2011

Description
Close up view of the sideslope with erosion control mat and fence reconstruction along the trail.

Photo No.	Date
40	10/24/2011

Description
Final condition of marsh following restoration, including three monitoring wells.

Photographic Log

Client Name:	Site Location:	Project No.:
Wisconsin Department of Natural Resources	Kewaunee Marsh Arsenic Hot Spot Kewaunee, Wisconsin	186467.0000.0000

Photo No.	Date
41	10/24/2011

Description
Final condition of the sign, fence, and trail following restoration.

Photo No.	Date
42	10/24/2011

Description
Final condition of the access road and gate on Maynard Kuehl's property at the completion of the project. Access road and gate were left in place per the agreement made with Maynard Kuehl.

Photographic Log

Client Name:	Site Location:	Project No.:
Wisconsin Department of Natural Resources	Kewaunee Marsh Arsenic Hot Spot Kewaunee, Wisconsin	186467.0000.0000

Photo No.	Date
43	10/24/2011

Description
One drum of hazardous waste generated during the in-situ remediation. Drum was removed and disposed by Veolia.

Appendix C
Well Abandonment and Well Construction Forms

State of Wis., Dept. of Natural Resources
dnr.wi.gov

Well / Drillhole / Borehole Filling & Sealing

Form 3300-005 (R 4/08)

Notice: Completion of this report is required by chs. 160, 281, 283, 289, 291-293, 295, and 299, Wis. Stats., and ch. NR 141, Wis. Adm. Code. In accordance with chs. 281, 289, 291-293, 295, and 299, Wis. Stats., failure to file this form may result in a forfeiture of between $10-25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on this form is not intended to be used for any other purpose. Return form to the appropriate DNR office and bureau. See instructions on reverse for more information.

☐ **Verification Only of Fill and Seal**

Route to: ☐ Drinking Water ☐ Watershed/Wastewater ☒ Remediation/Redevelopment ☐ Waste Management ☐ Other:

1. Well Location Information

County	WI Unique Well # of Removed Well	Hicap #
Kewaunee	PA262	

Latitude / Longitude (Degrees and Minutes) — Method Code (see instructions)

State Plane 243,994 'N
2,616,469 'E

¼ ¼	¼	Section	Township	Range
SW	SW	7	23 N	25 ☒ E ☐ W

or Gov't Lot #

Well Street Address

Well City, Village or Town	Well ZIP Code
Kewaunee	54216

Subdivision Name	Lot #

Reason For Removal From Service: Located in In-Situ treatment area

WI Unique Well # of Replacement Well:

2. Facility / Owner Information

Facility Name: Kewaunee Marsh Arsenic Area

Facility ID (FID or PWS):

License/Permit/Monitoring #:

Original Well Owner: Wisconsin Dept. of Natural Resources

Present Well Owner: WDNR

Mailing Address of Present Owner:

City of Present Owner	State	ZIP Code

3. Well / Drillhole / Borehole Information

☒ Monitoring Well ☐ Water Well ☐ Borehole / Drillhole

Original Construction Date (mm/dd/yyyy): 04/14/2004

If a Well Construction Report is available, please attach.

Construction Type:
☒ Drilled ☐ Driven (Sandpoint) ☐ Dug ☐ Other (specify):

Formation Type:
☒ Unconsolidated Formation ☐ Bedrock

Total Well Depth From Ground Surface (ft.)	Casing Diameter (in.)
7.0	4.0
Lower Drillhole Diameter (in.)	**Casing Depth (ft.)**
6.0	4.0

Was well annular space grouted? ☐ Yes ☒ No ☐ Unknown

If yes, to what depth (feet)?

Depth to Water (feet): 8.31 (6.31 bgs)

4. Pump, Liner, Screen, Casing & Sealing Material

Pump and piping removed?	☐ Yes	☐ No	☒ N/A
Liner(s) removed?	☒ Yes	☐ No	☐ N/A
Screen removed?	☒ Yes	☐ No	☐ N/A
Casing left in place?	☐ Yes	☒ No	☐ N/A
Was casing cut off below surface?	☐ Yes	☐ No	☒ N/A
Did sealing material rise to surface?	☐ Yes	☐ No	☒ N/A
Did material settle after 24 hours?	☐ Yes	☐ No	☒ N/A
If yes, was hole retopped?	☐ Yes	☐ No	☒ N/A
If bentonite chips were used, were they hydrated with water from a known safe source?	☐ Yes	☐ No	☒ N/A

Required Method of Placing Sealing Material
☐ Conductor Pipe-Gravity ☐ Conductor Pipe-Pumped
☐ Screened & Poured (Bentonite Chips) ☒ Other (Explain): Well pulled out w/ backhoe. Area mixed for In-Situ treatment.

Sealing Materials
☐ Neat Cement Grout ☐ Clay-Sand Slurry (11 lb./gal. wt.)
☐ Sand-Cement (Concrete) Grout ☐ Bentonite-Sand Slurry " "
☐ Concrete ☐ Bentonite Chips

For Monitoring Wells and Monitoring Well Boreholes Only:
☐ Bentonite Chips ☐ Bentonite - Cement Grout
☐ Granular Bentonite ☐ Bentonite - Sand Slurry

5. Material Used To Fill Well / Drillhole

	From (ft.)	To (ft.)	No. Yards, Sacks Sealant or Volume (circle one)	Mix Ratio or Mud Weight
Well pulled out w/ backhoe. Area then mixed w/ chemicals for In-Situ treatment. No filling/sealing required.	Surface	7' bgs	NA	NA

6. Comments

7. Supervision of Work

Name of Person or Firm Doing Filling & Sealing	License #	Date of Filling & Sealing (mm/dd/yyyy)
ORIN Remediation		10/05/11

Street or Route: 4908 Meinders Rd.

Telephone Number: ( )

City	State	ZIP Code	Signature of Person Doing Work	Date Signed
McFarland	WI	53558	Seth Beckes	8-19-11

DNR Use Only

Date Received: Noted By:

Comments:

State of Wisconsin
Department of Natural Resources

Route To: Watershed/Wastewater ☐ Waste Management ☐ Remediation/Redevelopment ☒ Other ☐

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 7-98

Facility/Project Name: Kewaunee Marsh	Local Grid Location of Well: ____ ft. ☐ N. ☐ S. ____ ft. ☐ E. ☐ W.	Well Name: MW11-1
Facility License, Permit or Monitoring No.	Local Grid Origin ☐ (estimated: ☐) or Well Location ☒ Lat. ° ' " Long. ° ' " or St. Plane 243,999 ft. N, 2,616,484 ft. E. S/©/N	Wis. Unique Well No.: PA266 / DNR Well Number:
Facility ID		Date Well Installed: 10/18/2011
Type of Well: Well Code 71/dw	Section Location of Waste/Source: ____ 1/4 of ____ 1/4 of Sec. ____, T. ____ N, R. ____ ☐ E ☐ W	Well Installed By: (Person's Name and Firm): Tony Kapugi
Distance from Waste/Source ____ ft. / Enf. Stds. Apply ☐	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known / Gov. Lot Number:	On-Site Environmental Services

A. Protective pipe, top elevation ____ ft. MSL
B. Well casing, top elevation 586.34 ft. MSL
C. Land surface elevation 583.8 ft. MSL
D. Surface seal, bottom 580.1 ft. MSL or 3.8 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

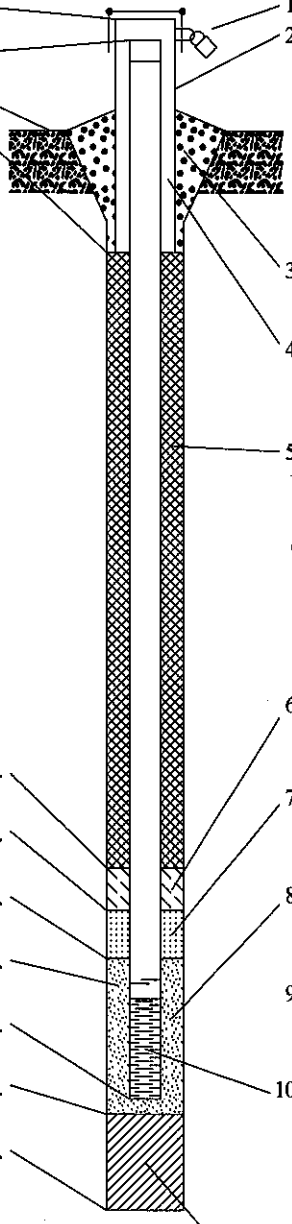
14. Drilling method used: Rotary ☐ 5 0 / Hollow Stem Auger ☒ 4 1 / ____ Other ☐

15. Drilling fluid used: Water ☐ 0 2 / Air ☐ 0 1 / Drilling Mud ☐ 0 3 / None ☒ 9 9

16. Drilling additives used? ☐ Yes ☒ No
Describe ____

17. Source of water (attach analysis, if required):
____

E. Bentonite seal, top 583.8 ft. MSL or 0.0 ft.
F. Fine sand, top 580.1 ft. MSL or 3.8 ft.
G. Filter pack, top 579.8 ft. MSL or 4.0 ft.
H. Screen joint, top 579.3 ft. MSL or 4.5 ft.
I. Well bottom 576.6 ft. MSL or 7.2 ft.
J. Filter pack, bottom 576.3 ft. MSL or 7.5 ft.
K. Borehole, bottom 576.3 ft. MSL or 7.5 ft.
L. Borehole, diameter 8.3 in.
M. O.D. well casing 2.38 in.
N. I.D. well casing 2.03 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 5.0 ft.
c. Material: Steel ☒ 0 4 / ____ Other ☐
d. Additional protection? ☐ Yes ☒ No
If yes, describe: ____
3. Surface seal: Bentonite ☒ 3 0 / Concrete ☐ 0 1 / ____ Other ☐
4. Material between well casing and protective pipe: Bentonite ☒ 3 0 / ____ Other ☐
5. Annular space seal: a. Granular/Chipped Bentonite ☒ 3 3
b. ____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐ 3 5
c. ____ Lbs/gal mud weight . . . Bentonite slurry ☐ 3 1
d. ____ % Bentonite . . . Bentonite-cement grout ☐ 5 0
e. 1.1 Ft^3 volume added for any of the above
f. How installed: Tremie ☐ 0 1 / Tremie pumped ☐ 0 2 / Gravity ☒ 0 8
6. Bentonite seal: a. Bentonite granules ☐ 3 3
b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite chips ☒ 3 2
c. ____ Other ☐
7. Fine sand material: Manufacturer, product name & mesh size
a. Sidley Ohio #4000
b. Volume added 0.2 ft^3
8. Filter pack material: Manufacturer, product name & mesh size
a. Sidley Ohio #5
b. Volume added 1.2 ft^3
9. Well casing: Flush threaded PVC schedule 40 ☒ 2 3 / Flush threaded PVC schedule 80 ☐ 2 4 / ____ Other ☐
10. Screen material: PVC
a. Screen Type: Factory cut ☐ 1 1 / Continuous slot ☒ 0 1 / ____ Other ☐
b. Manufacturer Monoflex/Geoprove
c. Slot size: 0.010 in.
d. Slotted length: 2.7 ft.
11. Backfill material (below filter pack): None ☒ 1 4 / ____ Other ☐

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: Mark Tuttle | Firm: TRC Environmental Corporation, 708 Heartland Trail Madison WI 53717 | Tel: 608.826.3600 Fax: 608.826.3941

Please complete both Forms 4400-113A and 4400-113B and return them to the appropriate DNR office and bureau. Completion of these reports is required by chs. 160, 281, 283, 289, 291, 292, 293, 295, and 299, Wis. Stats., and ch. NR 141, Wis. Adm. Code. In accordance with chs. 281, 289, 291, 292, 293, 295, and 299, Wis. Stats., failure to file these forms may result in a forfeiture of between $10 and $25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on these forms is not intended to be used for any other purpose. NOTE: See the instructions for more information, including where the completed forms should be sent.

WDNR WELL CONSTR 1998 KEWAUNEE MARSH.GPJ WI DNR 2003.GDT 12/16/11

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT

Form 4400-113B Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☒ Other ☐

Facility/Project Name	County	Well Name
Kewaunee Marsh	Kewaunee	MW11-1

Facility License, Permit or Monitoring Number	County Code	Wis. Unique Well Number	DNR Well Number
	31	PA266	

1. Can this well be purged dry? ☒ Yes ☐ No

2. Well development method:

surged with bailer and bailed	☐	41
surged with bailer and pumped	☐	61
surged with block and bailed	☐	42
surged with block and pumped	☐	62
surged with block, bailed, and pumped	☐	70
compressed air	☐	20
bailed only	☒	10
pumped only	☐	51
pumped slowly	☐	50
other _____	☐	

3. Time spent developing well 15 min.

4. Depth of well (from top of well casing) 10.0 ft.

5. Inside diameter of well 2.03 in.

6. Volume of water in filter pack and well casing 1.3 gal.

7. Volume of water removed from well 3.0 gal.

8. Volume of water added (if any) 0.0 gal.

9. Source of water added _____

10. Analysis performed on water added? ☐ Yes ☐ No
(If yes, attach results)

	Before Development	After Development
11. Depth to Water (from top of well casing) a.	2.15 ft.	ft.
Date b.	10/20/2011	10/20/2011
Time c.	02:50 ☐ a.m. ☒ p.m.	03:05 ☐ a.m. ☒ p.m.
12. Sediment in well bottom	0.0 inches	0.0 inches
13. Water clarity	Clear ☐ 10 Turbid ☒ 15 (Describe)	Clear ☐ 20 Turbid ☒ 25 (Describe)
	Moderate turbidity, Slight orange/yellow	Slightly turbid, slight light brown color
14. Total suspended solids	mg/l	mg/l
15. COD	mg/l	mg/l

Fill in if drilling fluids were used and well is at solid waste facility:

16. Well developed by: Person's Name and Firm
Mark Walter
TRC Environmental

17. Additional comments on development:

Facility Address or Owner/Responsible Party Address
Name: Annette Weissbach
Firm: WDNR
Street: 2984 Shawano Avenue
City/State/Zip: Green Bay, WI 54313

I hereby certify that the above information is true and correct to the best of my knowledge.
Signature: [signature]
Print Name: Mark Walter
Firm: TRC Environmental

NOTE: See instructions for more information including a list of county codes and well type codes.

WDNR WELL DEVELOP 1998 KEWAUNEE MARSH.GPJ WI DNR 2003.GDT 12/16/11

State of Wisconsin
Department of Natural Resources

Route To: Watershed/Wastewater ☐ Waste Management ☐ Remediation/Redevelopment ☒ Other ☐

MONITORING WELL CONSTRUCTION

Form 4400-113A Rev. 7-98

Facility/Project Name: Kewaunee Marsh	Local Grid Location of Well: ____ ft. ☐N. ☐S. ____ ft. ☐E. ☐W.	Well Name: MW11-1i
Facility License, Permit or Monitoring No.	Local Grid Origin ☐ (estimated: ☐) or Well Location ☒ Lat. ° ' " Long. ° ' " or	Wis. Unique Well No.: PA267 / DNR Well Number:
Facility ID	St. Plane 243,998 ft. N, 2,616,486 ft. E. S/©/N	Date Well Installed: 10/18/2011
Type of Well: Well Code 71/dw	Section Location of Waste/Source: ____1/4 of ____ 1/4 of Sec. ____, T. ____ N, R. ____ ☐E ☐W	Well Installed By: (Person's Name and Firm): Tony Kapugi
Distance from Waste/Source ft. / Enf. Stds. Apply ☐	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known	Gov. Lot Number: / On-Site Environmental Services

A. Protective pipe, top elevation ____ ft. MSL

B. Well casing, top elevation 586.24 ft. MSL

C. Land surface elevation 583.7 ft. MSL

D. Surface seal, bottom 574.7 ft. MSL or 9.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

14. Drilling method used: Rotary ☐ 5 0
Hollow Stem Auger ☒ 4 1
____ Other ☐

15. Drilling fluid used: Water ☐ 0 2 Air ☐ 0 1
Drilling Mud ☐ 0 3 None ☒ 9 9

16. Drilling additives used? ☐ Yes ☒ No

Describe ____

17. Source of water (attach analysis, if required):

E. Bentonite seal, top 583.7 ft. MSL or 0.0 ft.

F. Fine sand, top 574.7 ft. MSL or 9.0 ft.

G. Filter pack, top 574.2 ft. MSL or 9.5 ft.

H. Screen joint, top 573.7 ft. MSL or 10.0 ft.

I. Well bottom 571.2 ft. MSL or 12.5 ft.

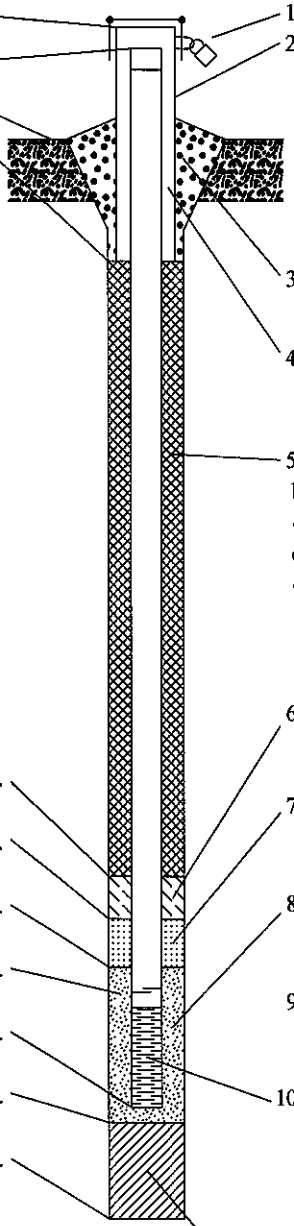
J. Filter pack, bottom 571.2 ft. MSL or 12.5 ft.

K. Borehole, bottom 576.2 ft. MSL or 7.5 ft.

L. Borehole, diameter 8.3 in.

M. O.D. well casing 2.38 in.

N. I.D. well casing 2.03 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 5.0 ft.
c. Material: Steel ☒ 0 4
____ Other ☐
d. Additional protection? ☐ Yes ☒ No
If yes, describe: ____
3. Surface seal: Bentonite ☒ 3 0
Concrete ☐ 0 1
____ Other ☐
4. Material between well casing and protective pipe:
Bentonite ☒ 3 0
____ Other ☐
5. Annular space seal: a. Granular/Chipped Bentonite ☒ 3 3
b. ____Lbs/gal mud weight . . . Bentonite-sand slurry ☐ 3 5
c. ____Lbs/gal mud weight . . . Bentonite slurry ☐ 3 1
d. ____% Bentonite . . . Bentonite-cement grout ☐ 5 0
e. 2.5 Ft³ volume added for any of the above
f. How installed: Tremie ☐ 0 1
Tremie pumped ☐ 0 2
Gravity ☒ 0 8
6. Bentonite seal: a. Bentonite granules ☐ 3 3
b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite chips ☒ 3 2
c. ____ Other ☐
7. Fine sand material: Manufacturer, product name & mesh size
a. Sidley Ohio #4000
b. Volume added 0.2 ft³
8. Filter pack material: Manufacturer, product name & mesh size
a. Sidley Ohio #5
b. Volume added 1.2 ft³
9. Well casing: Flush threaded PVC schedule 40 ☒ 2 3
Flush threaded PVC schedule 80 ☐ 2 4
____ Other ☐
10. Screen material: PVC
a. Screen Type: Factory cut ☐ 1 1
Continuous slot ☒ 0 1
____ Other ☐
b. Manufacturer Monoflex/Geoprove
c. Slot size: 0.010 in.
d. Slotted length: 2.5 ft.
11. Backfill material (below filter pack): None ☒ 1 4
____ Other ☐

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: ____ Firm: TRC Environmental Corporation, 708 Heartland Trail Madison WI 53717 Tel: 608.826.3600 Fax: 608.826.3941

Please complete both Forms 4400-113A and 4400-113B and return them to the appropriate DNR office and bureau. Completion of these reports is required by chs. 160, 281, 283, 289, 291, 292, 293, 295, and 299, Wis. Stats., and ch. NR 141, Wis. Adm. Code. In accordance with chs. 281, 289, 291, 292, 293, 295, and 299, Wis. Stats., failure to file these forms may result in a forfeiture of between $10 and $25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on these forms is not intended to be used for any other purpose. NOTE: See the instructions for more information, including where the completed forms should be sent.

WDNR WELL CONSTR 1998 KEWAUNEE MARSH.GPJ WI DNR 2003.GDT 12/16/11

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT

Form 4400-113B Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☒ Other ☐

Facility/Project Name	County	Well Name
Kewaunee Marsh	Kewaunee	MW11-1i

Facility License, Permit or Monitoring Number	County Code	Wis. Unique Well Number	DNR Well Number
	31	PA267	

1. Can this well be purged dry? ☒ Yes ☐ No

2. Well development method:

surged with bailer and bailed	☐	41
surged with bailer and pumped	☐	61
surged with block and bailed	☐	42
surged with block and pumped	☐	62
surged with block, bailed, and pumped	☐	70
compressed air	☐	20
bailed only	☒	10
pumped only	☐	51
pumped slowly	☐	50
other _____	☐	

3. Time spent developing well 15 min.

4. Depth of well (from top of well casing) 15.0 ft.

5. Inside diameter of well 2.03 in.

6. Volume of water in filter pack and well casing 2.0 gal.

7. Volume of water removed from well 3.5 gal.

8. Volume of water added (if any) 0.0 gal.

9. Source of water added _____

10. Analysis performed on water added? ☐ Yes ☐ No
(If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	2.75 ft.	ft.
Date	b.	10/20/2011	10/20/2011
Time	c.	02:15 ☐ a.m. ☒ p.m.	02:30 ☐ a.m. ☒ p.m.
12. Sediment in well bottom		0.0 inches	0.0 inches
13. Water clarity		Clear ☒ 10 Turbid ☐ 15 (Describe)	Clear ☒ 20 Turbid ☐ 25 (Describe)

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	mg/l	mg/l
15. COD	mg/l	mg/l

16. Well developed by: Person's Name and Firm
Mark Walter
TRC Environmental

17. Additional comments on development:

Facility Address or Owner/Responsible Party Address
Name: Annette Weissbach
Firm: WDNR
Street: 2984 Shawano Avenue
City/State/Zip: Green Bay, WI 54313

I hereby certify that the above information is true and correct to the best of my knowledge.
Signature: [signature]
Print Name: Mark Walter
Firm: TRC Environmental

NOTE: See instructions for more information including a list of county codes and well type codes.

WDNR WELL DEVELOP 1998 KEWAUNEE MARSH.GPJ WI DNR 2003.GDT 12/16/11

State of Wisconsin
Department of Natural Resources

Route To: Watershed/Wastewater ☐ Waste Management ☐ Remediation/Redevelopment ☒ Other ☐

MONITORING WELL CONSTRUCTION
Form 4400-113A Rev. 7-98

Facility/Project Name: Kewaunee Marsh	Local Grid Location of Well: ____ ft. ☐ N. ☐ S. ____ ft. ☐ E. ☐ W.	Well Name: MW11-2
Facility License, Permit or Monitoring No.	Local Grid Origin ☐ (estimated: ☐) or Well Location ☒ Lat. ° ' " Long. ° ' " or	Wis. Unique Well No.: PA268 / DNR Well Number
Facility ID	St. Plane 244,039 ft. N, 2,616,517 ft. E. S/Ⓒ/N	Date Well Installed: 10/18/2011
Type of Well: Well Code 71/dw	Section Location of Waste/Source: ____ 1/4 of ____ 1/4 of Sec. ____, T. ____ N, R. ____ ☐ E ☐ W	Well Installed By: (Person's Name and Firm) Tony Kapugi, On-Site Environmental Services
Distance from Waste/Source ft. / Enf. Stds. Apply ☐	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known	Gov. Lot Number

A. Protective pipe, top elevation ____ ft. MSL

B. Well casing, top elevation 583.01 ft. MSL

C. Land surface elevation 583.0 ft. MSL

D. Surface seal, bottom 579.3 ft. MSL or 3.8 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

14. Drilling method used: Rotary ☐ 5 0; Hollow Stem Auger ☒ 4 1; Other ☐

15. Drilling fluid used: Water ☐ 0 2; Air ☐ 0 1; Drilling Mud ☐ 0 3; None ☒ 9 9

16. Drilling additives used? ☐ Yes ☒ No

Describe ____

17. Source of water (attach analysis, if required): ____

E. Bentonite seal, top 583.0 ft. MSL or 0.0 ft.

F. Fine sand, top 579.3 ft. MSL or 3.8 ft.

G. Filter pack, top 579.0 ft. MSL or 4.0 ft.

H. Screen joint, top 578.5 ft. MSL or 4.5 ft.

I. Well bottom 575.8 ft. MSL or 7.2 ft.

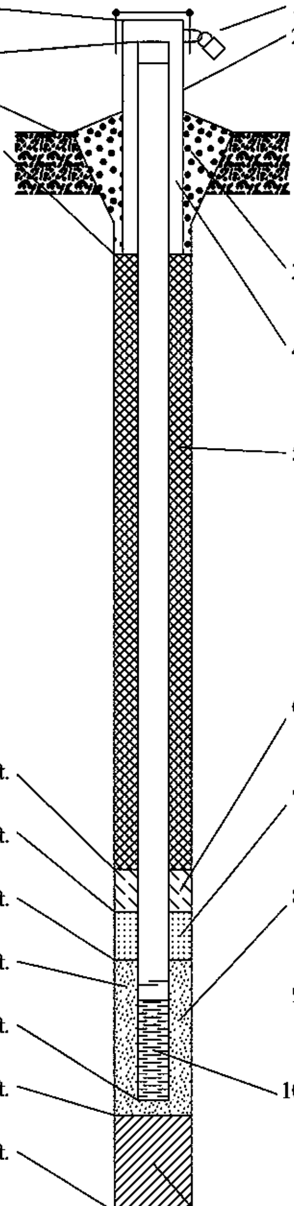
J. Filter pack, bottom 575.5 ft. MSL or 7.5 ft.

K. Borehole, bottom 575.5 ft. MSL or 7.5 ft.

L. Borehole, diameter 8.3 in.

M. O.D. well casing 2.38 in.

N. I.D. well casing 2.03 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
   a. Inside diameter: 4.0 in.
   b. Length: 5.0 ft.
   c. Material: Steel ☒ 0 4; Other ☐
   d. Additional protection? ☐ Yes ☒ No
   If yes, describe: ____
3. Surface seal: Bentonite ☒ 3 0; Concrete ☐ 0 1; Other ☐
4. Material between well casing and protective pipe: Bentonite ☒ 3 0; Other ☐
5. Annular space seal: a. Granular/Chipped Bentonite ☒ 3 3
   b. ____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐ 3 5
   c. ____ Lbs/gal mud weight . . . Bentonite slurry ☐ 3 1
   d. ____ % Bentonite . . . Bentonite-cement grout ☐ 5 0
   e. 1.1 Ft^3 volume added for any of the above
   f. How installed: Tremie ☐ 0 1; Tremie pumped ☐ 0 2; Gravity ☒ 0 8
6. Bentonite seal: a. Bentonite granules ☐ 3 3
   b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite chips ☒ 3 2
   c. ____ Other ☐
7. Fine sand material: Manufacturer, product name & mesh size
   a. Sidley Ohio #4000
   b. Volume added 0.2 ft^3
8. Filter pack material: Manufacturer, product name & mesh size
   a. Sidley Ohio #5
   b. Volume added 1.2 ft^3
9. Well casing: Flush threaded PVC schedule 40 ☒ 2 3; Flush threaded PVC schedule 80 ☐ 2 4; Other ☐
10. Screen material: PVC
    a. Screen Type: Factory cut ☐ 1 1; Continuous slot ☒ 0 1; Other ☐
    b. Manufacturer Monoflex/Geoprove
    c. Slot size: 0.010 in.
    d. Slotted length: 2.7 ft.
11. Backfill material (below filter pack): None ☒ 1 4; Other ☐

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature [signature] Firm TRC Environmental Corporation, 708 Heartland Trail Madison WI 53717 Tel: 608.826.3600 Fax: 608.826.3941

Please complete both Forms 4400-113A and 4400-113B and return them to the appropriate DNR office and bureau. Completion of these reports is required by chs. 160, 281, 283, 289, 291, 292, 293, 295, and 299, Wis. Stats., and ch. NR 141, Wis. Adm. Code. In accordance with chs. 281, 289, 291, 292, 293, 295, and 299, Wis. Stats., failure to file these forms may result in a forfeiture of between $10 and $25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on these forms is not intended to be used for any other purpose. NOTE: See the instructions for more information, including where the completed forms should be sent.

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT

Form 4400-113B Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☒ Other ☐

Facility/Project Name	County	Well Name
Kewaunee Marsh	Kewaunee	MW11-2

Facility License, Permit or Monitoring Number	County Code	Wis. Unique Well Number	DNR Well Number
	31	PA268	

1. Can this well be purged dry? ☒ Yes ☐ No

2. Well development method:

surged with bailer and bailed	☐	41
surged with bailer and pumped	☐	61
surged with block and bailed	☐	42
surged with block and pumped	☐	62
surged with block, bailed, and pumped	☐	70
compressed air	☐	20
bailed only	☒	10
pumped only	☐	51
pumped slowly	☐	50
other _____	☐	

3. Time spent developing well 20 min.

4. Depth of well (from top of well casing) 10.0 ft.

5. Inside diameter of well 2.03 in.

6. Volume of water in filter pack and well casing 1.0 gal.

7. Volume of water removed from well 4.8 gal.

8. Volume of water added (if any) 0.0 gal.

9. Source of water added _____

10. Analysis performed on water added? ☐ Yes ☐ No
(If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	4.15 ft.	ft.
Date	b.	10/19/2011	10/19/2011
Time	c.	04:15 ☒ p.m. ☐ a.m.	04:35 ☒ p.m. ☐ a.m.
12. Sediment in well bottom		0.0 inches	0.0 inches
13. Water clarity		Clear ☐ 10 Turbid ☒ 15	Clear ☐ 20 Turbid ☒ 25
(Describe)		Moderate slight light brown	Moderate slight light brown

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids		mg/l	mg/l
15. COD		mg/l	mg/l

16. Well developed by: Person's Name and Firm
Mark Walter
TRC Environmental

17. Additional comments on development:

Facility Address or Owner/Responsible Party Address
Name: Annette Weissbach
Firm: WDNR
Street: 2984 Shawano Avenue
City/State/Zip: Green Bay, WI 54313

I hereby certify that the above information is true and correct to the best of my knowledge.
Signature: [signature]
Print Name: Mark Walter
Firm: TRC Environmental

NOTE: See instructions for more information including a list of county codes and well type codes.

WDNR WELL DEVELOP 1998 KEWAUNEE MARSH.GPJ WI DNR 2003.GDT 12/16/11

State of Wisconsin
Department of Natural Resources

Route To: Watershed/Wastewater ☐ Waste Management ☐ Remediation/Redevelopment ☒ Other ☐

MONITORING WELL CONSTRUCTION

Form 4400-113A Rev. 7-98

Facility/Project Name: Kewaunee Marsh	Local Grid Location of Well: ____ ft. ☐ N. ☐ S. ____ ft. ☐ E. ☐ W.	Well Name: MW11-3
Facility License, Permit or Monitoring No.	Local Grid Origin ☐ (estimated: ☐) or Well Location ☒ Lat. ° ' " Long. ° ' " or St. Plane 244,001 ft. N, 2,616,556 ft. E. S /©/N	Wis. Unique Well No.: PA269 DNR Well Number:
Facility ID		Date Well Installed: 10/18/2011
Type of Well: Well Code 71/dw	Section Location of Waste/Source: ____ 1/4 of ____ 1/4 of Sec. ____, T. ____ N, R. ____ ☐ E ☐ W	Well Installed By: (Person's Name and Firm): Tony Kapugi
Distance from Waste/Source ft. / Enf. Stds. Apply ☐	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known	Gov. Lot Number: ____
		On-Site Environmental Services

A. Protective pipe, top elevation ____ ft. MSL

B. Well casing, top elevation 582.18 ft. MSL

C. Land surface elevation 582.2 ft. MSL

D. Surface seal, bottom 578.4 ft. MSL or 3.8 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

14. Drilling method used: Rotary ☐ 5 0
Hollow Stem Auger ☒ 4 1
____ Other ☐

15. Drilling fluid used: Water ☐ 0 2 Air ☐ 0 1
Drilling Mud ☐ 0 3 None ☒ 9 9

16. Drilling additives used? ☐ Yes ☒ No

Describe ____

17. Source of water (attach analysis, if required):

E. Bentonite seal, top 582.2 ft. MSL or 0.0 ft.

F. Fine sand, top 578.4 ft. MSL or 3.8 ft.

G. Filter pack, top 578.2 ft. MSL or 4.0 ft.

H. Screen joint, top 577.7 ft. MSL or 4.5 ft.

I. Well bottom 575.0 ft. MSL or 7.2 ft.

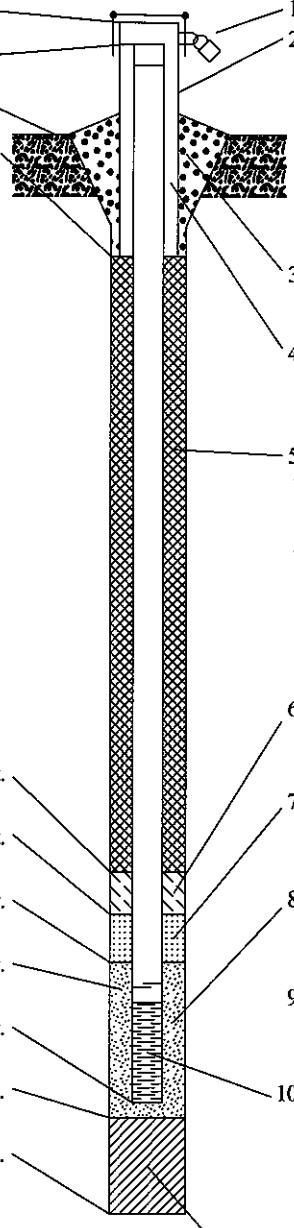
J. Filter pack, bottom 575.0 ft. MSL or 7.2 ft.

K. Borehole, bottom 574.7 ft. MSL or 7.5 ft.

L. Borehole, diameter 8.3 in.

M. O.D. well casing 2.38 in.

N. I.D. well casing 2.03 in.



1. Cap and lock? ☒ Yes ☐ No

2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 5.0 ft.
c. Material: Steel ☒ 0 4
____ Other ☐
d. Additional protection? ☐ Yes ☒ No
If yes, describe: ____

3. Surface seal: Bentonite ☒ 3 0
Concrete ☐ 0 1
____ Other ☐

4. Material between well casing and protective pipe:
Bentonite ☒ 3 0
____ Other ☐

5. Annular space seal: a. Granular/Chipped Bentonite ☒ 3 3
b. ____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐ 3 5
c. ____ Lbs/gal mud weight . . . Bentonite slurry ☐ 3 1
d. ____ % Bentonite . . . Bentonite-cement grout ☐ 5 0
e. 1.1 Ft^3 volume added for any of the above
f. How installed: Tremie ☐ 0 1
Tremie pumped ☐ 0 2
Gravity ☒ 0 8

6. Bentonite seal: a. Bentonite granules ☐ 3 3
b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite chips ☒ 3 2
c. ____ Other ☐

7. Fine sand material: Manufacturer, product name & mesh size
a. Sidley Ohio #4000
b. Volume added 0.2 ft^3

8. Filter pack material: Manufacturer, product name & mesh size
a. Sidley Ohio #5
b. Volume added 1.2 ft^3

9. Well casing: Flush threaded PVC schedule 40 ☒ 2 3
Flush threaded PVC schedule 80 ☐ 2 4
____ Other ☐

10. Screen material: PVC
a. Screen Type: Factory cut ☐ 1 1
Continuous slot ☒ 0 1
____ Other ☐
b. Manufacturer Monoflex/Geoprobe
c. Slot size: 0.010 in.
d. Slotted length: 2.7 ft.

11. Backfill material (below filter pack): None ☒ 1 4
____ Other ☐

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature: [signature] Firm: TRC Environmental Corporation, 708 Heartland Trail Madison WI 53717 Tel: 608.826.3600 Fax: 608.826.3941

Please complete both Forms 4400-113A and 4400-113B and return them to the appropriate DNR office and bureau. Completion of these reports is required by chs. 160, 281, 283, 289, 291, 292, 293, 295, and 299, Wis. Stats., and ch. NR 141, Wis. Adm. Code. In accordance with chs. 281, 289, 291, 292, 293, 295, and 299, Wis. Stats., failure to file these forms may result in a forfeiture of between $10 and $25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on these forms is not intended to be used for any other purpose. NOTE: See the instructions for more information, including where the completed forms should be sent.

WDNR WELL CONSTR 1998 KEWAUNEE MARSH.GPJ WI DNR 2003.GDT 12/16/11

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT

Form 4400-113B Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☒ Other ☐

Facility/Project Name	County	Well Name
Kewaunee Marsh	Kewaunee	MW11-3

Facility License, Permit or Monitoring Number	County Code	Wis. Unique Well Number	DNR Well Number
	31	PA269	

1. Can this well be purged dry? ☒ Yes ☐ No

2. Well development method:

surged with bailer and bailed	☐	41
surged with bailer and pumped	☐	61
surged with block and bailed	☐	42
surged with block and pumped	☐	62
surged with block, bailed, and pumped	☐	70
compressed air	☐	20
bailed only	☒	10
pumped only	☐	51
pumped slowly	☐	50
other _____	☐	

3. Time spent developing well 30 min.

4. Depth of well (from top of well casing) 10.0 ft.

5. Inside diameter of well 2.03 in.

6. Volume of water in filter pack and well casing 0.9 gal.

7. Volume of water removed from well 11.8 gal.

8. Volume of water added (if any) 0.0 gal.

9. Source of water added _____

10. Analysis performed on water added? ☐ Yes ☐ No
(If yes, attach results)

		Before Development	After Development
11. Depth to Water (from top of well casing)	a.	4.55 ft.	ft.
Date	b.	10/19/2011	10/19/2011
Time	c.	02:40 ☒ p.m. ☐ a.m.	03:10 ☒ p.m. ☐ a.m.
12. Sediment in well bottom		0.0 inches	0.0 inches
13. Water clarity		Clear ☐ 10 Turbid ☒ 15 (Describe) Moderate slight light brown	Clear ☐ 20 Turbid ☒ 25 (Describe) Slight light brown

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	mg/l	mg/l
15. COD	mg/l	mg/l

16. Well developed by: Person's Name and Firm
Mark Walter
TRC Environmental

17. Additional comments on development:

Facility Address or Owner/Responsible Party Address
Name: Annette Weissbach
Firm: WDNR
Street: 2984 Shawano Avenue
City/State/Zip: Green Bay, WI 54313

I hereby certify that the above information is true and correct to the best of my knowledge.
Signature: [signature]
Print Name: Mark Walter
Firm: TRC Environmental

NOTE: See instructions for more information including a list of county codes and well type codes.

WDNR WELL DEVELOP 1998 KEWAUNEE MARSH.GPJ WI DNR 2003.GDT 12/16/11

State of Wisconsin
Department of Natural Resources

Route To: Watershed/Wastewater ☐ Waste Management ☐ Remediation/Redevelopment ☒ Other ☐

MONITORING WELL CONSTRUCTION

Form 4400-113A Rev. 7-98

Facility/Project Name: Kewaunee Marsh	Local Grid Location of Well: ____ ft. ☐ N. ☐ S. ____ ft. ☐ E. ☐ W.	Well Name: MW11-3i
Facility License, Permit or Monitoring No.	Local Grid Origin ☐ (estimated: ☐) or Well Location ☒ Lat. ° ' " Long. ° ' " or	Wis. Unique Well No.: PA270 / DNR Well Number:
Facility ID	St. Plane 243,999 ft. N, 2,616,557 ft. E. S/©/N	Date Well Installed: 10/18/2011
Type of Well: Well Code 71/dw	Section Location of Waste/Source: ____ 1/4 of ____ 1/4 of Sec. ____, T. ____ N, R. ____ ☐ E ☐ W	Well Installed By: (Person's Name and Firm): Tony Kapugi, On-Site Environmental Services
Distance from Waste/Source ft. / Enf. Stds. Apply ☐	Location of Well Relative to Waste/Source: u ☐ Upgradient s ☐ Sidegradient d ☐ Downgradient n ☐ Not Known	Gov. Lot Number:

A. Protective pipe, top elevation ____ ft. MSL
B. Well casing, top elevation 584.80 ft. MSL
C. Land surface elevation 582.3 ft. MSL
D. Surface seal, bottom 573.3 ft. MSL or 9.0 ft.

12. USCS classification of soil near screen:
GP ☐ GM ☐ GC ☐ GW ☐ SW ☐ SP ☐
SM ☐ SC ☐ ML ☐ MH ☐ CL ☐ CH ☐
Bedrock ☐

13. Sieve analysis attached? ☐ Yes ☒ No

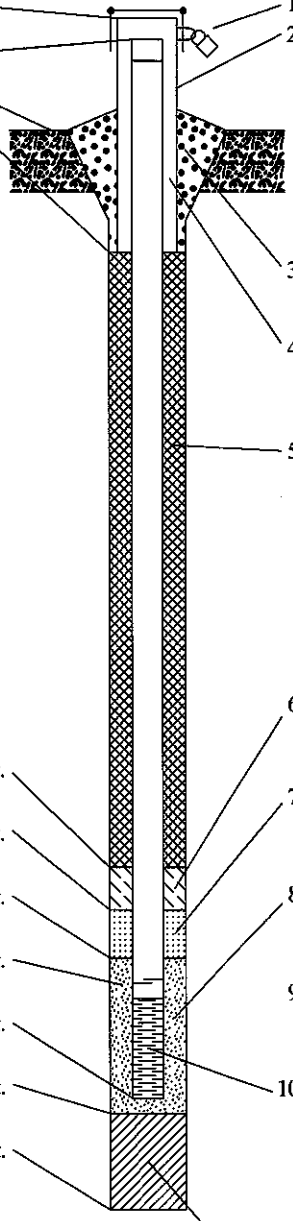
14. Drilling method used: Rotary ☐ 5 0 / Hollow Stem Auger ☒ 4 1 / Other ☐

15. Drilling fluid used: Water ☐ 0 2 Air ☐ 0 1 Drilling Mud ☐ 0 3 None ☒ 9 9

16. Drilling additives used? ☐ Yes ☒ No
Describe ____

17. Source of water (attach analysis, if required):

E. Bentonite seal, top 582.3 ft. MSL or 0.0 ft.
F. Fine sand, top 573.3 ft. MSL or 9.0 ft.
G. Filter pack, top 572.8 ft. MSL or 9.5 ft.
H. Screen joint, top 572.3 ft. MSL or 10.0 ft.
I. Well bottom 569.8 ft. MSL or 12.5 ft.
J. Filter pack, bottom 569.8 ft. MSL or 12.5 ft.
K. Borehole, bottom 569.8 ft. MSL or 12.5 ft.
L. Borehole, diameter 8.3 in.
M. O.D. well casing 2.38 in.
N. I.D. well casing 2.03 in.



1. Cap and lock? ☒ Yes ☐ No
2. Protective cover pipe:
a. Inside diameter: 4.0 in.
b. Length: 5.0 ft.
c. Material: Steel ☒ 0 4 / Other ☐
d. Additional protection? ☐ Yes ☒ No
If yes, describe: ____
3. Surface seal: Bentonite ☒ 3 0 / Concrete ☐ 0 1 / Other ☐
4. Material between well casing and protective pipe: Bentonite ☒ 3 0 / Other ☐
5. Annular space seal: a. Granular/Chipped Bentonite ☒ 3 3
b. ____ Lbs/gal mud weight . . . Bentonite-sand slurry ☐ 3 5
c. ____ Lbs/gal mud weight . . . Bentonite slurry ☐ 3 1
d. ____ % Bentonite . . . Bentonite-cement grout ☐ 5 0
e. 2.5 Ft^3 volume added for any of the above
f. How installed: Tremie ☐ 0 1 / Tremie pumped ☐ 0 2 / Gravity ☒ 0 8
6. Bentonite seal: a. Bentonite granules ☐ 3 3
b. ☐ 1/4 in. ☒ 3/8 in. ☐ 1/2 in. Bentonite chips ☒ 3 2
c. ____ Other ☐
7. Fine sand material: Manufacturer, product name & mesh size
a. Sidley Ohio #4000
b. Volume added 0.2 ft^3
8. Filter pack material: Manufacturer, product name & mesh size
a. Sidley Ohio #5
b. Volume added 1.2 ft^3
9. Well casing: Flush threaded PVC schedule 40 ☒ 2 3 / Flush threaded PVC schedule 80 ☐ 2 4 / Other ☐
10. Screen material: PVC
a. Screen Type: Factory cut ☐ 1 1 / Continuous slot ☒ 0 1 / Other ☐
b. Manufacturer Monoflex/Geoprobe
c. Slot size: 0.010 in.
d. Slotted length: 2.5 ft.
11. Backfill material (below filter pack): None ☒ 1 4 / Other ☐

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature ____ Firm TRC Environmental Corporation, 708 Heartland Trail Madison WI 53717 Tel: 608.826.3600 Fax: 608.826.3941

Please complete both Forms 4400-113A and 4400-113B and return them to the appropriate DNR office and bureau. Completion of these reports is required by chs. 160, 281, 283, 289, 291, 292, 293, 295, and 299, Wis. Stats., and ch. NR 141, Wis. Adm. Code. In accordance with chs. 281, 289, 291, 292, 293, 295, and 299, Wis. Stats., failure to file these forms may result in a forfeiture of between $10 and $25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on these forms is not intended to be used for any other purpose. NOTE: See the instructions for more information, including where the completed forms should be sent.

WDNR WELL CONSTR 1998 KEWAUNEE MARSH.GPJ WI DNR 2003.GDT 12/16/11

State of Wisconsin
Department of Natural Resources

MONITORING WELL DEVELOPMENT

Form 4400-113B Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☒ Other ☐

Facility/Project Name	County	Well Name
Kewaunee Marsh	Kewaunee	MW11-3i

Facility License, Permit or Monitoring Number	County Code	Wis. Unique Well Number	DNR Well Number
	31	PA270	

1. Can this well be purged dry? ☒ Yes ☐ No

2. Well development method:

surged with bailer and bailed	☐	41
surged with bailer and pumped	☐	61
surged with block and bailed	☐	42
surged with block and pumped	☐	62
surged with block, bailed, and pumped	☐	70
compressed air	☐	20
bailed only	☒	10
pumped only	☐	51
pumped slowly	☐	50
other _____	☐	

3. Time spent developing well 30 min.

4. Depth of well (from top of well casing) 15.0 ft.

5. Inside diameter of well 2.03 in.

6. Volume of water in filter pack and well casing 1.7 gal.

7. Volume of water removed from well 6.5 gal.

8. Volume of water added (if any) 0.0 gal.

9. Source of water added _____

10. Analysis performed on water added? ☐ Yes ☐ No
(If yes, attach results)

	Before Development	After Development
11. Depth to Water (from top of well casing) a.	4.83 ft.	ft.
Date b.	10/19/2011	10/19/2011
Time c.	03:20 ☒ p.m. ☐ a.m.	03:50 ☒ p.m. ☐ a.m.
12. Sediment in well bottom	0.0 inches	0.0 inches
13. Water clarity	Clear ☐ 10 Turbid ☒ 15	Clear ☐ 20 Turbid ☒ 25
(Describe)	Slight light brown	Slight light brown

Fill in if drilling fluids were used and well is at solid waste facility:

14. Total suspended solids	mg/l	mg/l
15. COD	mg/l	mg/l

16. Well developed by: Person's Name and Firm
Mark Walter
TRC Environmental

17. Additional comments on development:

Facility Address or Owner/Responsible Party Address

Name: Annette Weissbach
Firm: WDNR
Street: 2984 Shawano Avenue
City/State/Zip: Green Bay, WI 54313

I hereby certify that the above information is true and correct to the best of my knowledge.

Signature: [signature]
Print Name: Mark Walter
Firm: TRC Environmental

NOTE: See instructions for more information including a list of county codes and well type codes.

WDNR WELL DEVELOP 1998 KEWAUNEE MARSH.GPJ WI DNR 2003.GDT 12/16/11

Appendix D
Laboratory Reports

Pace Analytical®
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Pace Analytical Services, Inc.
1241 Bellevue Street - Suite 9
Green Bay, WI 54302
(920)469-2436

October 07, 2011

ALYSSA SELLWOOD
TRC - Madison
744 HEARTLAND TRAIL
Madison, WI 53717

RE: Project: KEWAUNEE MARSH 186467.0000.000
Pace Project No.: 4051774

Dear ALYSSA SELLWOOD:
Enclosed are the analytical results for sample(s) received by the laboratory on October 05, 2011. The results relate only to the samples included in this report. Results reported herein conform to the most current TNI standards, where applicable, unless otherwise narrated in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Brian Basten

brian.basten@pacelabs.com
Project Manager

Enclosures

cc: ALEX GOERGEN, TRC - MADISON
BOB STANFORTH, TRC - Madison

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Green Bay, WI 54302
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CERTIFICATIONS

Project: KEWAUNEE MARSH 186467.0000.000
Pace Project No.: 4051774

Green Bay Certification IDs
1241 Bellevue Street, Green Bay, WI 54302
Florida/NELAP Certification #: E87948
Illinois Certification #: 200050
Kentucky Certification #: 82
Louisiana Certification #: 04168
Minnesota Certification #: 055-999-334
New York Certification #: 11888
North Carolina Certification #: 503
North Dakota Certification #: R-150
South Carolina Certification #: 83006001
US Dept of Agriculture #: S-76505
Wisconsin Certification #: 405132750
Wisconsin DATCP Certification #: 105-444

Pace Analytical Services, Inc.
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Green Bay, WI 54302
(920)469-2436

SAMPLE SUMMARY

Project: KEWAUNEE MARSH 186467.0000.000
Pace Project No.: 4051774

Lab ID	Sample ID	Matrix	Date Collected	Date Received
4051774001	**FIELD TRIAL**	Solid	10/05/11 12:00	10/05/11 13:05

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Green Bay, WI 54302
(920)469-2436

SAMPLE ANALYTE COUNT

Project: KEWAUNEE MARSH 186467.0000.000
Pace Project No.: 4051774

Lab ID	Sample ID	Method	Analysts	Analytes Reported
4051774001	**FIELD TRIAL**	EPA 6010	DLB	1

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ANALYTICAL RESULTS

Project: KEWAUNEE MARSH 186467.0000.000
Pace Project No.: 4051774

Sample: FIELD TRIAL **Lab ID: 4051774001** Collected: 10/05/11 12:00 Received: 10/05/11 13:05 Matrix: Solid

Results reported on a "wet-weight" basis

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP, SPLP	Analytical Method: EPA 6010 Preparation Method: EPA 3010								
	Leachate Method/Date: EPA 1312; 10/05/11 00:00								
Arsenic	**0.26**	mg/L	0.050	0.025	1	10/06/11 10:20	10/06/11 18:43	7440-38-2	

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QUALITY CONTROL DATA

Project: KEWAUNEE MARSH 186467.0000.000
Pace Project No.: 4051774

QC Batch: MPRP/6043
QC Batch Method: EPA 3010
Analysis Method: EPA 6010
Analysis Description: 6010 MET SPLP
Associated Lab Samples: 4051774001

METHOD BLANK: 513621 Matrix: Water
Associated Lab Samples: 4051774001

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Arsenic	mg/L	<0.025	0.050	10/06/11 18:35	

LABORATORY CONTROL SAMPLE: 513622

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Arsenic	mg/L	.5	0.49	98	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 513623 513624

Parameter	Units	4051774001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Arsenic	mg/L	0.26	.5	.5	0.75	0.76	98	100	75-125	1	20	

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QUALIFIERS

Project: KEWAUNEE MARSH 186467.0000.000
Pace Project No.: 4051774

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to changes in sample preparation, dilution of the sample aliquot, or moisture content.

ND - Not Detected at or above adjusted reporting limit.

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

S - Surrogate

1,2-Diphenylhydrazine (8270 listed analyte) decomposes to Azobenzene.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

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UPPER MIDWEST REGION
MN: 612-607-1700 WI: 920-469-2436

Page 1 of

CHAIN OF CUSTODY

4051774

(Please Print Clearly)	
Company Name:	TRC
Branch/Location:	Madison
Project Contact:	Alyssa Sellwood
Phone:	608-826-3658
Project Number:	183467.0000.0000 Task 2
Project Name:	Kewaunee Marsh
Project State:	WI
Sampled By (Print):	Mark Walter
Sampled By (Sign):	
PO #:	Will send in email
Regulatory Program:	

*Preservation Codes
A=None B=HCL C=H2SO4 D=HNO3 E=DI Water F=Methanol G=NaOH
H=Sodium Bisulfate Solution I=Sodium Thiosulfate J=Other

Quote #:	
Mail To Contact:	Alyssa Sellwood
Mail To Company:	TRC
Mail To Address:	708 Heartland Trl. Madison, WI 53717
Invoice To Contact:	TRC Accts Payable
Invoice To Company:	TRC (PO# will be sent in email)
Invoice To Address:	Same
Invoice To Phone:	

Data Package Options (billable)
☐ EPA Level III
☐ EPA Level IV

MS/MSD
☐ On your sample (billable)
☐ NOT needed on your sample

Matrix Codes
A = Air; B = Biota; C = Charcoal; O = Oil; S = Soil; SI = Sludge; W = Water; DW = Drinking Water; GW = Ground Water; SW = Surface Water; WW = Waste Water; WP = Wipe

PACE LAB #	CLIENT FIELD ID	COLLECTION DATE	COLLECTION TIME	MATRIX	FILTERED? (YES/NO)	PRESERVATION (CODE)*	Analysis Requested	CLIENT COMMENTS	LAB COMMENTS (Lab Use Only)	Profile #
001	Field Trial	10/5/11	12:00	S	N	A	Arsenic SPLP ✓		1-4oz p	

Rush Turnaround Time Requested Prelims
(Rush TAT subject to approval/surcharge)
Date Needed: 10/7/11

Transmit Prelim Rush Results by (complete what you want):
Email #1: asellwood@trcsolutions.com
Email #2: MWalter@trcsolutions.com
Telephone:
Fax:

Samples on HOLD are subject to special pricing and release of liability

Relinquished By:	Date/Time:	Received By:	Date/Time:
Mark Walter	10/5/11 12:05		10/5/11 12:15
	10/5/11 12:05		10/5/11 13:05

PACE Project No.: 4051774
Receipt Temp = 10.1 °C
Sample Receipt pH OK / Adjusted
Cooler Custody Seal: Present / Not Present; Intact / Not Intact

C019a(27Jun2006)
Version 6.0 06/14/06

ORIGINAL

Pace Analytical Services, Inc.
1241 Bellevue Street, Suite 9
Green Bay, WI 54302

Pace Analytical

Sample Condition Upon Receipt

Client Name: TRC   Project # 4051774

Courier: ☐ Fed Ex ☐ UPS ☐ USPS ☑ Client ☐ Commercial ☐ Pace Other ______

Tracking #: ______

Custody Seal on Cooler/Box Present: ☐ yes ☑ no Seals intact: ☐ yes ☐ no

Custody Seal on Samples Present: ☐ yes ☑ no Seals intact: ☐ yes ☐ no

Packing Material: ☐ Bubble Wrap ☑ Bubble Bags ☐ None (Other) Ziplock

Thermometer Used NA **Type of Ice:** Wet Blue Dry None ☐ Samples on ice, cooling process has begun

Cooler Temperature ROI **Biological Tissue is Frozen:** ☐ yes ☐ no

Temp Blank Present: ☐ yes ☑ no

Temp should be above freezing to 6°C for all sample except Biota.
Biota Samples should be received ≤ 0°C.

Optional: Proj. Due Date: Proj. Name:

Person examining contents:
Date: 10 5
Initials: JK

		Comments:
Chain of Custody Present:	☑Yes ☐No ☐N/A	1.
Chain of Custody Filled Out:	☑Yes ☐No ☐N/A	2.
Chain of Custody Relinquished:	☑Yes ☐No ☐N/A	3.
Sampler Name & Signature on COC:	☑Yes ☐No ☐N/A	4.
Samples Arrived within Hold Time:	☑Yes ☐No ☐N/A	5.
Short Hold Time Analysis (<72hr):	☐Yes ☑No ☐N/A	6.
Rush Turn Around Time Requested:	☑Yes ☐No ☐N/A	7.
Sufficient Volume:	☑Yes ☐No ☐N/A	8.
Correct Containers Used:	☑Yes ☐No ☐N/A	9.
-Pace Containers Used:	☑Yes ☐No ☐N/A	
Containers Intact:	☑Yes ☐No ☐N/A	10.
Filtered volume received for Dissolved tests	☐Yes ☑No ☐N/A	11.
Sample Labels match COC:	☑Yes ☐No ☐N/A	12.
-Includes date/time/ID/Analysis Matrix: S		
All containers needing preservation have been checked.	☐Yes ☐No ☑N/A	13.
All containers needing preservation are found to be in compliance with EPA recommendation.	☐Yes ☐No ☑N/A	
exceptions: VOA, coliform, TOC, O&G, WI-DRO (water)	☐Yes ☐No	Initial when completed / Lot # of added preservative
Samples checked for dechlorination:	☐Yes ☐No ☑N/A	14.
Headspace in VOA Vials (>6mm):	☐Yes ☐No ☑N/A	15.
Trip Blank Present:	☐Yes ☐No ☑N/A	16.
Trip Blank Custody Seals Present	☐Yes ☐No ☑N/A	
Pace Trip Blank Lot # (if purchased): ______		

Client Notification/ Resolution: Field Data Required? Y / N

Person Contacted: ______ Date/Time: ______

Comments/ Resolution: ______

Project Manager Review: [signature] **Date:** 10-5-11

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e out of h incorrect preservative, out of temp, incorrect containers)

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October 10, 2011

ALYSSA SELLWOOD
TRC - Madison
744 HEARTLAND TRAIL
Madison, WI 53717

RE: Project: 186467 PH2 KEWAUNEE MARSH
Pace Project No.: 4051796

Dear ALYSSA SELLWOOD:
Enclosed are the analytical results for sample(s) received by the laboratory on October 05, 2011. The results relate only to the samples included in this report. Results reported herein conform to the most current TNI standards, where applicable, unless otherwise narrated in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Brian Basten

brian.basten@pacelabs.com
Project Manager

Enclosures

cc: ALEX GOERGEN, TRC - MADISON
BOB STANFORTH, TRC - Madison

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1241 Bellevue Street - Suite 9
Green Bay, WI 54302
(920)469-2436

CERTIFICATIONS

Project: 186467 PH2 KEWAUNEE MARSH
Pace Project No.: 4051796

Green Bay Certification IDs
1241 Bellevue Street, Green Bay, WI 54302
Florida/NELAP Certification #: E87948
Illinois Certification #: 200050
Kentucky Certification #: 82
Louisiana Certification #: 04168
Minnesota Certification #: 055-999-334
New York Certification #: 11888
North Carolina Certification #: 503
North Dakota Certification #: R-150
South Carolina Certification #: 83006001
US Dept of Agriculture #: S-76505
Wisconsin Certification #: 405132750
Wisconsin DATCP Certification #: 105-444

Pace Analytical Services, Inc.
1241 Bellevue Street - Suite 9
Green Bay, WI 54302
(920)469-2436

SAMPLE SUMMARY

Project: 186467 PH2 KEWAUNEE MARSH
Pace Project No.: 4051796

Lab ID	Sample ID	Matrix	Date Collected	Date Received
4051796001	**CELL #2 PRE-BENTONITE**	Solid	10/05/11 14:40	10/05/11 16:30
4051796002	**CELL #2 POST-BENTONITE**	Solid	10/05/11 15:10	10/05/11 16:30

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1241 Bellevue Street - Suite 9
Green Bay, WI 54302
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SAMPLE ANALYTE COUNT

Project: 186467 PH2 KEWAUNEE MARSH
Pace Project No.: 4051796

Lab ID	Sample ID	Method	Analysts	Analytes Reported
4051796001	**CELL #2 PRE-BENTONITE**	EPA 6010	MMZ	1
4051796002	**CELL #2 POST-BENTONITE**	EPA 6010	MMZ	1

Pace Analytical Services, Inc.
1241 Bellevue Street - Suite 9
Green Bay, WI 54302
(920)469-2436

ANALYTICAL RESULTS

Project: 186467 PH2 KEWAUNEE MARSH
Pace Project No.: 4051796

Sample: CELL #2 PRE-BENTONITE **Lab ID: 4051796001** Collected: 10/05/11 14:40 Received: 10/05/11 16:30 Matrix: Solid

Results reported on a "wet-weight" basis

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP, SPLP	Analytical Method: EPA 6010 Preparation Method: EPA 3010								
	Leachate Method/Date: EPA 1312; 10/06/11 00:00								
Arsenic	**<0.025**	mg/L	0.050	0.025	1	10/07/11 09:20	10/10/11 15:43	7440-38-2	

Sample: CELL #2 POST-BENTONITE **Lab ID: 4051796002** Collected: 10/05/11 15:10 Received: 10/05/11 16:30 Matrix: Solid

Results reported on a "wet-weight" basis

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP, SPLP	Analytical Method: EPA 6010 Preparation Method: EPA 3010								
	Leachate Method/Date: EPA 1312; 10/06/11 00:00								
Arsenic	**<0.025**	mg/L	0.050	0.025	1	10/07/11 09:20	10/10/11 15:47	7440-38-2	

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QUALITY CONTROL DATA

Project: 186467 PH2 KEWAUNEE MARSH
Pace Project No.: 4051796

QC Batch: MPRP/6049
QC Batch Method: EPA 3010
Analysis Method: EPA 6010
Analysis Description: 6010 MET SPLP
Associated Lab Samples: 4051796001, 4051796002

METHOD BLANK: 513961 Matrix: Water
Associated Lab Samples: 4051796001, 4051796002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Arsenic	mg/L	<0.025	0.050	10/10/11 15:19	

LABORATORY CONTROL SAMPLE: 513962

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Arsenic	mg/L	.5	0.47	95	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 513963 513964

Parameter	Units	4050724001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Arsenic	mg/L	<0.025	.5	.5	0.48	0.48	95	95	75-125	.2	20	

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QUALIFIERS

Project: 186467 PH2 KEWAUNEE MARSH
Pace Project No.: 4051796

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to changes in sample preparation, dilution of the sample aliquot, or moisture content.

ND - Not Detected at or above adjusted reporting limit.

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

S - Surrogate

1,2-Diphenylhydrazine (8270 listed analyte) decomposes to Azobenzene.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

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UPPER MIDWEST REGION
MN: 612-607-1700 WI: 920-469-2436

JK

4051796

CHAIN OF CUSTODY

*Preservation Codes
A=None B=HCL C=H2SO4 D=HNO3 E=DI Water F=Methanol G=NaOH
H=Sodium Bisulfate Solution I=Sodium Thiosulfate J=Other

(Please Print Clearly)	
Company Name:	TRC
Branch/Location:	Madison
Project Contact:	Alyssa Sellwood
Phone:	608-826-3658
Project Number:	[redacted] 18647 Ph 2
Project Name:	Kewaunee Marsh
Project State:	WI
Sampled By (Print):	Mark Walter
Sampled By (Sign):	[signature]
PO #:	Will send in email
Regulatory Program:	

Quote #:	
Mail To Contact:	Alyssa Sellwood
Mail To Company:	TRC
Mail To Address:	708 Heartland Tr/ Madison, WI 53717
Invoice To Contact:	TRC Accts Payable
Invoice To Company:	TRC
Invoice To Address:	Same (PO# will be sent in email)
Invoice To Phone:	

Data Package Options (billable)
☐ EPA Level III
☐ EPA Level IV

MS/MSD
☐ On your sample (billable)
☐ NOT needed on your sample

Matrix Codes
A = Air; W = Water; B = Biota; DW = Drinking Water; C = Charcoal; GW = Ground Water; O = Oil; SW = Surface Water; S = Soil; WW = Waste Water; SI = Sludge; WP = Wipe

PACE LAB #	CLIENT FIELD ID	COLLECTION DATE	COLLECTION TIME	MATRIX	FILTERED? (YES/NO)	PRESERVATION (CODE)*	Analyses Requested: Arsenic SPLP	CLIENT COMMENTS	LAB COMMENTS (Lab Use Only)	Profile #
					Y/N	Pick Letter				
001	Cell #2 Pre-Bentonite	10/5/11	2:40	S	N	A	✓		1-4oz p^A	
002	Cell #2 Post-Bentonite	10/5/11	3:10	S			✓			

Rush Turnaround Time Requested - Prelims
(Rush TAT subject to approval/surcharge)
Date Needed: 10/10/11

Transmit Prelim Rush Results by (complete what you want):
Email #1: [redacted]asellwood@trcsolutions.com
Email #2: mwalter@trcsolutions.com
Telephone: [redacted]608-354-4001/608/807-8112
Fax:

Samples on HOLD are subject to special pricing and release of liability

Relinquished By:	Date/Time:	Received By:	Date/Time:
Mark Walter	10/5/11	Alyssa Sellwood	10/5/11
Alyssa Sellwood	10/5/11 1630		10/5/11 1630

PACE Project No.: 4051796
Receipt Temp = 2.6 °C
Sample Receipt pH OK / Adjusted
Cooler Custody Seal: Present / Not Present; Intact / Not Intact

Version 6.0 06/14/06

C019a(27Jun2006)

ORIGINAL

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Pace Analytical

Sample Condition Upon Receipt

Client Name: TRC Project # 4051796

Courier: ☐ Fed Ex ☐ UPS ☐ USPS ☑ Client ☐ Commercial ☐ Pace Other _____

Tracking #: _____

Custody Seal on Cooler/Box Present: ☐ yes ☑ no Seals intact: ☐ yes ☐ no

Custody Seal on Samples Present: ☐ yes ☑ no Seals intact: ☐ yes ☐ no

Packing Material: ☐ Bubble Wrap ☐ Bubble Bags ☐ None ☑ Other

Optional
Proj. Due Date:
Proj. Name:

Thermometer Used NA Type of Ice: ☐ Wet ☑ Blue ☐ Dry ☐ None ☑ Samples on ice, cooling process has begun

Cooler Temperature RO1 Biological Tissue is Frozen: ☐ yes ☐ no

Temp Blank Present: ☐ yes ☑ no

Person examining contents:
Date: 10 5
Initials: JK

Temp should be above freezing to 6°C for all sample except Biota.
Biota Samples should be received ≤ 0°C.

		Comments:
Chain of Custody Present:	☑Yes ☐No ☐N/A	1.
Chain of Custody Filled Out:	☑Yes ☐No ☐N/A	2.
Chain of Custody Relinquished:	☑Yes ☐No ☐N/A	3.
Sampler Name & Signature on COC:	☑Yes ☐No ☐N/A	4.
Samples Arrived within Hold Time:	☑Yes ☐No ☐N/A	5.
Short Hold Time Analysis (<72hr):	☐Yes ☑No ☐N/A	6.
Rush Turn Around Time Requested:	☑Yes ☐No ☐N/A	7.
Sufficient Volume:	☑Yes ☐No ☐N/A	8.
Correct Containers Used:	☑Yes ☐No ☐N/A	9.
-Pace Containers Used:	☑Yes ☐No ☐N/A	
Containers Intact:	☑Yes ☐No ☐N/A	10.
Filtered volume received for Dissolved tests	☐Yes ☑No ☐N/A	11.
Sample Labels match COC:	☑Yes ☐No ☐N/A	12.
-Includes date/time/ID/Analysis Matrix: S		
All containers needing preservation have been checked.	☐Yes ☐No ☑N/A	13.
All containers needing preservation are found to be in compliance with EPA recommendation.	☐Yes ☐No ☑N/A	
exceptions: VOA, coliform, TOC, O&G, WI-DRO (water)	☐Yes ☑No	Initial when completed / Lot # of added preservative
Samples checked for dechlorination:	☐Yes ☐No ☑N/A	14.
Headspace in VOA Vials (>6mm):	☐Yes ☐No ☑N/A	15.
Trip Blank Present:	☐Yes ☐No ☑N/A	16.
Trip Blank Custody Seals Present	☐Yes ☐No ☑N/A	
Pace Trip Blank Lot # (if purchased): _____		

Client Notification/ Resolution: Field Data Required? Y / N

Person Contacted: _____ Date/Time: _____

Comments/ Resolution: _____

Project Manager Review: _____ **Date:** 10-5-11

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e. out of h
incorrect preservative, out of temp, incorrect containers)

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(920)469-2436

October 13, 2011

ALYSSA SELLWOOD
TRC - Madison
744 HEARTLAND TRAIL
Madison, WI 53717

RE: Project: 186467.0000.0000 KEWAUNEE MARS
Pace Project No.: 4052033

Dear ALYSSA SELLWOOD:
Enclosed are the analytical results for sample(s) received by the laboratory on October 11, 2011. The results relate only to the samples included in this report. Results reported herein conform to the most current TNI standards, where applicable, unless otherwise narrated in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Brian Basten

brian.basten@pacelabs.com
Project Manager

Enclosures

cc: ALEX GOERGEN, TRC - MADISON
BOB STANFORTH, TRC - Madison

Pace Analytical Services, Inc.
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(920)469-2436

CERTIFICATIONS

Project: 186467.0000.0000 KEWAUNEE MARS
Pace Project No.: 4052033

Green Bay Certification IDs
1241 Bellevue Street, Green Bay, WI 54302
Florida/NELAP Certification #: E87948
Illinois Certification #: 200050
Kentucky Certification #: 82
Louisiana Certification #: 04168
Minnesota Certification #: 055-999-334
New York Certification #: 11888
North Carolina Certification #: 503
North Dakota Certification #: R-150
South Carolina Certification #: 83006001
US Dept of Agriculture #: S-76505
Wisconsin Certification #: 405132750
Wisconsin DATCP Certification #: 105-444

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(920)469-2436

SAMPLE SUMMARY

Project: 186467.0000.0000 KEWAUNEE MARS
Pace Project No.: 4052033

Lab ID	Sample ID	Matrix	Date Collected	Date Received
4052033001	**CELL #7**	Solid	10/11/11 08:45	10/11/11 10:05

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SAMPLE ANALYTE COUNT

Project: 186467.0000.0000 KEWAUNEE MARS
Pace Project No.: 4052033

Lab ID	Sample ID	Method	Analysts	Analytes Reported
4052033001	**CELL #7**	EPA 6010	DLB	1

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ANALYTICAL RESULTS

Project: 186467.0000.0000 KEWAUNEE MARS
Pace Project No.: 4052033

Sample: CELL #7 **Lab ID: 4052033001** Collected: 10/11/11 08:45 Received: 10/11/11 10:05 Matrix: Solid

Results reported on a "wet-weight" basis

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP, SPLP	Analytical Method: EPA 6010 Preparation Method: EPA 3010								
	Leachate Method/Date: EPA 1312; 10/11/11 00:00								
Arsenic	**0.22**	mg/L	0.050	0.025	1	10/11/11 08:35	10/13/11 01:25	7440-38-2	

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QUALITY CONTROL DATA

Project: 186467.0000.0000 KEWAUNEE MARS
Pace Project No.: 4052033

QC Batch: MPRP/6072
QC Batch Method: EPA 3010
Analysis Method: EPA 6010
Analysis Description: 6010 MET SPLP
Associated Lab Samples: 4052033001

METHOD BLANK: 516483 Matrix: Water
Associated Lab Samples: 4052033001

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Arsenic	mg/L	<0.025	0.050	10/13/11 01:17	

LABORATORY CONTROL SAMPLE: 516484

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Arsenic	mg/L	.5	0.53	105	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 516485 516486

Parameter	Units	4052033001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Arsenic	mg/L	0.22	.5	.5	0.74	0.77	105	110	75-125	4	20	

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QUALIFIERS

Project: 186467.0000.0000 KEWAUNEE MARS
Pace Project No.: 4052033

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to changes in sample preparation, dilution of the sample aliquot, or moisture content.

ND - Not Detected at or above adjusted reporting limit.

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

S - Surrogate

1,2-Diphenylhydrazine (8270 listed analyte) decomposes to Azobenzene.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

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CHAIN OF CUSTODY

UPPER MIDWEST REGION
MN: 612-607-1700 WI: 920-469-2436

4052033

RM

(Please Print Clearly)

Company Name:	TRC
Branch/Location:	Madison
Project Contact:	Alyssa Sellwood
Phone:	608-826-3658
Project Number:	186467.0000.0000 Phase 2
Project Name:	Kewaunee Marsh
Project State:	WI
Sampled By (Print):	Mark Walter
Sampled By (Sign):	Mark Walter
PO #:	37809
Regulatory Program:	

*Preservation Codes
A=None B=HCL C=H2SO4 D=HNO3 E=DI Water F=Methanol G=NaOH H=Sodium Bisulfate Solution I=Sodium Thiosulfate J=Other

Quote #:	
Mail To Contact:	Alyssa Sellwood
Mail To Company:	TRC
Mail To Address:	708 Heartland Trl Madison, WI 53717
Invoice To Contact:	TRC Accts payable
Invoice To Company:	TRC
Invoice To Address:	TRC PO# 37809
Invoice To Phone:	

Data Package Options (billable)
☐ EPA Level III
☐ EPA Level IV

MS/MSD
☐ On your sample (billable)
☐ NOT needed on your sample

Matrix Codes
A = Air, B = Biota, C = Charcoal, O = Oil, S = Soil, Sl = Sludge
W = Water, DW = Drinking Water, GW = Ground Water, SW = Surface Water, WW = Waste Water, WP = Wipe

FILTERED? (YES/NO): N
PRESERVATION (CODE)*: A
Analyses Requested: Arsenic SPLP

PACE LAB #	CLIENT FIELD ID	COLLECTION DATE	COLLECTION TIME	MATRIX	Arsenic SPLP	CLIENT COMMENTS	LAB COMMENTS (Lab Use Only)	Profile #
001	Cell #7	10/11/11	8:45	S	✓		1-4oz poly	

Rush Turnaround Time Requested - Prelims
(Rush TAT subject to approval/surcharge)
Date Needed: 10/13/11

Transmit Prelim Rush Results by (complete what you want):
Email #1: asellwood@trcsolutions.com
Email #2: mwalter@trcsolutions.com
Telephone:
Fax:

Samples on HOLD are subject to special pricing and release of liability

Relinquished By:	Date/Time:	Received By:	Date/Time:
Mark Walter (signature)	10/11/11	(signature) - Pace	10/11/11 11:05

PACE Project No. 4052033
Receipt Temp = 10 °C
Sample Receipt pH OK / Adjusted
Cooler Custody Seal Present / Not Present Intact / Not Intact

Version 6.0 06/14/06
C019a(27Jun2006)
ORIGINAL

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Green Bay, WI 54302

Pace Analytical

Sample Condition Upon Receipt

Client Name: TRC Project # 4052033

Courier: ☐ Fed Ex ☐ UPS ☐ USPS ☑ Client ☐ Commercial ☐ Pace Other _____

Tracking #: _____

Custody Seal on Cooler/Box Present: ☐ yes ☑ no Seals intact: ☐ yes ☐ no

Custody Seal on Samples Present: ☐ yes ☑ no Seals intact: ☐ yes ☐ no

Packing Material: ☐ Bubble Wrap ☐ Bubble Bags ☐ None Other

Thermometer Used IR Type of Ice: Wet Blue Dry None ☑ Samples on ice, cooling process has begun

Cooler Temperature 0.2 Biological Tissue is Frozen: ☐ yes ☐ no

Temp Blank Present: ☐ yes ☑ no

Optional
Proj. Due Date:
Proj. Name:

Person examining contents:
Date: 10/11/11
Initials: _____

Temp should be above freezing to 6°C for all sample except Biota.
Biota Samples should be received ≤ 0°C.

		Comments:
Chain of Custody Present:	☑Yes ☐No ☐N/A	1.
Chain of Custody Filled Out:	☑Yes ☐No ☐N/A	2.
Chain of Custody Relinquished:	☑Yes ☐No ☐N/A	3.
Sampler Name & Signature on COC:	☑Yes ☐No ☐N/A	4.
Samples Arrived within Hold Time:	☑Yes ☐No ☐N/A	5.
Short Hold Time Analysis (<72hr):	☐Yes ☑No ☐N/A	6.
Rush Turn Around Time Requested:	☑Yes ☐No ☐N/A	7.
Sufficient Volume:	☑Yes ☐No ☐N/A	8.
Correct Containers Used:	☑Yes ☐No ☐N/A	9.
-Pace Containers Used:	☑Yes ☐No ☐N/A	
Containers Intact:	☑Yes ☐No ☐N/A	10.
Filtered volume received for Dissolved tests	☐Yes ☐No ☑N/A	11.
Sample Labels match COC:	☑Yes ☐No ☐N/A	12.
-Includes date/time/ID/Analysis Matrix: S		
All containers needing preservation have been checked.	☐Yes ☐No ☑N/A	13.
All containers needing preservation are found to be in compliance with EPA recommendation.	☐Yes ☐No ☑N/A	
exceptions: VOA, coliform, TOC, O&G, WI-DRO (water)	☐Yes ☐No	Initial when completed / Lot # of added preservative
Samples checked for dechlorination:	☐Yes ☐No ☑N/A	14.
Headspace in VOA Vials (>6mm):	☐Yes ☐No ☑N/A	15.
Trip Blank Present:	☐Yes ☐No ☑N/A	16.
Trip Blank Custody Seals Present	☐Yes ☐No ☑N/A	
Pace Trip Blank Lot # (if purchased):		

Client Notification/ Resolution: Field Data Required? Y / N

Person Contacted: _____ Date/Time: _____

Comments/ Resolution: _____

Project Manager Review: _____ **Date:** 10-11-11

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e out of h incorrect preservative, out of temp, incorrect containers)

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(920)469-2436

October 18, 2011

ALYSSA SELLWOOD
TRC - Madison
744 HEARTLAND TRAIL
Madison, WI 53717

RE: Project: 186467 TASK 2 KEWAUNEE MARSH
Pace Project No.: 4052225

Dear ALYSSA SELLWOOD:
Enclosed are the analytical results for sample(s) received by the laboratory on October 14, 2011. The results relate only to the samples included in this report. Results reported herein conform to the most current TNI standards, where applicable, unless otherwise narrated in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Brian Basten

brian.basten@pacelabs.com
Project Manager

Enclosures

cc: ALEX GOERGEN, TRC - MADISON
BOB STANFORTH, TRC - Madison

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CERTIFICATIONS

Project: 186467 TASK 2 KEWAUNEE MARSH
Pace Project No.: 4052225

Green Bay Certification IDs
1241 Bellevue Street, Green Bay, WI 54302
Florida/NELAP Certification #: E87948
Illinois Certification #: 200050
Kentucky Certification #: 82
Louisiana Certification #: 04168
Minnesota Certification #: 055-999-334
New York Certification #: 11888
North Carolina Certification #: 503
North Dakota Certification #: R-150
South Carolina Certification #: 83006001
US Dept of Agriculture #: S-76505
Wisconsin Certification #: 405132750
Wisconsin DATCP Certification #: 105-444

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SAMPLE SUMMARY

Project: 186467 TASK 2 KEWAUNEE MARSH
Pace Project No.: 4052225

Lab ID	Sample ID	Matrix	Date Collected	Date Received
4052225001	**CELL #12**	Solid	10/14/11 08:35	10/14/11 11:11

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(920)469-2436

SAMPLE ANALYTE COUNT

Project: 186467 TASK 2 KEWAUNEE MARSH
Pace Project No.: 4052225

Lab ID	Sample ID	Method	Analysts	Analytes Reported
4052225001	**CELL #12**	EPA 6010	DLB	1

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ANALYTICAL RESULTS

Project: 186467 TASK 2 KEWAUNEE MARSH
Pace Project No.: 4052225

Sample: CELL #12 **Lab ID: 4052225001** Collected: 10/14/11 08:35 Received: 10/14/11 11:11 Matrix: Solid

Results reported on a "wet-weight" basis

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP, SPLP	Analytical Method: EPA 6010 Preparation Method: EPA 3010								
	Leachate Method/Date: EPA 1312; 10/18/11 06:22								
Arsenic	**0.067**	mg/L	0.050	0.025	1	10/18/11 07:50	10/18/11 13:51	7440-38-2	

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QUALITY CONTROL DATA

Project: 186467 TASK 2 KEWAUNEE MARSH
Pace Project No.: 4052225

QC Batch: MPRP/6094
QC Batch Method: EPA 3010
Analysis Method: EPA 6010
Analysis Description: 6010 MET SPLP
Associated Lab Samples: 4052225001

METHOD BLANK: 520191 Matrix: Water
Associated Lab Samples: 4052225001

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Arsenic	mg/L	<0.025	0.050	10/18/11 13:44	

LABORATORY CONTROL SAMPLE: 520192

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Arsenic	mg/L	.5	0.47	94	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 520193 520194

Parameter	Units	4052225001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Arsenic	mg/L	0.067	.5	.5	0.56	0.55	98	96	75-125	2	20	

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QUALIFIERS

Project: 186467 TASK 2 KEWAUNEE MARSH
Pace Project No.: 4052225

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to changes in sample preparation, dilution of the sample aliquot, or moisture content.

ND - Not Detected at or above adjusted reporting limit.

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

S - Surrogate

1,2-Diphenylhydrazine (8270 listed analyte) decomposes to Azobenzene.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

UPPER MIDWEST REGION
MN: 612-607-1700 WI: 920-469-2436

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www.pacelabs.com

JK

4052225

CHAIN OF CUSTODY

*Preservation Codes
A=None B=HCL C=H2SO4 D=HNO3 E=DI Water F=Methanol G=NaOH
H=Sodium Bisulfate Solution I=Sodium Thiosulfate J=Other

(Please Print Clearly)	
Company Name:	TRC
Branch/Location:	Madison
Project Contact:	Alyssa Sellwood
Phone:	608-826-3658
Project Number:	186467 Task 2
Project Name:	Kewaunee Marsh
Project State:	WI
Sampled By (Print):	Mark Walter
Sampled By (Sign):	Mark Walter
PO #:	Same
Regulatory Program:	

Quote #:	
Mail To Contact:	Alyssa Sellwood
Mail To Company:	TRC
Mail To Address:	708 Heartland Trl Madison, WI 53717
Invoice To Contact:	TRC Accts Payable
Invoice To Company:	TRC
Invoice To Address:	Same (Mail Invoice to PO#)
Invoice To Phone:	

Data Package Options (billable)
☐ EPA Level III
☐ EPA Level IV

MS/MSD
☐ On your sample (billable)
☐ NOT needed on your sample

Matrix Codes
A = Air, B = Biota, C = Charcoal, O = Oil, S = Soil, SI = Sludge, W = Water, DW = Drinking Water, GW = Ground Water, SW = Surface Water, WW = Waste Water, WP = Wipe

PACE LAB #	CLIENT FIELD ID	COLLECTION DATE	COLLECTION TIME	MATRIX	FILTERED? (YES/NO)	PRESERVATION (CODE)*	Preservation Analysis	CLIENT COMMENTS	LAB COMMENTS (Lab Use Only)	Profile #
					Y/N	Pres. Letter				
001	Cell #12	10/14/11	8:35	S	N	A	Arsenic SRP ✓		1-4oz poly A	

Rush Turnaround Time Requested - Prelims
(Rush TAT subject to approval/surcharge)
Date Needed: ~~10/17~~ 10/17-10/18

Transmit Prelim Rush Results by (complete what you want):
Email #1: dsellwood@trcsolutions.com
Email #2: mwalter@trcsolutions.com
Telephone:
Fax:

Samples on HOLD are subject to special pricing and release of liability

Relinquished By:	Date/Time:	Received By:	Date/Time:
Mark Walter Mark Walter	10/14/11	[illegible]	10/14 10:52
[illegible]	10/14 11:11	K. Bullen-Pace	10/14/11 11:15

PACE Project No.: 4052225
Receipt Temp = 1.0 °C
Sample Receipt pH OK / Adjusted
Cooler Custody Seal: Present / Not Present
Intact / Not Intact

Version 6.0 06/14/06

C019a(27Jun2006)

ORIGINAL

Pace Analytical Services, Inc.
1241 Bellevue Street, Suite 9
Green Bay, WI 54302

Pace Analytical

Sample Condition Upon Receipt

Client Name: TRC Project # 4052225

Courier: ☐ Fed Ex ☐ UPS ☐ USPS ☑ Client ☐ Commercial ☐ Pace Other _____

Tracking #: _____

Custody Seal on Cooler/Box Present: ☐ yes ☑ no Seals intact: ☐ yes ☐ no

Custody Seal on Samples Present: ☐ yes ☑ no Seals intact: ☐ yes ☐ no

Packing Material: ☐ Bubble Wrap ☐ Bubble Bags ☐ None (Other)

Thermometer Used MA Type of Ice: (Wet) Blue Dry None ☑ Samples on ice, cooling process has begun

Cooler Temperature MOE Biological Tissue is Frozen: ☐ yes ☐ no

Temp Blank Present: ☐ yes ☑ no

Temp should be above freezing to 6°C for all sample except Biota.
Biota Samples should be received ≤ 0°C.

Person examining contents:
Date: MB 10/14/11
Initials: _____

		Comments:
Chain of Custody Present:	☑Yes ☐No ☐N/A	1.
Chain of Custody Filled Out:	☑Yes ☐No ☐N/A	2.
Chain of Custody Relinquished:	☑Yes ☐No ☐N/A	3.
Sampler Name & Signature on COC:	☑Yes ☐No ☐N/A	4.
Samples Arrived within Hold Time:	☑Yes ☐No ☐N/A	5.
Short Hold Time Analysis (<72hr):	☐Yes ☑No ☐N/A	6.
Rush Turn Around Time Requested:	☐Yes ☑No ☐N/A	7.
Sufficient Volume:	☑Yes ☐No ☐N/A	8.
Correct Containers Used:	☑Yes ☐No ☐N/A	9.
-Pace Containers Used:	☑Yes ☐No ☐N/A	
Containers Intact:	☑Yes ☐No ☐N/A	10.
Filtered volume received for Dissolved tests	☐Yes ☐No ☑N/A	11.
Sample Labels match COC:	☑Yes ☐No ☐N/A	12.
-Includes date/time/ID/Analysis Matrix: S		
All containers needing preservation have been checked.	☐Yes ☐No ☑N/A	13.
All containers needing preservation are found to be in compliance with EPA recommendation.	☐Yes ☐No ☑N/A	
exceptions: VOA, coliform, TOC, O&G, WI-DRO (water)	☐Yes ☐No	Initial when completed / Lot # of added preservative
Samples checked for dechlorination:	☐Yes ☐No ☑N/A	14.
Headspace in VOA Vials (>6mm):	☐Yes ☐No ☑N/A	15.
Trip Blank Present:	☐Yes ☐No ☑N/A	16.
Trip Blank Custody Seals Present	☐Yes ☐No ☑N/A	
Pace Trip Blank Lot # (if purchased): _____		

Client Notification/ Resolution: Field Data Required? Y / N

Person Contacted: _____ Date/Time: _____

Comments/ Resolution: _____

Project Manager Review: _____ Date: 10-14-11

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e. out of incorrect preservative, out of temp, incorrect containers)

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1241 Bellevue Street - Suite 9
Green Bay, WI 54302
(920)469-2436

October 19, 2011

ALYSSA SELLWOOD
TRC - Madison
744 HEARTLAND TRAIL
Madison, WI 53717

RE: Project: 186467 PH2 KEWAUNEE MARSH
Pace Project No.: 4052347

Dear ALYSSA SELLWOOD:
Enclosed are the analytical results for sample(s) received by the laboratory on October 17, 2011. The results relate only to the samples included in this report. Results reported herein conform to the most current TNI standards, where applicable, unless otherwise narrated in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Brian Basten

brian.basten@pacelabs.com
Project Manager

Enclosures

cc: ALEX GOERGEN, TRC - MADISON
BOB STANFORTH, TRC - Madison

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CERTIFICATIONS

Project: 186467 PH2 KEWAUNEE MARSH
Pace Project No.: 4052347

Green Bay Certification IDs
1241 Bellevue Street, Green Bay, WI 54302
Florida/NELAP Certification #: E87948
Illinois Certification #: 200050
Kentucky Certification #: 82
Louisiana Certification #: 04168
Minnesota Certification #: 055-999-334
New York Certification #: 11888
North Carolina Certification #: 503
North Dakota Certification #: R-150
South Carolina Certification #: 83006001
US Dept of Agriculture #: S-76505
Wisconsin Certification #: 405132750
Wisconsin DATCP Certification #: 105-444

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SAMPLE SUMMARY

Project: 186467 PH2 KEWAUNEE MARSH
Pace Project No.: 4052347

Lab ID	Sample ID	Matrix	Date Collected	Date Received
4052347001	**CELL #19**	Solid	10/17/11 12:45	10/17/11 13:40

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SAMPLE ANALYTE COUNT

Project: 186467 PH2 KEWAUNEE MARSH
Pace Project No.: 4052347

Lab ID	Sample ID	Method	Analysts	Analytes Reported
4052347001	**CELL #19**	EPA 6010	DLB	1
		ASTM D2974-87	KMF	1

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ANALYTICAL RESULTS

Project: 186467 PH2 KEWAUNEE MARSH
Pace Project No.: 4052347

Sample: CELL #19 **Lab ID: 4052347001** Collected: 10/17/11 12:45 Received: 10/17/11 13:40 Matrix: Solid

Results reported on a "dry-weight" basis

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP, SPLP	Analytical Method: EPA 6010 Preparation Method: EPA 3010								
	Leachate Method/Date: EPA 1312; 10/18/11 06:22								
Arsenic	**0.46**	mg/L	0.050	0.025	1	10/18/11 07:50	10/18/11 14:03	7440-38-2	
Percent Moisture	Analytical Method: ASTM D2974-87								
Percent Moisture	**17.4**	%	0.10	0.10	1		10/19/11 08:03		

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QUALITY CONTROL DATA

Project: 186467 PH2 KEWAUNEE MARSH
Pace Project No.: 4052347

QC Batch: MPRP/6094
QC Batch Method: EPA 3010
Analysis Method: EPA 6010
Analysis Description: 6010 MET SPLP
Associated Lab Samples: 4052347001

METHOD BLANK: 520191 Matrix: Water
Associated Lab Samples: 4052347001

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Arsenic	mg/L	<0.025	0.050	10/18/11 13:44	

LABORATORY CONTROL SAMPLE: 520192

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Arsenic	mg/L	.5	0.47	94	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 520193 520194

Parameter	Units	4052225001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Arsenic	mg/L	0.067	.5	.5	0.56	0.55	98	96	75-125	2	20	

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QUALITY CONTROL DATA

Project: 186467 PH2 KEWAUNEE MARSH
Pace Project No.: 4052347

QC Batch: PMST/6206
QC Batch Method: ASTM D2974-87
Analysis Method: ASTM D2974-87
Analysis Description: Dry Weight/Percent Moisture
Associated Lab Samples: 4052347001

SAMPLE DUPLICATE: 520183

Parameter	Units	4051795001 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	19.3	18.9	2	10	

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QUALIFIERS

Project: 186467 PH2 KEWAUNEE MARSH
Pace Project No.: 4052347

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to changes in sample preparation, dilution of the sample aliquot, or moisture content.

ND - Not Detected at or above adjusted reporting limit.

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

S - Surrogate

1,2-Diphenylhydrazine (8270 listed analyte) decomposes to Azobenzene.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

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CHAIN OF CUSTODY

UPPER MIDWEST REGION
MN: 612-607-1700 WI: 920-469-2436

4052347

*Preservation Codes
A=None B=HCL C=H2SO4 D=HNO3 E=DI Water F=Methanol G=NaOH
H=Sodium Bisulfate Solution I=Sodium Thiosulfate J=Other

(Please Print Clearly)

Company Name:	TRC
Branch/Location:	Madison
Project Contact:	Alyssa Sellwood
Phone:	608-826-3658
Project Number:	186467 Ph 2
Project Name:	Kewaunee Marsh
Project State:	WI
Sampled By (Print):	Mark Walter
Sampled By (Sign):	[signature]
PO #:	Same
Regulatory Program:	

Quote #:	
Mail To Contact:	Alyssa Sellwood
Mail To Company:	TRC
Mail To Address:	708 Heartland Trl Madison, WI 53717
Invoice To Contact:	TRC Accts Payable
Invoice To Company:	TRC
Invoice To Address:	(Invoice to PO#)
Invoice To Phone:	

Data Package Options (billable): ☐ EPA Level III ☐ EPA Level IV

MS/MSD: ☐ On your sample (billable) ☐ NOT needed on your sample

Matrix Codes: A = Air, B = Biota, C = Charcoal, O = Oil, S = Soil, Sl = Sludge, W = Water, DW = Drinking Water, GW = Ground Water, SW = Surface Water, WW = Waste Water, WP = Wipe

FILTERED? (YES/NO): N
PRESERVATION (CODE)*: A
Analyses Requested: Arsenic SPLP

PACE LAB #	CLIENT FIELD ID	COLLECTION DATE	COLLECTION TIME	MATRIX	Arsenic SPLP	CLIENT COMMENTS	LAB COMMENTS (Lab Use Only)	Profile #
001	Cell #19	10/17/11	12:45	S	✓		1-4oz pA	

Rush Turnaround Time Requested - Prelims
(Rush TAT subject to approval/surcharge)
Date Needed: 10/19/11

Transmit Prelim Rush Results by (complete what you want):

Email #1:	asellwood@trcsolutions.com
Email #2:	mwalter@trcsolutions.com
Telephone:	
Fax:	

Samples on HOLD are subject to special pricing and release of liability

Relinquished By:	Date/Time:	Received By:	Date/Time:
Mark Walter [signature]	10/17/11 13:40	Mmuelko Pace	10/17/11 1340

PACE Project No. 4052347
Receipt Temp = ROI °C
Sample Receipt pH OK / Adjusted
Cooler Custody Seal Present / Not Present Intact / Not Intact

Version 6.0 06/14/06

C019a(27Jun2006)

ORIGINAL

Pace Analytical Services, Inc.
1241 Bellevue Street, Suite 9
Green Bay, WI 54302

Pace Analytical

Sample Condition Upon Receipt

Client Name: TRC Madison Project # 4052347

Courier: ☐ Fed Ex ☐ UPS ☐ USPS ☑ Client ☐ Commercial ☐ Pace Other _____

Tracking #: _____

Custody Seal on Cooler/Box Present: ☐ yes ☑ no Seals intact: ☐ yes ☑ no

Custody Seal on Samples Present: ☐ yes ☑ no Seals intact: ☐ yes ☑ no

Packing Material: ☐ Bubble Wrap ☐ Bubble Bags ☑ None Other

Thermometer Used N/A Type of Ice: (Wet) Blue Dry None ☑ Samples on ice, cooling process has begun

Cooler Temperature ROI Biological Tissue is Frozen: ☐ yes ☐ no

Temp Blank Present: ☐ yes ☑ no

Temp should be above freezing to 6°C for all sample except Biota.
Biota Samples should be received ≤ 0°C.

Comments:

Person examining contents:
Date: 10/17/11
Initials: KM

Chain of Custody Present:	☑Yes	☐No	☐N/A 1.
Chain of Custody Filled Out:	☑Yes	☐No	☐N/A 2.
Chain of Custody Relinquished:	☑Yes	☐No	☐N/A 3.
Sampler Name & Signature on COC:	☑Yes	☐No	☐N/A 4.
Samples Arrived within Hold Time:	☑Yes	☐No	☐N/A 5.
Short Hold Time Analysis (<72hr):	☐Yes	☑No	☐N/A 6.
Rush Turn Around Time Requested:	☑Yes	☐No	☐N/A 7. KM 10/17
Sufficient Volume:	☑Yes	☐No	☐N/A 8.
Correct Containers Used:	☑Yes	☐No	☐N/A 9.
-Pace Containers Used:	☑Yes	☐No	☐N/A
Containers Intact:	☑Yes	☐No	☐N/A 10.
Filtered volume received for Dissolved tests	☐Yes	☐No	☑N/A 11.
Sample Labels match COC:	☑Yes	☐No	☐N/A 12.
-Includes date/time/ID/Analysis Matrix: S			
All containers needing preservation have been checked.	☐Yes	☐No	☑N/A 13.
All containers needing preservation are found to be in compliance with EPA recommendation.	☐Yes	☐No	☑N/A
exceptions: VOA, coliform, TOC, O&G, WI-DRO (water)	☐Yes	☐No	Initial when completed / Lot # of added preservative
Samples checked for dechlorination:	☐Yes	☐No	☑N/A 14.
Headspace in VOA Vials (>6mm):	☐Yes	☐No	☑N/A 15.
Trip Blank Present:	☐Yes	☐No	☑N/A 16.
Trip Blank Custody Seals Present	☐Yes	☐No	☑N/A
Pace Trip Blank Lot # (if purchased):			

Client Notification/ Resolution: Field Data Required? Y / N

Person Contacted: _____ Date/Time: _____

Comments/ Resolution: _____

Project Manager Review: _____ Date: 10-17-11

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e. out of hold, incorrect preservative, out of temp, incorrect containers)

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(920)469-2436

October 21, 2011

ALYSSA SELLWOOD
TRC - Madison
744 HEARTLAND TRAIL
Madison, WI 53717

RE: Project: 186467 PH 2 KEWAUNEE MARSH
Pace Project No.: 4052421

Dear ALYSSA SELLWOOD:
Enclosed are the analytical results for sample(s) received by the laboratory on October 19, 2011. The results relate only to the samples included in this report. Results reported herein conform to the most current TNI standards, where applicable, unless otherwise narrated in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Brian Basten

brian.basten@pacelabs.com
Project Manager

Enclosures

cc: ALEX GOERGEN, TRC - MADISON
BOB STANFORTH, TRC - Madison

Pace Analytical Services, Inc.
1241 Bellevue Street - Suite 9
Green Bay, WI 54302
(920)469-2436

CERTIFICATIONS

Project: 186467 PH 2 KEWAUNEE MARSH
Pace Project No.: 4052421

Green Bay Certification IDs
1241 Bellevue Street, Green Bay, WI 54302
Florida/NELAP Certification #: E87948
Illinois Certification #: 200050
Kentucky Certification #: 82
Louisiana Certification #: 04168
Minnesota Certification #: 055-999-334
New York Certification #: 11888
North Carolina Certification #: 503
North Dakota Certification #: R-150
South Carolina Certification #: 83006001
US Dept of Agriculture #: S-76505
Wisconsin Certification #: 405132750
Wisconsin DATCP Certification #: 105-444

Pace Analytical Services, Inc.
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Green Bay, WI 54302
(920)469-2436

SAMPLE SUMMARY

Project: 186467 PH 2 KEWAUNEE MARSH
Pace Project No.: 4052421

Lab ID	Sample ID	Matrix	Date Collected	Date Received
4052421001	**CELL #22 PEAT**	Solid	10/18/11 07:45	10/19/11 09:12
4052421002	**CELL #23 BALLAST**	Solid	10/18/11 13:30	10/19/11 09:12

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Green Bay, WI 54302
(920)469-2436

SAMPLE ANALYTE COUNT

Project: 186467 PH 2 KEWAUNEE MARSH
Pace Project No.: 4052421

Lab ID	Sample ID	Method	Analysts	Analytes Reported
4052421001	**CELL #22 PEAT**	EPA 6010	DLB	1
4052421002	**CELL #23 BALLAST**	EPA 6010	DLB	1

Pace Analytical Services, Inc.
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(920)469-2436

ANALYTICAL RESULTS

Project: 186467 PH 2 KEWAUNEE MARSH
Pace Project No.: 4052421

Sample: CELL #22 PEAT **Lab ID: 4052421001** Collected: 10/18/11 07:45 Received: 10/19/11 09:12 Matrix: Solid

Results reported on a "dry-weight" basis

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP, SPLP	Analytical Method: EPA 6010 Preparation Method: EPA 3010								
	Leachate Method/Date: EPA 1312; 10/19/11 00:00								
Arsenic	**0.19**	mg/L	0.050	0.025	1	10/20/11 10:30	10/21/11 13:11	7440-38-2	

Sample: CELL #23 BALLAST **Lab ID: 4052421002** Collected: 10/18/11 13:30 Received: 10/19/11 09:12 Matrix: Solid

Results reported on a "wet-weight" basis

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP, SPLP	Analytical Method: EPA 6010 Preparation Method: EPA 3010								
	Leachate Method/Date: EPA 1312; 10/19/11 00:00								
Arsenic	**17.6**	mg/L	0.050	0.025	1	10/20/11 10:30	10/21/11 13:15	7440-38-2	

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(920)469-2436

QUALITY CONTROL DATA

Project: 186467 PH 2 KEWAUNEE MARSH
Pace Project No.: 4052421

QC Batch: MPRP/6110
QC Batch Method: EPA 3010
Analysis Method: EPA 6010
Analysis Description: 6010 MET SPLP
Associated Lab Samples: 4052421001, 4052421002

METHOD BLANK: 521408 Matrix: Water
Associated Lab Samples: 4052421001, 4052421002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Arsenic	mg/L	<0.025	0.050	10/21/11 12:05	

LABORATORY CONTROL SAMPLE: 521409

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Arsenic	mg/L	.5	0.47	95	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 521410 521411

Parameter	Units	4052330007 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Arsenic	mg/L	0.49	.5	.5	0.96	0.96	95	94	75-125	.3	20	

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QUALIFIERS

Project: 186467 PH 2 KEWAUNEE MARSH
Pace Project No.: 4052421

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to changes in sample preparation, dilution of the sample aliquot, or moisture content.

ND - Not Detected at or above adjusted reporting limit.

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

S - Surrogate

1,2-Diphenylhydrazine (8270 listed analyte) decomposes to Azobenzene.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

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UPPER MIDWEST REGION
MN: 612-607-1700 WI: 920-469-2436

Page 1 of

4052421

JK

CHAIN OF CUSTODY

*Preservation Codes
A=None B=HCL C=H2SO4 D=HNO3 E=DI Water F=Methanol G=NaOH
H=Sodium Bisulfate Solution I=Sodium Thiosulfate J=Other

(Please Print Clearly)	
Company Name:	TRC
Branch/Location:	Madison
Project Contact:	Alyssa Sellwood
Phone:	608-826-3658
Project Number:	186467 Ph 2.
Project Name:	Kewaunee Marsh
Project State:	WI
Sampled By (Print):	Mark Walter
Sampled By (Sign):	
PO #:	Same
Regulatory Program:	

Quote #:	
Mail To Contact:	Alyssa Sellwood
Mail To Company:	TRC
Mail To Address:	708 Heartland Trl Madison, WI 53717
Invoice To Contact:	PO#
Invoice To Company:	TRC
Invoice To Address:	PO#
Invoice To Phone:	

Data Package Options (billable)
☐ EPA Level III
☐ EPA Level IV

MS/MSD
☐ On your sample (billable)
☐ NOT needed on your sample

Matrix Codes
A = Air, B = Biota, C = Charcoal, O = Oil, S = Soil, SI = Sludge, W = Water, DW = Drinking Water, GW = Ground Water, SW = Surface Water, WW = Waste Water, WP = Wipe

PACE LAB #	CLIENT FIELD ID	COLLECTION DATE	COLLECTION TIME	MATRIX	FILTERED? (YES/NO)	PRESERVATION (CODE)*	Analyses Requested	CLIENT COMMENTS	LAB COMMENTS (Lab Use Only)	Profile #
					N	A	Arsenic SPLP			
001	Cell #22 Peat	10/18/11	7:45AM	S	✓				1-4oz poly	
002	Cell #23 Ballast	10/18/11	1:30PM	S	✓					

Rush Turnaround Time Requested ( ) Prelims
(Rush TAT subject to approval/surcharge)
Date Needed: 10/21/11

Transmit Prelim Rush Results by (complete what you want):
Email #1: asellwood@trcsolutions.com
Email #2: mwalter@trcsolutions.com
Telephone:
Fax:

Samples on HOLD are subject to special pricing and release of liability

Relinquished By:	Date/Time:	Received By:	Date/Time:
Mark Walter	10/19/11		
	10/19/11 9:12		10/19/11 9:12

PACE Project No.: 4052421

Receipt Temp = 2.0 °C

Sample Receipt pH OK / Adjusted

Cooler Custody Seal Present / Not Present Intact / Not Intact

Version 6.0 06/14/06

C019a(27Jun2006)

ORIGINAL

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Pace Analytical

Sample Condition Upon Receipt

Client Name: TRC Project # 4052421

Courier: ☐ Fed Ex ☐ UPS ☐ USPS ☑ Client ☐ Commercial ☐ Pace Other ______

Tracking #: ______

Custody Seal on Cooler/Box Present: ☐ yes ☑ no Seals intact: ☐ yes ☐ no

Custody Seal on Samples Present: ☐ yes ☑ no Seals intact: ☐ yes ☐ no

Optional
Proj. Due Date:
Proj. Name:

Packing Material: ☐ Bubble Wrap ☐ Bubble Bags ☐ None (Other)

Thermometer Used: NA Type of Ice: (Wet) Blue Dry None ☑ Samples on ice, cooling process has begun

Cooler Temperature: [illegible] Biological Tissue is Frozen: ☐ yes ☐ no

Temp Blank Present: ☐ yes ☑ no

Temp should be above freezing to 6°C for all sample except Biota.
Biota Samples should be received ≤ 0°C.

Person examining contents:
Date: 10/19/11
Initials: [illegible]

		Comments:
Chain of Custody Present:	☑Yes ☐No ☐N/A	1.
Chain of Custody Filled Out:	☑Yes ☐No ☐N/A	2.
Chain of Custody Relinquished:	☑Yes ☐No ☐N/A	3.
Sampler Name & Signature on COC:	☑Yes ☐No ☐N/A	4.
Samples Arrived within Hold Time:	☑Yes ☐No ☐N/A	5.
Short Hold Time Analysis (<72hr):	☐Yes ☑No ☐N/A	6.
Rush Turn Around Time Requested:	☑Yes ☐No ☐N/A	7.
Sufficient Volume:	☑Yes ☐No ☐N/A	8.
Correct Containers Used:	☑Yes ☐No ☐N/A	9.
-Pace Containers Used:	☑Yes ☐No ☐N/A	
Containers Intact:	☑Yes ☐No ☐N/A	10.
Filtered volume received for Dissolved tests	☐Yes ☐No ☑N/A	11.
Sample Labels match COC:	☑Yes ☐No ☐N/A	12.
-Includes date/time/ID/Analysis Matrix: S		
All containers needing preservation have been checked.	☐Yes ☐No ☑N/A	13.
All containers needing preservation are found to be in compliance with EPA recommendation.	☐Yes ☐No ☑N/A	
exceptions: VOA, coliform, TOC, O&G, WI-DRO (water)	☐Yes ☐No	Initial when completed / Lot # of added preservative
Samples checked for dechlorination:	☐Yes ☐No ☑N/A	14.
Headspace in VOA Vials (>6mm):	☐Yes ☐No ☑N/A	15.
Trip Blank Present:	☐Yes ☐No ☑N/A	16.
Trip Blank Custody Seals Present	☐Yes ☐No ☑N/A	
Pace Trip Blank Lot # (if purchased): ______		

Client Notification/ Resolution: Field Data Required? Y / N

Person Contacted: ______ Date/Time: ______

Comments/ Resolution: ______

Project Manager Review: [signature] Date: 10-19-11

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e out of incorrect preservative, out of temp, incorrect containers)

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November 30, 2011

ALYSSA SELLWOOD
TRC - Madison
744 HEARTLAND TRAIL
Madison, WI 53717

RE: Project: 186467 KEWAUNEE MARSH
Pace Project No.: 4053755

Dear ALYSSA SELLWOOD:
Enclosed are the analytical results for sample(s) received by the laboratory on November 17, 2011. The results relate only to the samples included in this report. Results reported herein conform to the most current TNI standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Brian Basten

brian.basten@pacelabs.com
Project Manager

Enclosures

cc: ALEX GOERGEN, TRC - MADISON
BOB STANFORTH, TRC - Madison

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CERTIFICATIONS

Project: 186467 KEWAUNEE MARSH
Pace Project No.: 4053755

Green Bay Certification IDs
1241 Bellevue Street, Green Bay, WI 54302
Florida/NELAP Certification #: E87948
Illinois Certification #: 200050
Kentucky Certification #: 82
Louisiana Certification #: 04168
Minnesota Certification #: 055-999-334
New York Certification #: 11888
North Carolina Certification #: 503
North Dakota Certification #: R-150
South Carolina Certification #: 83006001
US Dept of Agriculture #: S-76505
Wisconsin Certification #: 405132750
Wisconsin DATCP Certification #: 105-444

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SAMPLE SUMMARY

Project: 186467 KEWAUNEE MARSH
Pace Project No.: 4053755

Lab ID	Sample ID	Matrix	Date Collected	Date Received
4053755001	GW01-2	Water	11/14/11 13:45	11/17/11 09:00
4053755002	MW02-1	Water	11/14/11 11:05	11/17/11 09:00
4053755003	MW02-1I	Water	11/14/11 11:10	11/17/11 09:00
4053755004	MW02-1D	Water	11/14/11 11:00	11/17/11 09:00
4053755005	MW02-3	Water	11/14/11 12:50	11/17/11 09:00
4053755006	MW02-3I	Water	11/14/11 13:15	11/17/11 09:00
4053755007	MW02-3D	Water	11/15/11 09:20	11/17/11 09:00
4053755008	MW02-8	Water	11/14/11 13:00	11/17/11 09:00
4053755009	MW02-8I	Water	11/14/11 13:05	11/17/11 09:00
4053755010	MW04-9	Water	11/14/11 15:00	11/17/11 09:00
4053755011	MW04-11	Water	11/15/11 08:30	11/17/11 09:00
4053755012	MW11-1	Water	11/15/11 10:25	11/17/11 09:00
4053755013	MW11-1I	Water	11/15/11 10:30	11/17/11 09:00
4053755014	MW11-2	Water	11/15/11 09:00	11/17/11 09:00
4053755015	MW11-3	Water	11/14/11 14:45	11/17/11 09:00
4053755016	MW11-3I	Water	11/14/11 15:05	11/17/11 09:00

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SAMPLE ANALYTE COUNT

Project: 186467 KEWAUNEE MARSH
Pace Project No.: 4053755

Lab ID	Sample ID	Method	Analysts	Analytes Reported
4053755001	GW01-2	EPA 6010	DLB	3
		EPA 300.0	JCJ	1
4053755002	MW02-1	EPA 6010	DLB	3
4053755003	MW02-1I	EPA 6010	DLB	3
4053755004	MW02-1D	EPA 6010	DLB	3
4053755005	MW02-3	EPA 6010	DLB	3
		EPA 300.0	JCJ	1
4053755006	MW02-3I	EPA 6010	DLB	3
		EPA 300.0	JCJ	1
4053755007	MW02-3D	EPA 6010	DLB	3
		EPA 300.0	JCJ	1
4053755008	MW02-8	EPA 6010	DLB	3
4053755009	MW02-8I	EPA 6010	DLB	3
4053755010	MW04-9	EPA 6010	DLB	3
		EPA 300.0	JCJ	1
4053755011	MW04-11	EPA 6010	DLB	3
		EPA 300.0	JCJ	1
4053755012	MW11-1	EPA 6010	DLB	3
		EPA 300.0	JCJ	1
4053755013	MW11-1I	EPA 6010	DLB	3
		EPA 300.0	JCJ	1
4053755014	MW11-2	EPA 6010	DLB	3
		EPA 300.0	JCJ	1
4053755015	MW11-3	EPA 6010	DLB	3
		EPA 300.0	JCJ	1
4053755016	MW11-3I	EPA 6010	DLB	3
		EPA 300.0	JCJ	1

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ANALYTICAL RESULTS

Project: 186467 KEWAUNEE MARSH
Pace Project No.: 4053755

Sample: GW01-2 **Lab ID: 4053755001** Collected: 11/14/11 13:45 Received: 11/17/11 09:00 Matrix: Water

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP, Dissolved	Analytical Method: EPA 6010								
Arsenic, Dissolved	**143**	ug/L	20.0	2.0	1		11/21/11 16:33	7440-38-2	
Calcium, Dissolved	**96900**	ug/L	200	6.1	1		11/21/11 16:33	7440-70-2	
Iron, Dissolved	**1080**	ug/L	100	3.3	1		11/21/11 16:33	7439-89-6	
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0								
Sulfate	**<2.0**	mg/L	4.0	2.0	1		11/28/11 20:14	14808-79-8	

Sample: MW02-1 **Lab ID: 4053755002** Collected: 11/14/11 11:05 Received: 11/17/11 09:00 Matrix: Water

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP, Dissolved	Analytical Method: EPA 6010								
Arsenic, Dissolved	**11.9J**	ug/L	20.0	2.0	1		11/21/11 16:45	7440-38-2	
Calcium, Dissolved	**135000**	ug/L	200	6.1	1		11/21/11 16:45	7440-70-2	
Iron, Dissolved	**4960**	ug/L	100	3.3	1		11/21/11 16:45	7439-89-6	

Sample: MW02-1I **Lab ID: 4053755003** Collected: 11/14/11 11:10 Received: 11/17/11 09:00 Matrix: Water

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP, Dissolved	Analytical Method: EPA 6010								
Arsenic, Dissolved	**11.2J**	ug/L	20.0	2.0	1		11/21/11 16:49	7440-38-2	
Calcium, Dissolved	**115000**	ug/L	200	6.1	1		11/21/11 16:49	7440-70-2	
Iron, Dissolved	**1060**	ug/L	100	3.3	1		11/21/11 16:49	7439-89-6	

Sample: MW02-1D **Lab ID: 4053755004** Collected: 11/14/11 11:00 Received: 11/17/11 09:00 Matrix: Water

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP, Dissolved	Analytical Method: EPA 6010								
Arsenic, Dissolved	**6.7J**	ug/L	20.0	2.0	1		11/21/11 16:53	7440-38-2	
Calcium, Dissolved	**92000**	ug/L	200	6.1	1		11/21/11 16:53	7440-70-2	
Iron, Dissolved	**1280**	ug/L	100	3.3	1		11/21/11 16:53	7439-89-6	

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ANALYTICAL RESULTS

Project: 186467 KEWAUNEE MARSH
Pace Project No.: 4053755

Sample: MW02-3 **Lab ID: 4053755005** Collected: 11/14/11 12:50 Received: 11/17/11 09:00 Matrix: Water

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP, Dissolved	Analytical Method: EPA 6010								
Arsenic, Dissolved	**91.4**	ug/L	20.0	2.0	1		11/21/11 16:57	7440-38-2	
Calcium, Dissolved	**137000**	ug/L	200	6.1	1		11/21/11 16:57	7440-70-2	
Iron, Dissolved	**2370**	ug/L	100	3.3	1		11/21/11 16:57	7439-89-6	
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0								
Sulfate	**9.5**	mg/L	4.0	2.0	1		11/28/11 20:57	14808-79-8	

Sample: MW02-3I **Lab ID: 4053755006** Collected: 11/14/11 13:15 Received: 11/17/11 09:00 Matrix: Water

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP, Dissolved	Analytical Method: EPA 6010								
Arsenic, Dissolved	**16.0J**	ug/L	20.0	2.0	1		11/21/11 17:01	7440-38-2	
Calcium, Dissolved	**160000**	ug/L	200	6.1	1		11/21/11 17:01	7440-70-2	
Iron, Dissolved	**5940**	ug/L	100	3.3	1		11/21/11 17:01	7439-89-6	
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0								
Sulfate	**<2.0**	mg/L	4.0	2.0	1		11/28/11 21:11	14808-79-8	

Sample: MW02-3D **Lab ID: 4053755007** Collected: 11/15/11 09:20 Received: 11/17/11 09:00 Matrix: Water

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP, Dissolved	Analytical Method: EPA 6010								
Arsenic, Dissolved	**4.0J**	ug/L	20.0	2.0	1		11/21/11 17:05	7440-38-2	
Calcium, Dissolved	**71200**	ug/L	200	6.1	1		11/21/11 17:05	7440-70-2	
Iron, Dissolved	**226**	ug/L	100	3.3	1		11/21/11 17:05	7439-89-6	
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0								
Sulfate	**2.5J**	mg/L	4.0	2.0	1		11/28/11 21:25	14808-79-8	

Sample: MW02-8 **Lab ID: 4053755008** Collected: 11/14/11 13:00 Received: 11/17/11 09:00 Matrix: Water

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP, Dissolved	Analytical Method: EPA 6010								
Arsenic, Dissolved	**178**	ug/L	20.0	2.0	1		11/21/11 17:09	7440-38-2	
Calcium, Dissolved	**134000**	ug/L	200	6.1	1		11/21/11 17:09	7440-70-2	
Iron, Dissolved	**880**	ug/L	100	3.3	1		11/21/11 17:09	7439-89-6	

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ANALYTICAL RESULTS

Project: 186467 KEWAUNEE MARSH
Pace Project No.: 4053755

Sample: MW02-8I **Lab ID: 4053755009** Collected: 11/14/11 13:05 Received: 11/17/11 09:00 Matrix: Water

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP, Dissolved	Analytical Method: EPA 6010								
Arsenic, Dissolved	**11.5J**	ug/L	20.0	2.0	1		11/21/11 17:13	7440-38-2	
Calcium, Dissolved	**150000**	ug/L	200	6.1	1		11/21/11 17:13	7440-70-2	
Iron, Dissolved	**2730**	ug/L	100	3.3	1		11/21/11 17:13	7439-89-6	

Sample: MW04-9 **Lab ID: 4053755010** Collected: 11/14/11 15:00 Received: 11/17/11 09:00 Matrix: Water

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP, Dissolved	Analytical Method: EPA 6010								
Arsenic, Dissolved	**42.8**	ug/L	20.0	2.0	1		11/21/11 17:17	7440-38-2	
Calcium, Dissolved	**148000**	ug/L	200	6.1	1		11/21/11 17:17	7440-70-2	
Iron, Dissolved	**572**	ug/L	100	3.3	1		11/21/11 17:17	7439-89-6	
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0								
Sulfate	**<2.0**	mg/L	4.0	2.0	1		11/28/11 21:40	14808-79-8	

Sample: MW04-11 **Lab ID: 4053755011** Collected: 11/15/11 08:30 Received: 11/17/11 09:00 Matrix: Water

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP, Dissolved	Analytical Method: EPA 6010								
Arsenic, Dissolved	**6.8J**	ug/L	20.0	2.0	1		11/21/11 17:21	7440-38-2	
Calcium, Dissolved	**152000**	ug/L	200	6.1	1		11/21/11 17:21	7440-70-2	
Iron, Dissolved	**433**	ug/L	100	3.3	1		11/21/11 17:21	7439-89-6	
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0								
Sulfate	**2.1J**	mg/L	4.0	2.0	1		11/28/11 22:22	14808-79-8	

Sample: MW11-1 **Lab ID: 4053755012** Collected: 11/15/11 10:25 Received: 11/17/11 09:00 Matrix: Water

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP, Dissolved	Analytical Method: EPA 6010								
Arsenic, Dissolved	**304000**	ug/L	200	20.0	10		11/23/11 03:22	7440-38-2	
Calcium, Dissolved	**590000**	ug/L	2000	61.4	10		11/23/11 03:22	7440-70-2	
Iron, Dissolved	**112000**	ug/L	100	3.3	1		11/21/11 17:32	7439-89-6	
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0								
Sulfate	**3340**	mg/L	400	200	100		11/29/11 18:09	14808-79-8	

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ANALYTICAL RESULTS

Project: 186467 KEWAUNEE MARSH
Pace Project No.: 4053755

Sample: MW11-1I **Lab ID: 4053755013** Collected: 11/15/11 10:30 Received: 11/17/11 09:00 Matrix: Water

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP, Dissolved	Analytical Method: EPA 6010								
Arsenic, Dissolved	**121000**	ug/L	200	20.0	10		11/23/11 03:26	7440-38-2	
Calcium, Dissolved	**128000**	ug/L	200	6.1	1		11/21/11 17:37	7440-70-2	
Iron, Dissolved	**3940**	ug/L	100	3.3	1		11/21/11 17:37	7439-89-6	
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0								
Sulfate	**124**	mg/L	20.0	10.0	5		11/29/11 18:23	14808-79-8	

Sample: MW11-2 **Lab ID: 4053755014** Collected: 11/15/11 09:00 Received: 11/17/11 09:00 Matrix: Water

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP, Dissolved	Analytical Method: EPA 6010								
Arsenic, Dissolved	**108000**	ug/L	200	20.0	10		11/23/11 03:30	7440-38-2	
Calcium, Dissolved	**429000**	ug/L	200	6.1	1		11/21/11 17:41	7440-70-2	
Iron, Dissolved	**165000**	ug/L	100	3.3	1		11/21/11 17:41	7439-89-6	
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0								
Sulfate	**3120**	mg/L	400	200	100		11/29/11 18:38	14808-79-8	

Sample: MW11-3 **Lab ID: 4053755015** Collected: 11/14/11 14:45 Received: 11/17/11 09:00 Matrix: Water

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP, Dissolved	Analytical Method: EPA 6010								
Arsenic, Dissolved	**360000**	ug/L	200	20.0	10		11/23/11 03:34	7440-38-2	
Calcium, Dissolved	**285000**	ug/L	200	6.1	1		11/21/11 17:45	7440-70-2	
Iron, Dissolved	**1280**	ug/L	100	3.3	1		11/21/11 17:45	7439-89-6	
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0								
Sulfate	**<2.0**	mg/L	4.0	2.0	1		11/28/11 23:19	14808-79-8	

Sample: MW11-3I **Lab ID: 4053755016** Collected: 11/14/11 15:05 Received: 11/17/11 09:00 Matrix: Water

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP, Dissolved	Analytical Method: EPA 6010								
Arsenic, Dissolved	**153000**	ug/L	200	20.0	10		11/23/11 03:38	7440-38-2	
Calcium, Dissolved	**154000**	ug/L	200	6.1	1		11/21/11 17:49	7440-70-2	
Iron, Dissolved	**3770**	ug/L	100	3.3	1		11/21/11 17:49	7439-89-6	

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ANALYTICAL RESULTS

Project: 186467 KEWAUNEE MARSH
Pace Project No.: 4053755

Sample: MW11-3I **Lab ID: 4053755016** Collected: 11/14/11 15:05 Received: 11/17/11 09:00 Matrix: Water

Parameters	Results	Units	LOQ	LOD	DF	Prepared	Analyzed	CAS No.	Qual
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0								
Sulfate	**15.9**	mg/L	4.0	2.0	1		11/28/11 23:33	14808-79-8	

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QUALITY CONTROL DATA

Project: 186467 KEWAUNEE MARSH
Pace Project No.: 4053755

QC Batch: ICP/5319 Analysis Method: EPA 6010
QC Batch Method: EPA 6010 Analysis Description: ICP Metals, Trace, Dissolved
Associated Lab Samples: 4053755001, 4053755002, 4053755003, 4053755004, 4053755005, 4053755006, 4053755007, 4053755008, 4053755009, 4053755010, 4053755011, 4053755012, 4053755013, 4053755014, 4053755015, 4053755016

METHOD BLANK: 537399 Matrix: Water
Associated Lab Samples: 4053755001, 4053755002, 4053755003, 4053755004, 4053755005, 4053755006, 4053755007, 4053755008, 4053755009, 4053755010, 4053755011, 4053755012, 4053755013, 4053755014, 4053755015, 4053755016

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Arsenic, Dissolved	ug/L	<2.0	20.0	11/21/11 16:06	
Calcium, Dissolved	ug/L	6.5J	200	11/21/11 16:06	
Iron, Dissolved	ug/L	<3.3	100	11/21/11 16:06	

LABORATORY CONTROL SAMPLE: 537400

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Arsenic, Dissolved	ug/L	500	480	96	80-120	
Calcium, Dissolved	ug/L	5000	4810	96	80-120	
Iron, Dissolved	ug/L	5000	4850	97	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 537401 537402

Parameter	Units	4053702006 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Arsenic, Dissolved	ug/L	<2.0	500	500	517	511	103	102	75-125	1	20	
Calcium, Dissolved	ug/L	77.0 mg/L	5000	5000	79700	79500	54	51	75-125	.2	20	P6
Iron, Dissolved	ug/L	152	5000	5000	5000	5000	97	97	75-125	.2	20	

Pace Analytical Services, Inc.
1241 Bellevue Street - Suite 9
Green Bay, WI 54302
(920)469-2436

QUALITY CONTROL DATA

Project: 186467 KEWAUNEE MARSH
Pace Project No.: 4053755

QC Batch: WETA/10695 Analysis Method: EPA 300.0
QC Batch Method: EPA 300.0 Analysis Description: 300.0 IC Anions
Associated Lab Samples: 4053755001, 4053755005, 4053755006, 4053755007, 4053755010, 4053755011, 4053755012, 4053755013, 4053755014, 4053755015, 4053755016

METHOD BLANK: 539066 Matrix: Water
Associated Lab Samples: 4053755001, 4053755005, 4053755006, 4053755007, 4053755010, 4053755011, 4053755012, 4053755013, 4053755014, 4053755015, 4053755016

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Sulfate	mg/L	<2.0	4.0	11/28/11 11:18	

LABORATORY CONTROL SAMPLE: 539067

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Sulfate	mg/L	20	18.9	94	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 539068 539069

Parameter	Units	4053755001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Sulfate	mg/L	<2.0	20	20	20.4	20.6	94	94	90-110	.6	20	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 539070 539071

Parameter	Units	4053789001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Sulfate	mg/L	211	200	200	415	413	102	101	90-110	.5	20	

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Green Bay, WI 54302
(920)469-2436

QUALIFIERS

Project: 186467 KEWAUNEE MARSH
Pace Project No.: 4053755

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to changes in sample preparation, dilution of the sample aliquot, or moisture content.

ND - Not Detected at or above adjusted reporting limit.

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

S - Surrogate

1,2-Diphenylhydrazine (8270 listed analyte) decomposes to Azobenzene.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

ANALYTE QUALIFIERS

P6 Matrix spike recovery was outside laboratory control limits due to a parent sample concentration notably higher than the spike level.

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UPPER MIDWEST REGION
MN: 612-607-1700 WI: 920-469-2436

4053785

CHAIN OF COPY CUSTODY

*Preservation Codes
A=None B=HCL C=H2SO4 D=HNO3 E=DI Water F=Methanol G=NaOH
H=Sodium Bisulfate Solution I=Sodium Thiosulfate J=Other

(Please Print Clearly)

Company Name:	TRC Environmental
Branch/Location:	MADISON
Project Contact:	A. SELLWOOD
Phone:	608-826-3658
Project Number:	186467.
Project Name:	Kewaunee Marsh
Project State:	WI
Sampled By (Print):	T. O'Connell
Sampled By (Sign):	[signature]
PO #:	39082
Regulatory Program:	

Quote #:	
Mail To Contact:	
Mail To Company:	
Mail To Address:	
Invoice To Contact:	A. Sellwood
Invoice To Company:	TRC
Invoice To Address:	708 Heartland Trail Suite 3000 Madison WI 53717
Invoice To Phone:	608-826-3658

Data Package Options (billable): ☐ EPA Level III ☐ EPA Level IV

MS/MSD: ☐ On your sample (billable) ☐ NOT needed on your sample

Matrix Codes: A = Air, B = Biota, C = Charcoal, O = Oil, S = Soil, Sl = Sludge, W = Water, DW = Drinking Water, GW = Ground Water, SW = Surface Water, WW = Waste Water, WP = Wipe

PACE LAB #	CLIENT FIELD ID	COLLECTION DATE	COLLECTION TIME	MATRIX	Arsenic	Calcium	Iron	Sulfate	CLIENT COMMENTS	LAB COMMENTS (Lab Use Only)	Profile #
FILTERED? (YES/NO)					Y	Y	Y	N			
PRESERVATION (CODE)*					D	D	D	A			
001	GW01-2	11/14/11	1345	GW	X	X	X	X		2-250mL AD	
002	MW02-1	11/14/11	1105		X					1-250mL D	
003	MW02-1i	11/14/11	1110		X					↓	
004	MW02-10	11/14/11	1100		X					↓	
005	MW02-3	11/14/11	1250		X	X	X	X		2-250mL AD	
006	MW02-3i	11/14/11	1315		X	X	X	X		↓	
007	MW02-3d	11/15/11	920		X	X	X	X		↓	
008	MW02-8	11/14/11	1300		X					1-250mL D	
009	MW02-8i	11/14/11	1305		X					↓	
010	MW04-9	11/14/11	1500		X	X	X	X		2-250mL AD	
011	MW04-11	11/15/11	830		X	X	X	X		↓	
012	MW11-1	11/15/11	1025		X	X	X	X		↓	
013	MW11-1i	11/15/11	1030	↓	X	X	X	X		↓	

Rush Turnaround Time Requested - Prelims
(Rush TAT subject to approval/surcharge)
Date Needed:

Transmit Prelim Rush Results by (complete what you want):

Email #1:	
Email #2:	
Telephone:	
Fax:	

Samples on HOLD are subject to special pricing and release of liability

Relinquished By:	Date/Time:	Received By:	Date/Time:
T. O'Connell	11/16/11 940	TRC cooler	11/16/11 940
WaltCo	11/17/11 9:00A	[signature]	11/17/11 9:00A

PACE Project No. 4053785

Receipt Temp = 0 °C

Sample Receipt pH: OK / Adjusted

Cooler Custody Seal: Present / Not Present; Intact / Not Intact

Version 6.0 06/14/06

C019a(27Jun2006)

ORIGINAL

(Please Print Clearly)

Company Name:	
Branch/Location:	
Project Contact:	SEE PAGE 1
Phone:	
Project Number:	
Project Name:	
Project State:	
Sampled By (Print):	
Sampled By (Sign):	
PO #:	Regulatory Program:

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CHAIN OF CUSTODY

UPPER MIDWEST REGION
MN: 612-607-1700 WI: 920-469-2436

*Preservation Codes
A=None B=HCL C=H2SO4 D=HNO3 E=DI Water F=Methanol G=NaOH
H=Sodium Bisulfate Solution I=Sodium Thiosulfate J=Other

Quote #:	
Mail To Contact:	
Mail To Company:	
Mail To Address:	See Pg 1
Invoice To Contact:	
Invoice To Company:	
Invoice To Address:	
Invoice To Phone:	

Data Package Options (billable): ☐ EPA Level III ☐ EPA Level IV

MS/MSD: ☐ On your sample (billable) ☐ NOT needed on your sample

Matrix Codes: A = Air, B = Biota, C = Charcoal, O = Oil, S = Soil, Sl = Sludge, W = Water, DW = Drinking Water, GW = Ground Water, SW = Surface Water, WW = Waste Water, WP = Wipe

					Arsenic	Calcium	Iron	Sulfate						
				FILTERED? (YES/NO) Y/N	Y	Y	Y	N						
				PRESERVATION (CODE)* Pick Letter	D	D	D	A						
PACE LAB #	CLIENT FIELD ID	COLLECTION DATE	COLLECTION TIME	MATRIX	Analyses Requested							CLIENT COMMENTS	LAB COMMENTS (Lab Use Only)	Profile #
014	MW11-2	11/15/11	900	GW	X	X	X	X					2-250mL #D	
015	MW11-3	11/14/11	1445	↓	X	X	X	X					↓	
016	MW11-3i	11/14/11	1505	↓	X	X	X	X						

Rush Turnaround Time Requested - Prelims
(Rush TAT subject to approval/surcharge)
Date Needed:

Transmit Prelim Rush Results by (complete what you want):
Email #1:
Email #2:
Telephone:
Fax:

Samples on HOLD are subject to special pricing and release of liability

Relinquished By:	Date/Time:	Received By:	Date/Time:
Ed Olund	11/16/11	TRC Cooler	11/16/11 940
Walter 11/17/11	9:00A	[signature]	11/17/11 9:00A

PACE Project No. 4053755

Receipt Temp = 0 °C

Sample Receipt pH: OK / Adjusted (OK circled)

Cooler Custody Seal: Present / Not Present (Not Present circled); Intact / Not Intact (Not Intact circled)

Version 6.0 06/14/06

ORIGINAL

Pace Analytical Services, Inc.
1241 Bellevue Street, Suite 9
Green Bay, WI 54302

Pace Analytical

Sample Condition Upon Receipt

Client Name: TRC ENV. Project # WO53755

Courier: ☐ Fed Ex ☐ UPS ☐ USPS ☐ Client ☑ Commercial ☐ Pace Other _____

Tracking #: _____

Custody Seal on Cooler/Box Present: ☐ yes ☑ no Seals intact: ☐ yes ☑ no

Custody Seal on Samples Present: ☐ yes ☑ no Seals intact: ☐ yes ☑ no

Packing Material: ☐ Bubble Wrap ☐ Bubble Bags ☐ None (Other) Ziploc

Thermometer Used 56

Type of Ice: (Wet) Blue Dry None ☑ Samples on ice, cooling process has begun.

Cooler Temperature 0°C

Biological Tissue is Frozen: ☐ yes ☐ no

Temp Blank Present: ☐ yes ☑ no

Person examining contents:
Date: 11/17/11
Initials: ABF

Temp should be above freezing to 6°C for all sample except Biota.
Biota Samples should be received ≤ 0°C.

		Comments:
Chain of Custody Present:	☑Yes ☐No ☐N/A	1.
Chain of Custody Filled Out:	☑Yes ☐No ☐N/A	2.
Chain of Custody Relinquished:	☑Yes ☐No ☐N/A	3.
Sampler Name & Signature on COC:	☑Yes ☐No ☐N/A	4.
Samples Arrived within Hold Time:	☑Yes ☐No ☐N/A	5.
Short Hold Time Analysis (<72hr):	☐Yes ☑No ☐N/A	6.
Rush Turn Around Time Requested:	☐Yes ☑No ☐N/A	7.
Sufficient Volume:	☑Yes ☐No ☐N/A	8.
Correct Containers Used:	☑Yes ☐No ☐N/A	9.
-Pace Containers Used:	☑Yes ☐No ☐N/A	
Containers Intact:	☑Yes ☐No ☐N/A	10.
Filtered volume received for Dissolved tests	☐Yes ☐No ☑N/A	11.
Sample Labels match COC:	☑Yes ☐No ☐N/A	12.
-Includes date/time/ID/Analysis Matrix: W		
All containers needing preservation have been checked.	☑Yes ☐No ☐N/A	13.
All containers needing preservation are found to be in compliance with EPA recommendation.	☑Yes ☐No ☐N/A	
exceptions: VOA, coliform, TOC, O&G, WI-DRO (water)	☐Yes ☐No	Initial when completed ABF / Lot # of added preservative
Samples checked for dechlorination:	☐Yes ☐No ☑N/A	14.
Headspace in VOA Vials (>6mm):	☐Yes ☐No ☑N/A	15.
Trip Blank Present:	☐Yes ☐No ☑N/A	16.
Trip Blank Custody Seals Present	☐Yes ☐No ☑N/A	
Pace Trip Blank Lot # (if purchased):		

Client Notification/ Resolution: Field Data Required? Y / N

Person Contacted: _____ Date/Time: _____

Comments/ Resolution: _____

Project Manager Review: _____ Date: 11-17-11

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e out of hold, incorrect preservative, out of temp, incorrect containers)

Appendix E
2010 Investigation Tables and Figures

Table 1
December 2009/March 2010 Hotspot Geoprobe Investigation
Compositional Arsenic Results - Soil Sampling
Kewaunee Marsh, Kewaunee, Wisconsin

	Transect B1					Transect B2					Transect B3					Transect M2					Transect M3					Transect M4					Transect M5				
	ID	Date	Depth (ft bgs)	Moisture (%)	As (mg/kg)	ID	Date	Depth (ft bgs)	Moisture (%)	As (mg/kg)	ID	Date	Depth (ft bgs)	Moisture (%)	As (mg/kg)	ID	Date	Depth (ft bgs)	Moisture (%)	As (mg/kg)	ID	Date	Depth (ft bgs)	Moisture (%)	As (mg/kg)	ID	Date	Depth (ft bgs)	Moisture (%)	As (mg/kg)	ID	Date	Depth (ft bgs)	Moisture (%)	As (mg/kg)
Transect A						B2-A	10-Dec-09	0-2	4.3	3.8						M-2A	17-Mar-10	0-2.5'	43.9	13.6											M-5A	17-Mar-10	0-2.0'	48.8	20.8
								2-4	3	2.2								2.5-5.0'	63.1	107													2-4.0'	69.7	**1090**
								4-6	6.3	30.9								5.0-7.5'	79.5	67													4-6.0'	82.5	**3000**
								6-8	12.9	27.5								7.5-10.0'	66.5	63.9													6-8.0'	76.4	590
								8-10	12.6	1.6J																							8-10.0'	61.9	3.9 J
								10-12	17.6	2.4																									
								12-14	24.2	7.1J																									
								14-15	56.2	2.9J																									
Transect B						B2-B	10-Dec-09	0-2	3.3	9.5						M-2B	17-Mar-10	0-2.5'	41.4	**4500**											M-5B	17-Mar-10	0-2.0'	82	**1460**
								2-4	5.8	527								2.5-5.0'	79.4	**13200**													2.0-4.0'	50.5	400
								4-6	7.4	**3830**								5.0-7.5'	51.4	834													4.0-6.0'	82	**4350**
								6-8	15.1	309								7.5-10.0'	22.8	**2100**													6.0-8.0'	84.1	**4300**
								8-10	14	343																							8.0-10.0'	67.5	91.6
								10-12	15.5	240																									
								12-14	54.9	140																									
								15-19	50.6	8.7																									
								19-20	18	2.8																									
Transect C						B2-C	10-Dec-09	0-2	3.9	332						M-2C	17-Mar-10	0-2.5'	47	**1510**											M-5C	17-Mar-10	0-2.5'	75.2	**3070**
								2-4	4.9	804								2.5-5.0'	38.4	**4510**													2.5-5.0'	85.2	**5060**
								4-6	5.6	**2880**								5.0-7.5'	74.4	**11400**													5.0-7.5'	82.3	**4080**
								6-8	15	996								7.5-10.0'	82.3	**9950**													7.5-10.0'	79.3	**1780**
								8-10	8.7	**1470**																									
								10-12	13.3	**1270**																									
								12-14	72.6	**9050**																									
								14-20	50.8	708																									
Transect D	B-1D	10-Dec-09	0-2	14.7	7.1	B2-D	10-Dec-09	0-2	6.7	4.3	B-3D	10-Dec-09	0-2	46.5	408	M-2D	10-Dec-09	0-2	19.5	454	M-3D	10-Dec-09	0-2	56.5	**2310**	M-4D	10-Dec-09	0-5	53.5	**1850**	M-5D	10-Dec-09	0-5	77.7	**4960**
			2-4	12.8	105			2-4	2.3	3.3			2-4	8.5	11.8			2-4	71.1	**5120**			2-4	82.3	**3800**			5-7	84.5	**4770**			5-7	87.9	**7300**
			4-6	20.2	719			4-6	5.7	4.1			4-6	13.5	14.9			4-6	78.6	**1930**			4-6	78.8	**2450**			6-10	67.9	628			6-10	68.8	500
			6-8	25.5	**1850**			6-8	13.4	**1030**			6-8	11.8	538			6-8	81.1	**2180**			6-8	75.7	**1610**									
			8-10	75.9	**2160**			8-10	12.8	**1420**			8-10	17.5	**2130**			8-10	67.4	633			8-10	67.1	654									
			10-12	80.8	**1070**			10-12	17.4	798			10-12	18.4	**1210**																			
			12-14	53.4	151			12-14	13.9	533			12-14	77.3	**2030**																			
			15-19	54.3	86.4			14-15	72.8	**2820**			14-16	59.4	759																			
			19-20	16.2	4.6			15-17.5	44.9	**1330**																									
								17.5-20	24.7	81.5																									
								20-25	9.7	15.5																									
Transect E	B-1E	10-Dec-09	0-2	8.6	2.8	B2-E	10-Dec-09	0-2	2.6	2.6	B-3E	10-Dec-09	0-2	8.9	2.9	M-2E	17-Mar-10	0-2.5'	48.3	734											M-5E	17-Mar-10	0-2.0'	70.3	269
			2-4	17.8	35.4			2-4	4.2	1.5J			2-4	9.9	23.2			2.5-5.0'	59.6	**1720**													2.0-4.0'	82.6	215
			4-6	18	49.9			4-6	6.2	112			4-6	17.3	330			5.0-7.5'	55	906													4.0-6.0'	87.9	46.6
			6-8	23.2	232			6-8	14.6	100			6-8	17.4	249			7.5-10.0'	77.4	**1400**													6.0-8.0'	83.8	9.8 J
			8-10	77.5	932			8-10	13.1	107			8-10	14	151																			8.0-10.0'	60.7	2.7 J
			10-12	63.3	294			10-13.8	10.1	87.1			10-12	66.8	927																			10.0-12.0'	60.1	40.3
			12-14	77.1	341			13.8-15	75.2	324			12-14	79	582																			12-14'	64.1	8.1
			14-16	58	6.2			20-23	62.8	86.5			14-16	61.7	63.1																			14-15'	20.1	3.1
			16-19	53.6	3.4J			23-25	12.4	2.6			16-20	53	11.7																					
			19-20	21.5	2.7								20-25	15.4	2.9																					
Transect F						B2-F	10-Dec-09	0-2	2.7	4.1						M-2F	17-Mar-10	0-2.5'	53.6	109 M0											M-5F	17-Mar-10	0-2.5'	51.7	98.2
								2-4	4.8	1.8J								2.5-5.0'	78.7	664													2.5-5.0'	77.7	**1300**
								4-6	5.4	21.8								5.0-7.5'	77.2	407													5.0-7.5'	86	**1260**
								6-8	10.5	68.1								7.5-10.0'	78.1	54.7													7.5-10.0'	76.7	111
								8-10	12.2	10.4																									
								10-12	15.6	11.8																									
								12-13.8	16.7	16																									
								13.8-15	76	4.8J																									
								15-16	67	37.5																									
								16-20	37.6	2.6J																									
								23-25	7.8	1.9J																									
								25-30	10.9	3.2																									

Table 1 (continued)
December 2009/March 2010 Hotspot Geoprobe Investigation
Compositional Arsenic Results - Soil Sampling
Kewaunee Marsh, Kewaunee, Wisconsin

	Transect M6					Transect M7					Transect M8					Transect M9					Transect M10					Transect M11					Transect M12				
	ID	Date	Depth (ft bgs)	Moisture (%)	As (mg/kg)	ID	Date	Depth (ft bgs)	Moisture (%)	As (mg/kg)	ID	Date	Depth (ft bgs)	Moisture (%)	As (mg/kg)	ID	Date	Depth (ft bgs)	Moisture (%)	As (mg/kg)	ID	Date	Depth (ft bgs)	Moisture (%)	As (mg/kg)	ID	Date	Depth (ft bgs)	Moisture (%)	As (mg/kg)	ID	Date	Depth (ft bgs)	Moisture (%)	As (mg/kg)
Transect A																																		
Transect B																																		
Transect C																																		
Transect D																																		
Transect E	**M-6E**	17-Mar-10	0-4.0'	77.2	895	**M-7E**	17-Mar-10	0-2.0'	42	15.1	**M-8E**	17-Mar-10	0-4.0'	61.8	311																				
			4-6.0'	78.2	**1910**			2-4.0'	48.4	277			4-6.0'	60.5	24.4																				
			6-8.0'	88.2	**2020**			4-6.0'	83.2	**1260**			6-8.0'	87.8	12.9 J																				
								6-8.0'	86.8	478																										
Transect F																**M-9F**	17-Mar-10	0-4.0'	70	348	**M-10F**	17-Mar-10	0-4.0'	59.3	357	**M-11F**	17-Mar-10	0-2.0'	60.7	106	**M-12F**	17-Mar-10	0-4.0'	58.3	204
																		4.0-6.0'	67.8	452			4-6'	69.3	589			2.0-4.0'	73.3	549			4.0-6.0'	84.7	313
																		6.0-8.0'	86.3	82.1			6-8.0'	86.3	52.7			4.0-6.0'	86	160			6.0-8.0'	74.9	7.6
																													6.0-8.0'	87.7	27.5					
																													8.0-10.0'	84.5	62.9					
																													10.0-12.0'	75.3	3.3 JB					

Notes
1. Sample data presented in the grid orientation shown on Figure 2.
J = Estimated concentrations above the detection limit and below the reporting limit
B = Analyte was detected in the associated method blank
M0 = Matrix spike recover and/or matrix spike duplicate recovery was outside laboratory control limits
BOLD =Arsenic concentration greater than 1,000 mg/kg, which corresponds to the material that has been classified as "hot spot" based on its potential to be hazardous (TCLP > 5 mg/L).

Prepared By: A. Goergen 12/29/09, A. Sellwood 4/5/10
Checked By: A. Sellwood 12/30/09, T. O'Connell 5/12/10

SCALE OF DETAIL

0 50 100 FEET

1 " = 60 '
1:720

N

LEGEND

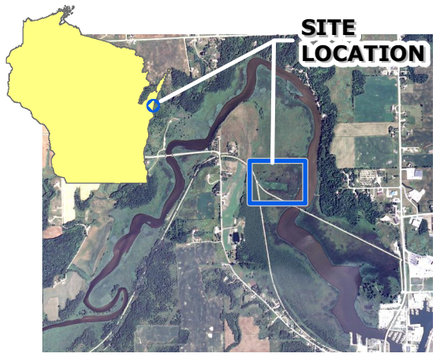
- ARSENIC > 1,000 mg/kg
- ARSENIC < 1,000 mg/kg

} M-SERIES = MARSH (8-12 FT)
B-SERIES = BALLAST (15-30 FT)

- MONITORING WELL LOCATION
- FENCE
- CAPPED AREA
- APPROXIMATE AREA OF PREVIOUSLY DISTRESSED VEGETATION
- CROSS-SECTION TRANSECT

NOTES:

1. ALL GEOPROBE BORINGS WERE LOCATED USING A TRIMBLE GEOXH GPS UNIT.



PROJECT: WISCONSIN DEPARTMENT OF NATURAL RESOURCES KEWAUNEE MARSH			
SHEET TITLE: 2009/2010 HOT SPOT GEOPROBE INVESTIGATION CROSS-SECTION TRANSECTS			
DRAWN BY: PAPEZ J	SCALE: AS NOTED	PROJ. NO.	00-07201.22
CHECKED BY: SELLWOOD A		FILE NO.	72011904.mxd
APPROVED BY: FISH D	DATE PRINTED: 5/27/2010	FIGURE 3	
DATE: MAY 2010			

RMT

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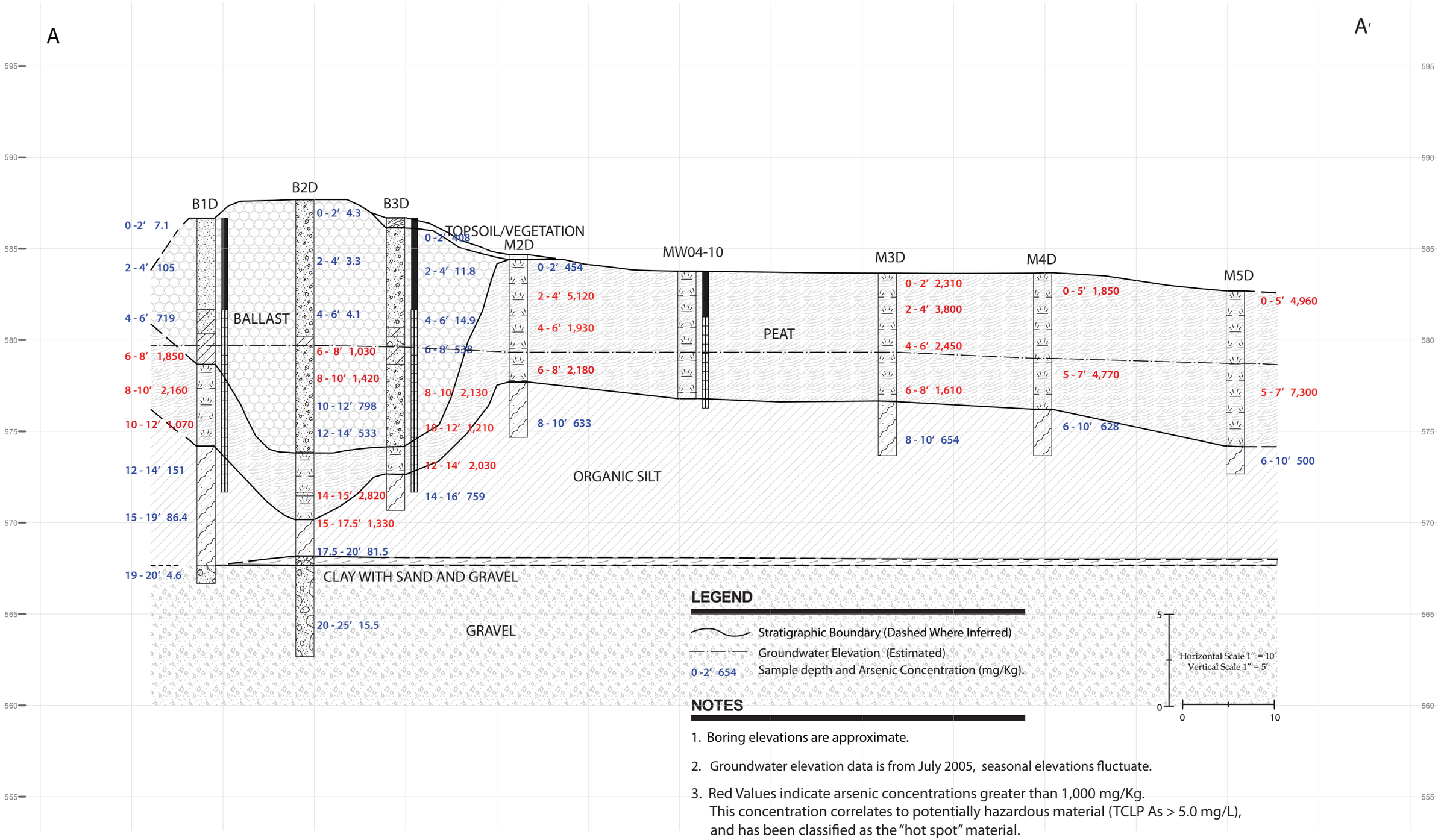

LEGEND

Stratigraphic Boundary (Dashed Where Inferred)

Groundwater Elevation (Estimated)

0 -2' 654 Sample depth and Arsenic Concentration (mg/Kg).

Horizontal Scale 1" = 10'
Vertical Scale 1" = 5'

NOTES

1. Boring elevations are approximate.
2. Groundwater elevation data is from July 2005, seasonal elevations fluctuate.
3. Red Values indicate arsenic concentrations greater than 1,000 mg/Kg. This concentration correlates to potentially hazardous material (TCLP As > 5.0 mg/L), and has been classified as the "hot spot" material.

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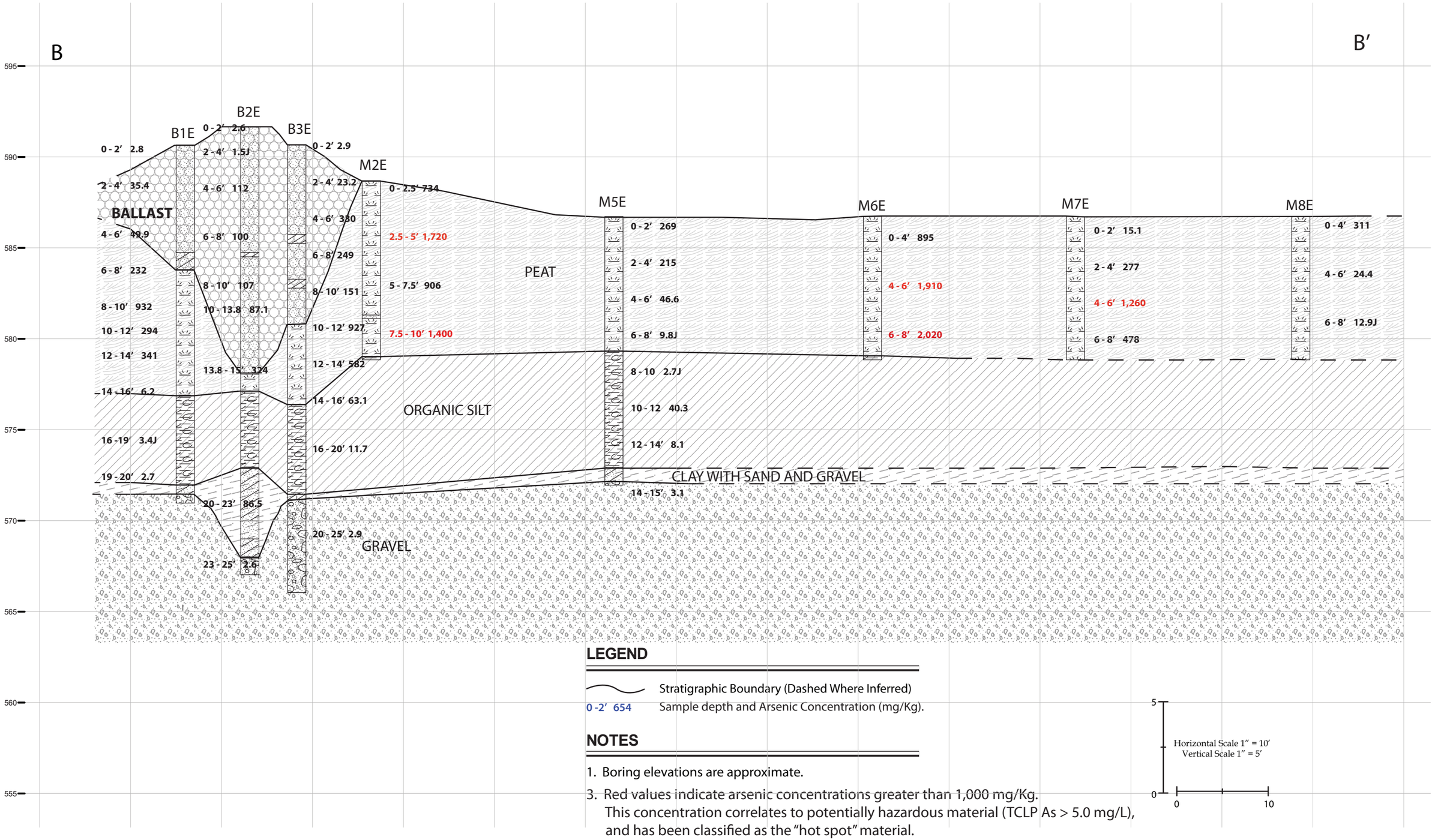
KEWAUNEE MARSH — KEWAUNEE, WISCONSIN

GEOLOGIC CROSS SECTION A - A'
Arsenic Concentrations

SCALE:	PROJ. NO.	DWG. NAME	
	7201.15		FIGURE 4



LEGEND

Stratigraphic Boundary (Dashed Where Inferred)

0 -2′ 654 Sample depth and Arsenic Concentration (mg/Kg).

NOTES

1. Boring elevations are approximate.
3. Red values indicate arsenic concentrations greater than 1,000 mg/Kg. This concentration correlates to potentially hazardous material (TCLP As > 5.0 mg/L), and has been classified as the "hot spot" material.

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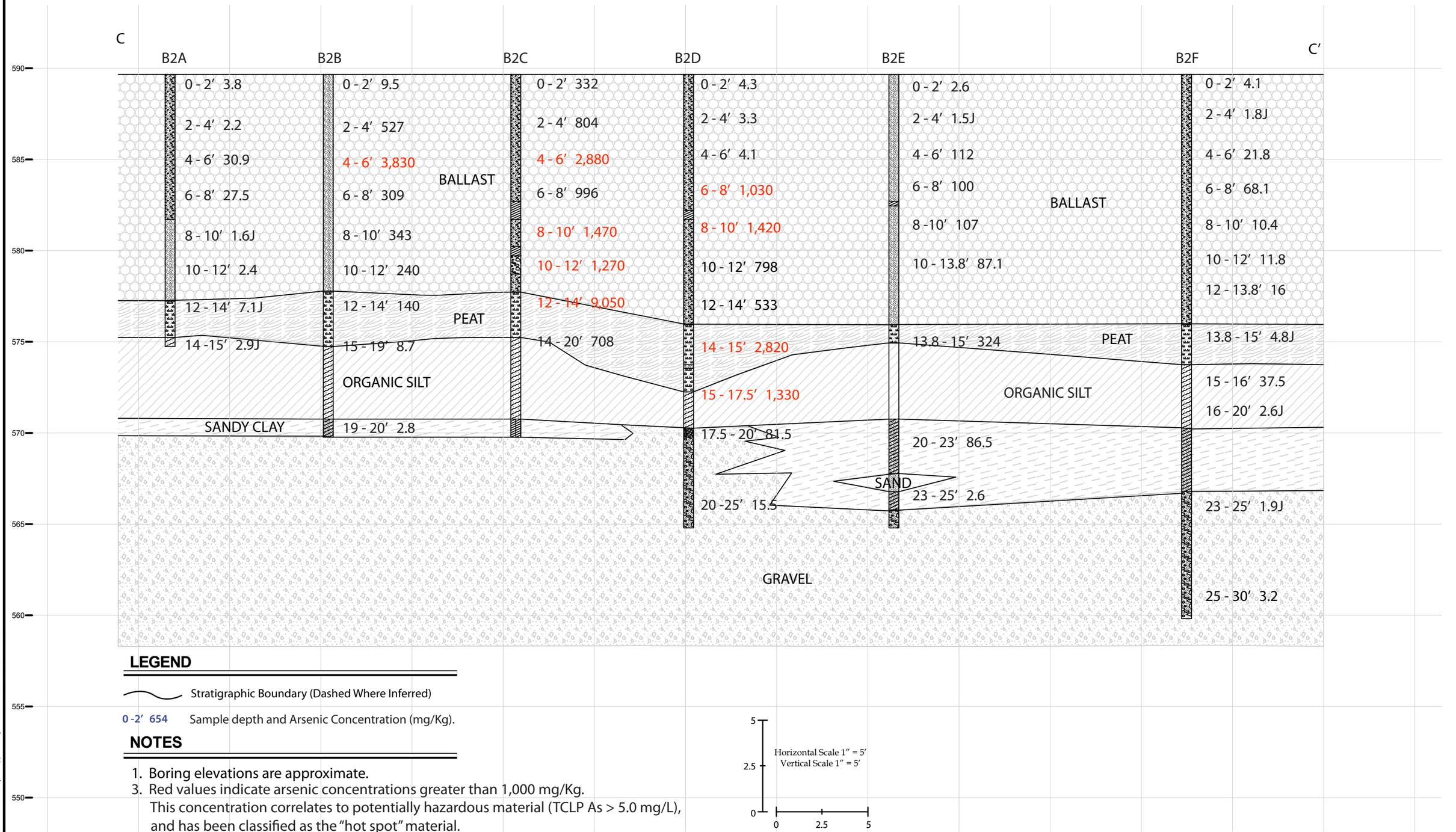
KEWAUNEE MARSH — KEWAUNEE, WISCONSIN

GEOLOGIC CROSS SECTION B - B'

SCALE: | PROJ. NO. 7201.15 | DWG. NAME | FIGURE 5



LEGEND

Stratigraphic Boundary (Dashed Where Inferred)

0 -2' 654 Sample depth and Arsenic Concentration (mg/Kg).

NOTES

1. Boring elevations are approximate.
3. Red values indicate arsenic concentrations greater than 1,000 mg/Kg. This concentration correlates to potentially hazardous material (TCLP As > 5.0 mg/L), and has been classified as the "hot spot" material.

Cartographer: OCONNELL T Checked By: Approved By: Date Printed: JANUARY 2010

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KEWAUNEE MARSH — KEWAUNEE, WISCONSIN

GEOLOGIC CROSS SECTION C - C'
Arsenic Concentrations

SCALE:	PROJ. NO.	DWG. NAME	
AS NOTED	07201.15		FIGURE 6

D

D′

M5A

0 - 2′ 20.8

2 - 4′ 1,090

4 - 6′ 3,000

6 - 8′ 590

8 - 10.0′ 3.9J

M5B

0 - 2′ 1,460

2 - 4′ 400

4 - 6′ 4,350

6 - 8′ 4,300

8 - 10′ 91.6

M5C

0 - 2.5′ 3,070

2.5 - 5′ 5,060

5 - 7.5′ 4,080

7.5 - 10′ 1,780

PEAT

M5D

0 - 5′ 4,960

5 - 7′ 7,300

7 - 10′ 500

M5E

0 - 2′ 269

2 - 4′ 215

4 - 6′ 46.6

6 - 8′ 9.8J

8 - 10′ 2.7J

10 - 12′ 40.3

12 - 14′ 8.1

14 - 14′ 3.1

M5F

0 - 2.5′ 98.2

2.5 - 5′ 1,300

5 - 7.5′ 1,260

7.5 - 10′ 111

PEAT

ORGANIC SILT

CLAY WITH SAND AND GRAVEL

580

575

570

565

LEGEND

Stratigraphic Boundary (Dashed Where Inferred)

0 -2′ 654 Sample depth and Arsenic Concentration (mg/Kg).

NOTES

1. Boring elevations are approximate.
3. Red values indicate arsenic concentrations greater than 1,000 mg/Kg. This concentration correlates to potentially hazardous material (TCLP As > 5.0 mg/L), and has been classified as the "hot spot" material.

2.5

Horizontal Scale 1″ = 10′
Vertical Scale 1″ = 2.5′

0

0

10

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KEWAUNEE MARSH — KEWAUNEE, WISCONSIN

GEOLOGIC CROSS SECTION D - D'
Arsenic Concentrations

SCALE:	PROJ. NO.	DWG. NAME	
	7201.15		FIGURE 7

E

E′

M9F

M10F

M11F

M12F

580

575

570

565

0 - 4′ 348

4 - 6′ 452

6 - 8′ 82.1

0 - 4′ 357

4 - 6′ 589

6 - 8′ 52.7

0 - 2′ 106

2 - 4′ 549

4 - 6′ 160

6 - 8′ 27.5

8 - 10′ 62.9

10 - 12′ 3.3JB

0 - 4′ 204

4 - 6′ 313

6 - 8′ 7.6

PEAT

PEAT

ORGANIC SILT

ORGANIC SILT

LEGEND

Stratigraphic Boundary (Dashed Where Inferred)

0 -2′ 654 Sample depth and Arsenic Concentration (mg/Kg).

NOTES

1. Boring elevations are approximate.
3. Red values indicate arsenic concentrations greater than 1,000 mg/Kg. This concentration correlates to potentially hazardous material (TCLP As > 5.0 mg/L), and has been classified as the "hot spot" material.

2.5

0

Horizontal Scale 1″ = 10′
Vertical Scale 1″ = 5′

0 10

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KEWAUNEE MARSH — KEWAUNEE, WISCONSIN

GEOLOGIC CROSS SECTION E - E'
Arsenic Concentrations

SCALE:	PROJ. NO.	DWG. NAME	
	7201.15		FIGURE 8

Appendix F
Comparison of SPLP Arsenic Analysis versus Time Post-Treatment

Appendix F
Comparison of SPLP Arsenic Analysis versus Time Post-Treatment
Kewaunee Marsh Arsenic Source Area In-Situ Remediation

CELL		SPLP ARSENIC CONCENTRATION[1] (mg/L)	
ID	MEDIA	1-WEEK POST-TREATMENT	2-WEEK POST-TREATMENT
7	Peat	<0.013	0.0123
8	Peat	0.088	<0.013
10	Peat	0.059	<0.013
15	Peat	0.092	0.017
19	Ballast	0.19	0.138
23[2]	Ballast	2.62	8.725
	Peat	0.89	3.175
25	Ballast	0.47	0.253
	Peat	1.3	3.05
26	Peat	0.59	2.175

Footnotes:

(1) SPLP test completed in TRC's Applied Chemistry Laboratory. The results from TRC are screening level results, but have been previously shown to be consistent with results from a Certified laboratory (Pace).

(2) The sample collected from the treated ballast material of cell #23 was not likely representative of treated material.

Appendix G
Pre-Treatment Arsenic SPLP Test Result Estimates

LEGEND

- CAPPED AREA
- APPROXIMATE TREATMENT CELL
- TREATMENT AREA, HORIZONTAL LIMITS AT BASE OF EXCAVATION
- FENCE (NOTE 2)

PRE-REMEDIATION GEOPROBE SAMPLE (2009/2010)

- ARSENIC > 1,000 mg/kg
- ARSENIC < 1,000 mg/kg

} M-SERIES = MARSH (8-12 FT)
B-SERIES = BALLAST (15-30 FT)

NOTES

1. BASE MAP IMAGERY FROM KEWAUNEE COUNTY, 2010.
2. GREYED OUT SECTION OF THE FENCE WAS REMOVED AND REPLACED TO PROVIDE ACCESS TO TREATMENT AREA IN THE MARSH.

N

0 30 60
FEET

1 " = 30 '
1:360

PROJECT: **WISCONSIN DEPARTMENT OF NATURAL RESOURCES KEWAUNEE MARSH**

SHEET TITLE: **PRE-TREATMENT SOURCE AREA SAMPLE LOCATIONS**

DRAWN BY:	PAPEZ J	SCALE:		PROJ. NO.	186467-003
CHECKED BY:	WALTER M		AS NOTED	FILE NO.	186467.004.G1.mxd
APPROVED BY:	SELLWOOD A	DATE PRINTED:		**FIGURE G-1**	
DATE:	MARCH 2012				

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Printed By: jpapez on 3/9/2012, 11:06 AM

Appendix G

Kewaunee Marsh Pre-Treatment Arsenic SPLP Leaching Test Result Estimates

CELL		ASSOCIATED TRANSECT SAMPLE(S)					ESTIMATED TCLP AS CONC.[1] (mg/L)
NUMBER	MEDIA	NAME	BORING LOG SUMMARY (ft)	DEPTH (ft)	TOTAL ARSENIC CONC (mg/kg)	AVG. TOTAL ARSENIC CONC. (mg/kg)	
1		NA					
2	Peat	M5A	Peat 0 - 6.5	0 - 2	20.8	1370	8.4
				2 - 4	1090		
				4 - 6	3000		
3	Peat	M5B	Peat 0 - 7.5	0 - 2	1460	2628	22
				2 - 4	400		
				4 - 6	4350		
				6 - 8	4300		
4		NA					
5		NA					
6	Peat	M5D	Peat 0 - 8.5	0 - 5	4960	6130	61
				5 - 7	7300		
7	Peat	M5C	Peat 0 - 7.5	0 - 2.5	3070	4070	38
				2.5 - 5.0	5060		
				5.0 - 7.5	4080		
8	Peat	M5B	Peat 0 - 7.5	0 - 2	1460	2628	22
				2 - 4	400		
				4 - 6	4350		
				6 - 8	4300		
9		NA					
10	Peat	M4D	Peat 0 - 7.5	0 - 5	1850	3310	30
				5 - 7	4770		
11		NA					
12		NA					
13		NA					
14		NA					
15		NA					
16		NA					
17		NA					
18	Peat	M3D	Peat 0 - 7	0 - 2	2310	2853	25
				2 - 4	3800		
				4 - 6	2450		
19	Peat	M2C	Peat 0 - 8.5	0 - 2.5	1510	5807	57
				2.5 - 5.0	4510		
				5.0 - 7.5	11400		

Appendix G (continued)
Kewaunee Marsh Pre-Treatment Arsenic SPLP Leaching Test Result Estimates

CELL		ASSOCIATED TRANSECT SAMPLE(S)					ESTIMATED TCLP AS CONC.[1] (mg/L)
NUMBER	MEDIA	NAME	BORING LOG SUMMARY (ft)	DEPTH (ft)	TOTAL ARSENIC CONC (mg/kg)	AVG. TOTAL ARSENIC CONC. (mg/kg)	
20	Peat	M2D	Peat 0 - 7	0 - 2	454	2421	20
				2 - 4	5120		
				4 - 6	1930		
				6 - 8	2180		
21	Ballast	B2D	Clean ballast 0 - 5. Contaminated ballast 5 - 14.	6 - 8	1030	1094	5.4
				8 - 10	1420		
				10 - 12	798		
				12 - 14	533		
		B3D	Clean ballast 0 - 5. Contaminated ballast 5 - 12.5.	6 - 8	538		
				8 - 10	2130		
				10 - 12	1210		
	Peat	B3D	Peat 12.5 - 14	12 - 14	2030	2060	16
		B2D	Peat 14 - 17.5	14 - 15	2820		
				15 - 17.5	1330		
22	Ballast	B3D	Clean ballast 0 - 5. Contaminated ballast 5 - 12.5.	6 - 8	538	1293	7.6
				8 - 10	2130		
				10 - 12	1210		
	Peat	B3D	Peat 12.5 - 14	12 - 14	2030	2030	16
23	Ballast	B2C	Clean ballast 0 - 5. Contaminated ballast 5 - 12.	4 - 6	2880	1654	12
				6 - 8	996		
				8 - 10	1470		
				10 - 12	1270		
	Peat	B2C	Peat 12 - 14.5	12 - 14	9050	9050	93
24	Ballast	B2B	Clean ballast 0 - 5. Contaminated ballast 5 - 12.	4 - 6	3830	1181	6.3
				6 - 8	309		
				8 - 10	343		
				10 - 12	240		
	Peat	B2B	Peat 12 - 15	12 - 14	140	140	NA
25	Peat	M2B	Peat 0 - 5	0 - 2.5	4500	8850	91
				2.5 - 5	13200		
26		NA					

Footnotes:

[1] Total arsenic converted to SPLP arsenic using the equation shown on Figure 2 in Appendix G. SPLP arsenic (mg/L) = 0.011(total arsenic[mg/kg])-6.6576, when total arsenic concentrations are greater than 1,000 mg/kg.

= Sample not collected during investigation within the limits of the treatment cell.

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Memorandum

From: Bob Stanforth, Ph.D.

Subject: 2011 Baseline Monitoring – Colloid and Long-Term Stability Evaluation
Kewaunee Marsh Source Area Remediation

Date: January 2012

Project No.: 186467.0000.0000.000003

Background

The arsenic source area in Kewaunee Marsh was remediated in October 2011 and baseline performance monitoring was completed in November 2011 using 16 site monitoring wells. The arsenic results of the water analysis were much higher than expected for the wells constructed in or near the treatment area. These include MW11-1, MW11-2 and MW11-3 completed in the peat, and nested wells MW11-1i and MW11-3i completed in the underlying silt. The results for the wells in question are presented below in Table 1.

Table 1
2011 Baseline Water Monitoring Results

WELL	COLOR	pH	CONDUCTIVITY	ARSENIC	CALCIUM	IRON	SULFATE
			µmhos/cm	mg/L			
Wells in Peat Material							
MM11-1	Light yellow	6.41	6,462	304	590	112	3,340
MW11-2	Light yellow	6.88	5,322	108	429	165	3,120
MW11-3	Light yellow	7.12	2,197	360	285	1.28	<2
Wells in Organic Silt							
MW11-1i	Light gray	6.99	1,209	121	128	3.94	124
MW11-3i	Clear	7.12	1,299	153	154	3.70	15.9

Treated Material

Water collected from MW11-1 and MW11-2 is from area that was treated, as indicated both by their location and by the high sulfate and calcium concentrations in the water. Both sulfate and calcium are contributed to the water by the treatment process (sulfate from the ferrous sulfate and calcium from the limestone). The presence of the calcium and sulfate indicate that the marsh material has been treated and the high arsenic numbers are not the results of incomplete treatment. Based on all the previous treatability results and on the SPLP tests on treated material collected during the remediation, there is no reason to believe that the arsenic stabilization would not be successful. Two possible explanations for the high arsenic levels are evaluated below.

Colloid Evaluation

Based on all the previous treatability results and on the SPLP tests on treated cell material during the remediation, there is no reason to believe that the treatment would not be successful. However, iron concentrations are also much higher than would be expected in the water, and this provides a possible explanation for the high arsenic levels. Most likely, the high arsenic concentrations are due to colloidal ferric hydroxide or ferric arsenate solids which may be passing through the 0.45µ filter used to differentiate dissolved and particulate metals and is being measured as "dissolved" iron. Iron hydroxide solids often occur in the colloidal size range, and can pass through the filter.

As mentioned, the iron concentrations in the water are unexpectedly high. At the pH values of the samples, the dissolved iron concentrations under oxic conditions where ferric iron is the stable form should be very low – much less than 1 mg/L. The presence of such high iron concentrations – in the 100 mg/L range – suggests that the iron is not truly dissolved. While ferrous iron is more soluble than ferric iron, these concentrations are above what would be expected for ferrous iron in the presence of carbonate. A calculation of the theoretical ferrous iron concentration in water under these conditions illustrates the point. Since the treatment process involved the addition of calcium carbonate, the carbonate concentration in the water will be controlled by the dissolved calcium concentration, as shown from the following dissolution reaction for limestone.

$$CaCO_3 \leftrightarrow Ca^{2+} + CO_3^{2-}$$

$$K_{sp,\ CaCO3} = [Ca^{2+}][CO_3^{2-}] = 5 \times 10^{-9}$$

The ferrous iron concentration, in turn will be controlled by the precipitation of ferrous carbonate, as follows:

$$FeCO_3 \leftrightarrow Fe^{2+} + CO^{2-}$$

$$K_{spFeCO3} = [Fe^{2+}][CO_3^{2-}] = 2 \times 10^{-11}$$

The concentrations for all three species (calcium, ferrous iron and carbonate) are described by their respective solubility constants (K_{sp}). Since there is solid calcium carbonate present in the treated material, the concentrations of both calcium and carbonate will be controlled by the dissolution of the limestone. The carbonate concentration is the same for both solubility equations, which means that we can calculate the theoretical ferrous iron concentrations from the K_{sp}s and the calcium concentration, as follows:

$$[Fe^{2+}][CO_3^{2-}] \ / \ [Ca^{2+}][CO_3^{2-}] = K_{spFeCO3} / K_{sp,\ CaCO3}$$

$$([Fe^{2+}][CO_3^{2-}]) / ([Ca^{2+}][CO_3^{2-}]) = 2 \times 10^{-11} / 5 \times 10^{-9}$$

$$[Fe^{2+}] / \ [Ca^{2+}] = 4 \times 10^{-3}$$

$$[Fe^{2+}] = 4 \times 10^{-3} ([Ca^{2+}])$$

In the presence of 500 mg/L calcium (or 0.0125 M Ca^{2+}), the dissolved iron concentration in the water should be

$$0.0125 \times 4 \times 10^{-3} = 5 \times 10^{-5} \text{ M, or } 2.8 \text{ mg/L}$$

Iron concentrations are orders of magnitude higher than the theoretical solubility value, indicating that it is unlikely that the iron concentrations are due to dissolved ferrous iron in the water.

Thus the most likely explanation for the high iron concentrations is that particulate ferric iron particles are passing through the filter, and these carry arsenic with them.

Long Term Stability Evaluation

Stabilization of arsenic using ferric iron can be reversed if the iron is reduced to the ferrous oxidation state. Thus, an alternative explanation for the elevated arsenic concentrations in the treated hot spot area could be that the iron has been reduced. However, this explanation does not appear likely for several reasons.

1. As discussed above, ferrous iron is not soluble in the water to the concentrations observed due to the presence of carbonate from the limestone.
2. To reduce that much iron (100 mg/L or more) would require a significant amount of reducing agent. While the organics in the marsh will favor reducing conditions over time, the organics are stable at this point (since they have been in the marsh for an extended time period and the readily reduced material has already reacted), and it is highly doubtful that they would react this quickly.
3. Ferrous iron oxidizes very quickly at the pH values observed in the sample once it is exposed to air. Acid is generated during this oxidation process. If the iron were in the

ferrous oxidation state, one would expect that some of the iron would oxidize during sampling using a bailer and the pH would drop. In contrast, the pH values are where they are expected to be following treatment, and there is no suggestion that ferrous iron oxidation has occurred.

4. Iron reduction was not observed in the treatability testing completed for the site in 2010, including samples that were incubated under conditions that should have encouraged reduction if it were going to occur. These samples from the 2010 treatability study were stored in anaerobic conditions in the lab, and analyzed for SPLP arsenic in January 2012 to evaluate the potential for iron reduction. The results from the 2010 treatability study, including the analysis from January 2012, are summarized below in Table 2. The results from the bench scale test suggest that even after two years reaction time, iron reduction is not observed, and the SPLP arsenic concentrations are near or below detection and consistent with the level of stabilization seen in at the time of original treatment in 2010.

Table 2
Results of Long-term Stability Treatability Study Results

SAMPLE		SCREENING SPLP	
		pH	As, mg/L
Ballast			
Untreated		8.91	13
Treated	Immediate	6.56	<0.013
	10 Day	7.46	<0.013
	1 month	7.63	<0.013
	3 month	7.74	<0.013
	7 month	7.8	0.020
	23 months	7.7	0.020
Peat Under Ballast			
Untreated		8.36	11
Treated	Immediate	6.71	<0.013
	10 Day	7.31	<0.013
	1 month	7.44	<0.013
	3 month	7.54	<0.013
	7 month	7.4	0.025
	23 months	7.7	0.02

Table 2
Results of Long-term Stability Treatability Study Results

SAMPLE		SCREENING SPLP	
		pH	As, mg/L
Peat in Marsh			
Untreated		8.33	18
Treated	Immediate	5.70	<0.013
	10 Day	6.93	<0.013
	1 month	6.97	<0.013
	3 month	7.45	<0.013
	7 month	7.1	0.033
	23 months	7.5	0.02
Organic Silt in Marsh			
Untreated		8.76	2.5
Treated	Immediate	7.21	<0.013
	10 Day	7.46	<0.013
	1 month	7.56	<0.013
	3 month	7.77	<0.013
	7 month	7.65	0.022
	23 months	7.7	<0.013

Notes:
Treatability study methods are described in the Hot Spot Investigation and Remedial Options Analysis Report (RMT, 2010).

Conclusions

The most likely explanation describing the elevated arsenic concentrations in MW11-1 and MW11-2, is that arsenic is not truly dissolved (and mobile), but rather is associated with finely divided iron particles that have passed through the filter. If this is the explanation, then the high arsenic levels noted in the water samples are not mobile at the site. The colloids do not travel very far in most groundwater and certainly would not be transported far in the marsh given the slow groundwater flow. Further, the colloidal concentrations should decrease over time as the colloids settle out, and the concentrations should be much lower in future sampling events.

Table 1
December 2009/March 2010 Hotspot Geoprobe Investigation
Compositional Arsenic Results - Soil Sampling
Kewaunee Marsh, Kewaunee, Wisconsin

	Transect B1					Transect B2					Transect B3				
	ID	Date	Depth (ft bgs)	Moisture (%)	As (mg/kg)	ID	Date	Depth (ft bgs)	Moisture (%)	As (mg/kg)	ID	Date	Depth (ft bgs)	Moisture (%)	As (mg/kg)
Transect A						B2-A	10-Dec-09	0-2	4.3	3.8					
								2-4	3	2.2					
								4-6	6.3	30.9					
								6-8	12.9	27.5					
								8-10	12.6	1.6J					
								10-12	17.6	2.4					
								12-14	24.2	7.1J					
								14-15	56.2	2.9J					
Transect B						B2-B	10-Dec-09	0-2	3.3	9.5					
								2-4	5.8	527					
								4-6	7.4	**3830**					
								6-8	15.1	309					
								8-10	14	343					
								10-12	15.5	240					
								12-14	54.9	140					
								15-19	50.6	8.7					
								19-20	18	2.8					
Transect C						B2-C	10-Dec-09	0-2	3.9	332					
								2-4	4.9	804					
								4-6	5.6	**2880**					
								6-8	15	996					
								8-10	8.7	**1470**					
								10-12	13.3	**1270**					
								12-14	72.6	**9050**					
								14-20	50.8	708					
Transect D	B-1D	10-Dec-09	0-2	14.7	7.1	B2-D	10-Dec-09	0-2	6.7	4.3	B-3D	10-Dec-09	0-2	46.5	408
			2-4	12.8	105			2-4	2.3	3.3			2-4	8.5	11.8
			4-6	20.2	719			4-6	5.7	4.1			4-6	13.5	14.9
			6-8	25.5	**1850**			6-8	13.4	**1030**			6-8	11.8	538
			8-10	75.9	**2160**			8-10	12.8	**1420**			8-10	17.5	**2130**
			10-12	80.8	**1070**			10-12	17.4	798			10-12	18.4	**1210**
			12-14	53.4	151			12-14	13.9	533			12-14	77.3	**2030**
			15-19	54.3	86.4			14-15	72.8	**2820**			14-16	59.4	759
			19-20	16.2	4.6			15-17.5	44.9	**1330**					
								17.5-20	24.7	81.5					
								20-25	9.7	15.5					
Transect E	B-1E	10-Dec-09	0-2	8.6	2.8	B2-E	10-Dec-09	0-2	2.6	2.6	B-3E	10-Dec-09	0-2	8.9	2.9
			2-4	17.8	35.4			2-4	4.2	1.5J			2-4	9.9	23.2
			4-6	18	49.9			4-6	6.2	112			4-6	17.3	330
			6-8	23.2	232			6-8	14.6	100			6-8	17.4	249
			8-10	77.5	932			8-10	13.1	107			8-10	14	151
			10-12	63.3	294			10-13.8	10.1	87.1			10-12	66.8	927
			12-14	77.1	341			13.8-15	75.2	324			12-14	79	582
			14-16	58	6.2			20-23	62.8	86.5			14-16	61.7	63.1
			16-19	53.6	3.4J			23-25	12.4	2.6			16-20	53	11.7
			19-20	21.5	2.7								20-25	15.4	2.9
Transect F						B-2F	10-Dec-09	0-2	2.7	4.1					
								2-4	4.8	1.8J					
								4-6	5.4	21.8					
								6-8	10.5	68.1					
								8-10	12.2	10.4					
								10-12	15.6	11.8					
								12-13.8	16.7	16					
								13.8-15	76	4.8J					
								15-16	67	37.5					
								16-20	37.6	2.6J					
								23-25	7.8	1.9J					
								25-30	10.9	3.2					

	Transect M2					Transect M3					Transect M4					Transect M5				
	ID	Date	Depth (ft bgs)	Moisture (%)	As (mg/kg)	ID	Date	Depth (ft bgs)	Moisture (%)	As (mg/kg)	ID	Date	Depth (ft bgs)	Moisture (%)	As (mg/kg)	ID	Date	Depth (ft bgs)	Moisture (%)	As (mg/kg)
Transect A	M-2A	17-Mar-10	0-2.5'	43.9	13.6											M-5A	17-Mar-10	0-2.0'	48.8	20.8
			2.5-5.0'	63.1	107													2-4.0'	69.7	**1090**
			5.0-7.5'	79.5	67													4-6.0'	82.5	**3000**
			7.5-10.0'	66.5	63.9													6-8.0'	76.4	590
																		8-10.0'	61.9	3.9 J
Transect B	M-2B	17-Mar-10	0-2.5'	41.4	**4500**											M-5B	17-Mar-10	0-2.0'	82	**1460**
			2.5-5.0'	79.4	**13200**													2.0-4.0'	50.5	400
			5.0-7.5'	51.4	834													4.0-6.0'	82	**4350**
			7.5-10.0'	22.8	**2100**													6.0-8.0'	84.1	**4300**
																		8.0-10.0'	67.5	91.6
Transect C	M-2C	17-Mar-10	0-2.5'	47	**1510**											M-5C	17-Mar-10	0-2.5'	75.2	**3070**
			2.5-5.0'	38.4	**4510**													2.5-5.0'	85.2	**5060**
			5.0-7.5'	74.4	**11400**													5.0-7.5'	82.3	**4080**
			7.5-10.0'	82.3	**9950**													7.5-10.0'	79.3	**1780**
Transect D	M-2D	10-Dec-09	0-2	19.5	454	M-3D	10-Dec-09	0-2	56.5	**2310**	M-4D	10-Dec-09	0-5	53.5	**1850**	M-5D	10-Dec-09	0-5	77.7	**4960**
			2-4	71.1	**5120**			2-4	82.3	**3800**			5-7	84.5	**4770**			5-7	87.9	**7300**
			4-6	78.6	**1930**			4-6	78.8	**2450**			6-10	67.9	628			6-10	68.8	500
			6-8	81.1	**2180**			6-8	75.7	**1610**										
			8-10	67.4	633			8-10	67.1	654										
Transect E	M-2E	17-Mar-10	0-2.5'	48.3	734											M-5E	17-Mar-10	0-2.0'	70.3	269
			2.5-5.0'	59.6	**1720**													2.0-4.0'	82.6	215
			5.0-7.5'	55	906													4.0-6.0'	87.9	46.6
			7.5-10.0'	77.4	**1400**													6.0-8.0'	83.8	9.8 J
																		8.0-10.0'	60.7	2.7 J
																		10.0-12.0'	60.1	40.3
																		12-14'	64.1	8.1
																		14-15'	20.1	3.1
Transect F	M-2F	17-Mar-10	0-2.5'	53.6	109 M0											M-5F	17-Mar-10	0-2.5'	51.7	98.2
			2.5-5.0'	78.7	664													2.5-5.0'	77.7	**1300**
			5.0-7.5'	77.2	407													5.0-7.5'	86	**1260**
			7.5-10.0'	78.1	54.7													7.5-10.0'	76.7	111

Table 1 (continued)
December 2009/March 2010 Hotspot Geoprobe Investigation
Compositional Arsenic Results - Soil Sampling
Kewaunee Marsh, Kewaunee, Wisconsin

	Transect M6					Transect M7					Transect M8					Transect M9					Transect M10					Transect M11					Transect M12				
	ID	Date	Depth (ft bgs)	Moisture (%)	As (mg/kg)	ID	Date	Depth (ft bgs)	Moisture (%)	As (mg/kg)	ID	Date	Depth (ft bgs)	Moisture (%)	As (mg/kg)	ID	Date	Depth (ft bgs)	Moisture (%)	As (mg/kg)	ID	Date	Depth (ft bgs)	Moisture (%)	As (mg/kg)	ID	Date	Depth (ft bgs)	Moisture (%)	As (mg/kg)	ID	Date	Depth (ft bgs)	Moisture (%)	As (mg/kg)
Transect A																																		
Transect B																																		
Transect C																																		
Transect D																																		
Transect E	**M-6E**	17-Mar-10	0-4.0'	77.2	895	**M-7E**	17-Mar-10	0-2.0'	42	15.1	**M-8E**	17-Mar-10	0-4.0'	61.8	311																				
			4-6.0'	78.2	**1910**			2-4.0'	48.4	277			4-6.0'	60.5	24.4																				
			6-8.0'	88.2	**2020**			4-6.0'	83.2	**1260**			6-8.0'	87.8	12.9 J																				
								6-8.0'	86.8	478																										
Transect F																**M-9F**	17-Mar-10	0-4.0'	70	348	**M-10F**	17-Mar-10	0-4.0'	59.3	357	**M-11F**	17-Mar-10	0-2.0'	60.7	106	**M-12F**	17-Mar-10	0-4.0'	58.3	204
																		4.0-6.0'	67.8	452			4-6'	69.3	589			2.0-4.0'	73.3	549			4.0-6.0'	84.7	313
																		6.0-8.0'	86.3	82.1			6-8.0'	86.3	52.7			4.0-6.0'	86	160			6.0-8.0'	74.9	7.6
																													6.0-8.0'	87.7	27.5					
																													8.0-10.0'	84.5	62.9					
																													10.0-12.0'	75.3	3.3 JB					

Notes
1. Sample data presented in the grid orientation shown on Figure 2.
J = Estimated concentrations above the detection limit and below the reporting limit
B = Analyte was detected in the associated method blank
M0 = Matrix spike recover and/or matrix spike duplicate recovery was outside laboratory control limits
BOLD =Arsenic concentration greater than 1,000 mg/kg, which corresponds to the material that has been classified as "hot spot" based on its potential to be hazardous (TCLP > 5 mg/L).

Prepared By: A. Goergen 12/29/09, A. Sellwood 4/5/10
Checked By: A. Sellwood 12/30/09, T. O'Connell 5/12/10

State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Kewaunee Marsh		B1D

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Dusty Harvey On-Site Environmental Services	12/7/2009	12/7/2009	Geoprobe

WI Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
			Feet MSL	586.0 Feet MSL	2.1 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 243,967 N, 2,616,443 E S/C/N
1/4 of 1/4 of Section , T N, R
Lat ° ' "
Long ° ' "
Local Grid Location ☐ N Feet ☐ S ☐ E Feet ☐ W

Facility ID	County	County Code	Civil Town/City/ or Village
	Kewaunee	31	Kewaunee

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	60 36		1–5	SAND (SP), with gravel, medium grained, medium to light brown 10YR 6/4, moist.	SP									
2 CS	60 48		5–8	SANDY CLAY (CL), with trace gravel, brown 10YR 5/3, moist, soft. Large rock from 6.0 - 6.3 feet bgs. CLAY (CL), with sand, reddish gray brown 5YR 5/2, moist, soft.	CL CL									
			8–9	PEAT, with organics (wood and root mass), dark brown 10YR 3/2, moist, soft.										
3 CS	60 51		10–12											

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm	Tel: 608-831-4444
	RMT, Inc. 744 Heartland Trail Madison, WI 53717	Fax: 608-831-3334

This form is authorized by Chapters 281, 283, 289, 291, 292, 293, 295, and 299, Wis. Stats. Completion of this form is mandatory. Failure to file this form may result in forfeiture of between $10 and $25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on this form is not intended to be be used for any other purpose. NOTE: See instructions for more information, including where the completed form should be sent.

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State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION SUPPLEMENT
Form 4400-122A

Boring Number B1D — Use only as an attachment to Form 4400-122. —

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
4 CS	60 42		13	ORGANIC SILT (OL), with shells and trace organics, dark greenish gray GLEY1 4/1, moist, soft.	OL									
			14											
			15											
			16											
			17											
			18											
			19	GRAVEL WITH SAND (GW), and trace fines, small to large, subangular, coarse to medium grained sand, light red brown 2.5YR 7/3, wet.	GW									
			20	E.O.B at 20 feet bgs.										

WDNR SBL 1998 07201DNR.GPJ WI DNR 2003.GDT 4/22/10

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State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Kewaunee Marsh		B1E

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Dusty Harvey On-Site Environmental Services	12/7/2009	12/7/2009	Geoprobe

WI Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
			Feet MSL	586.0 Feet MSL	2.1 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 243,946 N, 2,616,456 E S/C/N
1/4 of 1/4 of Section , T N, R
Lat ° ' "
Long ° ' "
Local Grid Location ☐ N Feet ☐ S ☐ E Feet ☐ W

Facility ID	County	County Code	Civil Town/City/ or Village
	Kewaunee	31	Kewaunee

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth in Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	60 21		1	SAND (SP), with gravel, medium to fine grained, brown 10YR 5/3, moist.	SP									
2 CS	60 24		6	SANDY CLAY (CL), light red brown 2.5YR 6/3, moist, soft.	CL									
			7	PEAT, with organics (root mass, wood), dark brown black 10YR 3/2, moist, soft.										
3 CS	60 60		10											

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm	
	RMT, Inc. 744 Heartland Trail Madison, WI 53717	Tel: 608-831-4444 Fax: 608-831-3334

This form is authorized by Chapters 281, 283, 289, 291, 292, 293, 295, and 299, Wis. Stats. Completion of this form is mandatory. Failure to file this form may result in forfeiture of between $10 and $25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on this form is not intended to be be used for any other purpose. NOTE: See instructions for more information, including where the completed form should be sent.

State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION SUPPLEMENT
Form 4400-122A

Boring Number B1E — Use only as an attachment to Form 4400-122. —

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			13											
			14	ORGANIC SILT (OL), with shells and trace organics, dark greenish gray GLEY1 4/1, moist, soft.										
4 CS	60 48		15		OL									
			16											
			17											
			18											
			19	SANDY CLAY (CL), with gravel, fine to medium grained, reddish brown 5YR 5/3, very wet, soft.	CL									
			20	GRAVEL WITH SAND (GW), and trace fines, small to large, subangular, coarse to medium grained sand, light red brown 2.5YR 7/3, wet. E.O.B at 20 feet bgs.	GW									

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State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Kewaunee Marsh		B2A

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Dusty Harvey On-Site Environmental Services	12/8/2009	12/8/2009	Geoprobe

WI Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
			Feet MSL	587.0 Feet MSL	2.1 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 244,022 N, 2,616,416 E S/C/N
1/4 of 1/4 of Section , T N, R
Lat ° ' "
Long ° ' "
Local Grid Location ☐ N Feet ☐ S ☐ E Feet ☐ W

Facility ID	County	County Code	Civil Town/City/ or Village
	Kewaunee	31	Kewaunee

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	60 39		1–12	SAND (SP), with gravel, medium grained, yellow brown 10YR 4/4, moist. Black stained material at 6.5 - 6.7 feet bgs. Ballast.	SP									
2 CS	60 45			Black stained material from 6.5 - 6.8 feet bgs. As above, with clay, moist to wet, red brown 5YR 5/3.										
3 CS	60 60			SAND (SP), with trace gravel, medium to fine grained, grayish brown 10YR 5/2, very wet.	SP									

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm	
	RMT, Inc. 744 Heartland Trail Madison, WI 53717	Tel: 608-831-4444 Fax: 608-831-3334

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Department of Natural Resources

SOIL BORING LOG INFORMATION SUPPLEMENT
Form 4400-122A

Boring Number B2A — Use only as an attachment to Form 4400-122. — Page 2 of 2

Sample: Number and Type	Sample: Length Att. & Recovered (in)	Sample: Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
					SP									
			13	PEAT, with organics (wood and root mass), dark brown 10YR 3/2, moist, soft.										
			14											
					OL									
			15	ORGANIC SILT (OL), with shells and trace organics, dark greenish gray GLEY1 4/1, moist, soft.										
				E.O.B. at 15 feet bgs.										

WDNR SBL 1998 07201DNR.GPJ WI DNR 2003.GDT 4/22/10

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State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Kewaunee Marsh		B2B

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Dusty Harvey On-Site Environmental Services	12/8/2009	12/8/2009	Geoprobe

WI Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
			Feet MSL	587.0 Feet MSL	2.1 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 244,007 N, 2,616,427 E S/C/N
1/4 of 1/4 of Section , T N, R
Lat ° ' "
Long ° ' "
Local Grid Location ☐ N Feet ☐ S ☐ E Feet ☐ W

Facility ID	County	County Code	Civil Town/City/ or Village
	Kewaunee	31	Kewaunee

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	60 30		1	SAND (SP), with gravel, medium grained, small to large, subangular gravel, yellowish brown 10YR 5/4, moist.										
			2											
			3											
			4											
2 CS	60 30		5											
			6		SP									
			7											
			8											
			9	As above, with clay, moist to wet.										
3 CS	60 15		10											
			11											
			12											

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm	Tel: 608-831-4444
	RMT, Inc. 744 Heartland Trail Madison, WI 53717	Fax: 608-831-3334

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Department of Natural Resources

SOIL BORING LOG INFORMATION SUPPLEMENT
Form 4400-122A

Boring Number B2B — Use only as an attachment to Form 4400-122. — Page 2 of 2

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			13	PEAT, with organics (wood and root mass), dark brown 10YR 3/2, moist, soft.										
			14											
4 CS	60 60		15	ORGANIC SILT (OL), with shells and trace organics, dark greenish gray GLEY1 4/1, moist, soft.										
			16											
			17		OL									
			18											
			19	SANDY CLAY (CL),with gravel, medium grained, red brown gray 5YR 5/2, moist.	CL									
			20	E.O.B. at 20 feet bgs.										

WDNR SBL 1998 07201DNR.GPJ WI DNR 2003.GDT 4/22/10

State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Kewaunee Marsh		B2C

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Dusty Harvey On-Site Environmental Services	12/8/2009	12/8/2009	Geoprobe

WI Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
			Feet MSL	587.0 Feet MSL	2.1 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 243,989 N, 2,616,440 E S/C/N
1/4 of 1/4 of Section , T N, R
Lat ° ' "
Long ° ' "
Local Grid Location ☐ N Feet ☐ S ☐ E Feet ☐ W

Facility ID	County	County Code	Civil Town/City/ or Village
	Kewaunee	31	Kewaunee

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	60 30		1	SAND (SP), with gravel, medium grained, small to large, subangular gravel, yellowish brown 10YR 5/4, moist.	SP									
2 CS	60 48		7	CLAY (CL), red brown 5YR 5/3, moist, stiff.	CL									
			8	SAND (SP), with gravel, medium grained, small to medium, subangular gravel, yellowish brown 10YR 5/4, moist.	SP									
			10	CLAY (CL), red brown 5YR 5/3, moist, stiff.	CL									
3 CS	60 60		11	GRAVEL (GP), with sand, medium to large, medium grained, light brown 10YR 6/3, wet.	GP									
				SAND (SP), with gravel, medium to fine	SP									

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm	
	RMT, Inc. 744 Heartland Trail Madison, WI 53717	Tel: 608-831-4444 Fax: 608-831-3334

This form is authorized by Chapters 281, 283, 289, 291, 292, 293, 295, and 299, Wis. Stats. Completion of this form is mandatory. Failure to file this form may result in forfeiture of between $10 and $25,000, or imprisonment for up to one year, depending on the program and conduct involved. Personally identifiable information on this form is not intended to be be used for any other purpose. NOTE: See instructions for more information, including where the completed form should be sent.

State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION SUPPLEMENT
Form 4400-122A

Boring Number B2C — Use only as an attachment to Form 4400-122. — Page 2 of 2

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			13	grained, small to medium subangular to round gravel, brown 10YR 5/3, very wet. PEAT, with organics (wood and root mass), dark brown 10YR 3/2, moist, soft.										
			14											
4 CS	60 30		15	ORGANIC SILT (OL), with shells and trace organics, dark greenish gray GLEY1 4/1, moist, soft.	OL									
			16											
			17											
			18											
			19	SILTY CLAY (CL-ML), with sand, red brown 5YR 5/3, moist, stiff.	CL-ML									
			20	E.O.B. at 20 feet bgs.										

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State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Kewaunee Marsh		B2D

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Dusty Harvey On-Site Environmental Services	12/7/2009	12/7/2009	Geoprobe

WI Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
			Feet MSL	587.0 Feet MSL	2.1 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 243,973 N, 2,616,452 E S/C/N
1/4 of 1/4 of Section , T N, R
Lat ° ' "
Long ° ' "
Local Grid Location ☐ N Feet ☐ S ☐ E Feet ☐ W

Facility ID	County	County Code	Civil Town/City/ or Village
	Kewaunee	31	Kewaunee

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	60 36		1	SAND (SP), with gravel, medium grained, yellow brown 10YR 4/4, moist. Black stained material at 6.5 - 6.7 feet bgs. Ballast.	SP									
2 CS	60 42		5											
			8	CLAY (CL), brownish red 5YR 4/4, moist, soft.	CL									
			9	SAND (SP), with gravel, medium grained, brown 10YR 5/3, moist.										
3 CS	60 48		10		SP									
			12											

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm	
	RMT, Inc. 744 Heartland Trail Madison, WI 53717	Tel: 608-831-4444 Fax: 608-831-3334

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Department of Natural Resources

SOIL BORING LOG INFORMATION SUPPLEMENT
Form 4400-122A

Boring Number B2D — Use only as an attachment to Form 4400-122. —

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			13		SP									
			14	PEAT, with organics (wood and root mass), dark brown 10YR 3/2, moist, soft.										
4 CS	60 54		15											
			16	SAND (SW), medium grained, light yellow brown 10YR 6/4, moist.	SW									
			17	PEAT, with organics (wood and root mass), dark brown 10YR 3/2, moist, soft.										
			18	ORGANIC SILT (OL), with shells and trace organics, dark greenish gray GLEY1 4/1, moist, soft.	OL									
			19											
			20	GRAVEL WITH CLAY AND SAND (GW-GC), small to large gravel, medium to coarse grained, red-brown gray 5YR 5/3, wet.	GW-GC									
5 CS	60 60		21											
			22	GRAVEL WITH SAND (GW), and clay, small to large gravel, sub-angular, medium to coarse grained, light red brown 2.5YR 7/3, wet.	GW									
			23											
			24											
			25	E.O.B. at 25 feet bgs.										

WDNR SBL 1998 07201DNR.GPJ WI DNR 2003.GDT 4/22/10

State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Kewaunee Marsh		B2E

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Dusty Harvey On-Site Environmental Services	12/7/2009	12/7/2009	Geoprobe

WI Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
			Feet MSL	587.0 Feet MSL	2.1 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 243,954 N, 2,616,467 E S/C/N
1/4 of 1/4 of Section , T N, R
Lat ° ' "
Long ° ' "
Local Grid Location ☐ N Feet ☐ S ☐ E Feet ☐ W

Facility ID	County	County Code	Civil Town/City/ or Village
	Kewaunee	31	Kewaunee

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	60 42		1	SAND (SP), with gravel, medium grained, small to large gravel, yellow brown 10YR 6/6, moist. Ballast.	SP									
2 CS	60 36		5											
			7	CLAY (CL), brown red 5YR 5/3, moist, moderately stiff. Ballast	CL									
			8	SAND (SP), with gravel, medium to fine grained, small to large gravel, yellow brown 10YR 6/6, moist, Ballast.										
3 CS	60 60		10	As above, medium grained, brownish gray 10YR 5/2, very wet.	SP									

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm	Tel: 608-831-4444
	RMT, Inc. 744 Heartland Trail Madison, WI 53717	Fax: 608-831-3334

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Department of Natural Resources

SOIL BORING LOG INFORMATION SUPPLEMENT
Form 4400-122A

Boring Number B2E — Use only as an attachment to Form 4400-122. —

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			13		SP									
			14	PEAT, with organics (wood and root mass), dark brown 10YR 3/2, moist, soft.										
4 CS	60 0		15	ORGANIC SILT (OL), with shells and trace organics, dark greenish gray GLEY1 4/1, moist, soft.	OL									
			16											
			17											
			18											
			19	SANDY CLAY (CL), dark red gray 2.5YR 4/2, moist, soft.	CL									
5 CS	60 18		20											
			21											
			22	SAND (SP), with trace small gravel and fines, very fine grained, red brown 5YR 5/3, very wet.	SP									
			23	SANDY CLAY (CL), fine to medium grained, reddish brown 5YR 5/3, very wet, soft.	CL									
			24	GRAVEL WITH SAND (GW), and trace fines, small to large, subangular, coarse to medium grained sand, light red brown 2.5YR 7/3, wet.	GW									
			25	E.O.B at 25 feet bgs.										

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State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Kewaunee Marsh		B2F

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Dusty Harvey On-Site Environmental Services	12/7/2009	12/7/2009	Geoprobe

WI Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
			Feet MSL	587.0 Feet MSL	2.1 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 243,927 N, 2,616,488 E S/C/N
1/4 of 1/4 of Section , T N, R
Lat ° ' "
Long ° ' "
Local Grid Location ☐ N Feet ☐ S ☐ E Feet ☐ W

Facility ID	County	County Code	Civil Town/City/ or Village
	Kewaunee	31	Kewaunee

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth in Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	60 36		1	SAND (SP), with gravel, medium grained, brown-yellow 10YR 6/6, moist. Ballast.										
			2											
			3											
			4											
			5											
2 CS	60 27		6		SP									
			7	As above, fine to medium grained, small to medium gravel, with trace fines, dark gray 10 YR 4/1, wet. Ballast.										
			8											
			9											
			10											
3 CS	60 60		11	As above, very wet.										
			12											

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm	
	RMT, Inc. 744 Heartland Trail Madison, WI 53717	Tel: 608-831-4444 Fax: 608-831-3334

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Department of Natural Resources

SOIL BORING LOG INFORMATION SUPPLEMENT
Form 4400-122A

Boring Number B2F — Use only as an attachment to Form 4400-122. —

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			13		SP									
			14	PEAT, with visible organics, very dark brown 10YR 2/2, moist, soft.										
4 CS	60 60		15											
			16	ORGANIC SILT (OL), with shells and trace organics, dark greenish gray GLEY1 4/1, moist, soft.										
			17											
			18		OL									
			19											
			20	CLAY (CL), with sand, very fine grained, dark grayish red 2.5YR 4/2, moist, moderately stiff.										
5 CS	60 60		21											
			22		CL									
			23	GRAVEL WITH SAND (GW), and trace fines, small to large, subangular, coarse to medium grained sand, light red brown 2.5YR 7/3, wet.										
			24											
6 CS	60 60		25											
			26											
			27		GW									
			28											
			29											
			30	E.O.B. at 30 feet bgs.										

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State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Kewaunee Marsh		B3D

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Dusty Harvey On-Site Environmental Services	12/7/2009	12/7/2009	Geoprobe

WI Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
			Feet MSL	586.0 Feet MSL	2.1 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 243,979 N, 2,616,460 E S / C / N
1/4 of 1/4 of Section , T N, R
Lat ° ' "
Long ° ' "
Local Grid Location ☐ N Feet ☐ S ☐ E Feet ☐ W

Facility ID	County	County Code	Civil Town/City/ or Village
	Kewaunee	31	Kewaunee

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	60 48		1	TOPSOIL.										
			1	SAND (SP), with gravel, medium grained, brown-yellow 10YR 6/6, moist. Ballast.										
			2											
			3		SP									
			4											
2 CS	60 57		5											
			6	SANDY CLAY (CL), medium grained, reddish brown 5YR 5/3, moist.	CL									
			7	GRAVEL (GP), with sand, small to medium, coarse grained, brown-yellow 10YR 6/6, moist.	GP									
			8	SANDY CLAY (CL), brown 10YR 5/3, moist, soft.	CL									
			9	SAND (SP), with gravel, medium grained, large angular gravel, brown 10YR 5/3, moist.										
3 CS	60 57		10		SP									
			11											
			12											

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm	
	RMT, Inc. 744 Heartland Trail Madison, WI 53717	Tel: 608-831-4444 Fax: 608-831-3334

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State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION SUPPLEMENT
Form 4400-122A

Boring Number B3D — Use only as an attachment to Form 4400-122. — Page 2 of 2

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			13	PEAT, with visible organics, very dark brown 10YR 2/2, moist, soft.	SP									
4 CS	12 12		14 15	ORGANIC SILT (OL), with shells and trace organics, dark greenish gray GLEY1 4/1, moist, soft.	OL									
			16	E.O.B. at 16 feet bgs.										

WDNR SBL 1998 07201DNR.GPJ WI DNR 2003.GDT 4/22/10

State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Kewaunee Marsh		B3E

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Dusty Harvey On-Site Environmental Services	12/7/2009	12/7/2009	Geoprobe

WI Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
			Feet MSL	586.0 Feet MSL	2.1 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 243,960 N, 2,616,475 E S / C / N
1/4 of 1/4 of Section , T N, R
Lat ° ' "
Long ° ' "
Local Grid Location ☐ N Feet ☐ S ☐ E Feet ☐ W

Facility ID	County	County Code	Civil Town/City/ or Village
	Kewaunee	31	Kewaunee

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	60 48		1–5	SAND (SP), with small gravel, fine grained, yellow brown 10YR 6/6, moist.	SP									
2 CS	60 48		5–6	CLAY (CL), brown 7.5YR 4/6, moist, soft.	CL									
			6–8	SAND (SP), with small gravel, fine grained, yellow brown 10YR 6/6, moist.	SP									
			8–9	CLAY (CL), brown 7.5YR 4/6, moist, soft.	CL									
			9–10	SAND (SP), with trace gravel, fine to medium grained, yellow brown 10YR 6/2, very wet.	SP									
3 CS	60 39		10–12	PEAT, with visible organics, very dark brown 10YR 2/2, moist, soft.										

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm	
	RMT, Inc. 744 Heartland Trail Madison, WI 53717	Tel: 608-831-4444 Fax: 608-831-3334

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Department of Natural Resources

SOIL BORING LOG INFORMATION SUPPLEMENT
Form 4400-122A

Boring Number B3E — Use only as an attachment to Form 4400-122. — Page 2 of 2

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
			13											
			14											
4 CS	60 42		15	ORGANIC SILT (OL), with shells and trace organics, dark greenish gray GLEY1 4/1, moist, soft.										
			16											
			17		OL									
			18											
			19											
			20	SILTY CLAY (CL-ML), dark grayish red 2.5YR 4/2, moist, soft.	CL-ML									
5 CS	60 48		21	GRAVEL WITH SAND (GW), and clay, small to large, subangular, coarse to medium grained sand, light red brown 2.5YR 7/3, wet.										
			22	As above, trace fines.	GW									
			23											
			24											
			25	E.O.B at 25 feet bgs.										

WDNR SBL 1998 07201DNR.GPJ WI DNR 2003.GDT 4/22/10

State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Kewaunee Marsh		M10F

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Toni Kapugi On-Site Environmental Services	3/17/2010	3/17/2010	Geoprobe

WI Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
			Feet MSL	582.0 Feet MSL	2.1 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 243,962 N, 2,616,829 E S/C/N
1/4 of 1/4 of Section , T N, R
Lat ° ' "
Long ° ' "
Local Grid Location ☐ N Feet ☐ S ☐ E Feet ☐ W

Facility ID	County	County Code	Civil Town/City/ or Village
	Kewaunee	31	Kewaunee

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	48 24		1	**PEAT,** dark brown to black (10YR 3/2), moist, soft.										
			2											
			3											
2 CS	48 24		4											
			5											
			6											
			7											
			8	E.O.B. at 8 feet bgs.										

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm	
	RMT, Inc. 744 Heartland Trail Madison, WI 53717	Tel: 608-831-4444 Fax: 608-831-3334

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State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Kewaunee Marsh		M11F

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Toni Kapugi On-Site Environmental Services	3/17/2010	3/17/2010	Geoprobe

WI Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
			Feet MSL	583.0 Feet MSL	2.1 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 243,956 N, 2,616,948 E S/C/N
1/4 of 1/4 of Section , T N, R
Lat ° ' "
Long ° ' "
Local Grid Location ☐ N ☐ E Feet ☐ S Feet ☐ W

Facility ID	County	County Code	Civil Town/City/ or Village
	Kewaunee	31	Kewaunee

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	48 30		1	**PEAT,** dark brown to black (10YR 3/2), frozen, soft.										
			2	As above, no longer frozen - wet.										
			3	Styrofoam cap material present										
2 CS	48 30		4											
			5											
			6											
			7											
3 CS	48 48		8	**ORGANIC SILT (OL),** with shells, dark greenish gray (gley1 4/1), moist, soft.	OL									
			9											
			10											
			11											
			12											

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Signature	Firm	Tel: 608-831-4444
	RMT, Inc. 744 Heartland Trail Madison, WI 53717	Fax: 608-831-3334

State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION SUPPLEMENT
Form 4400-122A

Boring Number M11F Use only as an attachment to Form 4400-122.

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
4 CS	48 0		13 14 15 16	No recovery from 12 - 16 feet bgs. Drillers reported very soft material.	OL									
				E.O.B. at 16 feet bgs										

State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Kewaunee Marsh		M12F

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Toni Kapugi On-Site Environmental Services	3/17/2010	3/17/2010	Geoprobe

WI Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
			Feet MSL	582.0 Feet MSL	2.1 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 243,953 N, 2,617,062 E S/C/N
1/4 of 1/4 of Section , T N, R
Lat ° ' "
Long ° ' "
Local Grid Location ☐ N Feet ☐ S ☐ E Feet ☐ W

Facility ID	County	County Code	Civil Town/City/ or Village
	Kewaunee	31	Kewaunee

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	48 9.6		1	**PEAT,** dark brown to black (10YR 3/2), moist, soft.										
			2											
			3											
2 CS	48 30		4	As above, wet.										
			5											
			6											
			7	**ORGANIC SILT(OL),** with shells, dark greenish gray (gley1 4/1), moist, soft.	OL									
			8	E.O.B. at 8 feet bgs.										

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	RMT, Inc. 744 Heartland Trail Madison, WI 53717	Tel: 608-831-4444 Fax: 608-831-3334

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State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Kewaunee Marsh		M2A

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Toni Kapugi On-Site Environmental Services	3/17/2010	3/17/2010	Geoprobe

WI Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
			Feet MSL	584.0 Feet MSL	2.1 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 244,040 N, 2,616,437 E S/C/N
1/4 of 1/4 of Section , T N, R
Lat ° ' "
Long ° ' "
Local Grid Location ☐ N ☐ E Feet ☐ S Feet ☐ W

Facility ID	County	County Code	Civil Town/City/ or Village
	Kewaunee	31	Kewaunee

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	60 25		1	**TOPSOIL/CAP MATERIAL.**										
			2											
			3	**POORLY GRADED SAND (SP),** medium grained, light brown, wet.	SP									
			4	**PEAT,** dark brown to black (10YR 3/2), wet, soft.										
2 CS	60 30		5											
			6											
			7											
			8											
			9	**ORGANIC SILT (OL),** with shells, dark greenish gray (gley1 4/1), wet, soft.	OL									
			10	E.O.B. at 10 feet bgs.										

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State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Kewaunee Marsh		M2B

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Toni Kapugi On-Site Environmental Services	3/17/2010	3/17/2010	Geoprobe

WI Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
			Feet MSL	584.0 Feet MSL	2.1 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 244,017 N, 2,616,449 E S/C/N
1/4 of 1/4 of Section , T N, R
Lat ° ' "
Long ° ' "
Local Grid Location ☐ N Feet ☐ S ☐ E Feet ☐ W

Facility ID	County	County Code	Civil Town/City/ or Village
	Kewaunee	31	Kewaunee

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	60 30		1	**TOPSOIL.**	SP									
				POORLY GRADED SAND (SP), medium grained, light brown, wet.										
			2	**PEAT,** dark brown to black (10YR 3/2), wet, soft.										
			3											
			4											
2 CS	60 40		5	**ORGANIC SILT (OL),** with shells, greenish gray (gley1 4/1), wet, soft.	OL									
			6											
			7											
			8											
			9	**POORLY GRADED SAND WITH GRAVEL (SP),** medium grained, small gravel, wet, soft.	SP									
			10	**PEAT,** dark brown to black (10YR 3/2), wet, soft.										
				E.O.B. at 10 feet bgs.										

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State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Kewaunee Marsh		M2C

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Toni Kapugi On-Site Environmental Services	3/17/2010	3/17/2010	Geoprobe

WI Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
			Feet MSL	584.0 Feet MSL	2.1 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 243,998 N, 2,616,463 E S/C/N
1/4 of 1/4 of Section , T N, R
Lat ° ' "
Long ° ' "
Local Grid Location ☐ N Feet ☐ S ☐ E Feet ☐ W

Facility ID	County	County Code	Civil Town/City/ or Village
	Kewaunee	31	Kewaunee

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	60 30		1 2 3 4	**PEAT,** dark brown to black (10YR 3/2), wet, soft.										
2 CS	60 35		5 6 7 8	**POORLY GRADED SAND (SP),** medium grained, light yellow brown, wet. **PEAT,** dark brown to black (10YR 3/2), wet, soft.	SP									
			9 10	**ORGANIC SILT (OL),** with shells, dark geenish gray (gley1 4/1), wet, soft. E.O.B. at 10 feet bgs.	OL									

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	RMT, Inc. 744 Heartland Trail Madison, WI 53717	Tel: 608-831-4444 Fax: 608-831-3334

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Department of Natural Resources

SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Kewaunee Marsh		M2D

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Dusty Harvey On-Site Environmental Services	12/8/2009	12/8/2009	Geoprobe

WI Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
			Feet MSL	584.0 Feet MSL	2.1 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 243,983 N, 2,616,473 E S/C/N
1/4 of 1/4 of Section , T N, R
Lat ° ' "
Long ° ' "
Local Grid Location ☐ N ☐ E Feet ☐ S Feet ☐ W

Facility ID	County	County Code	Civil Town/City/ or Village
	Kewaunee	31	Kewaunee

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	60 9		1	ORGANICS. PEAT, with organics (wood and root mass), dark brown 10YR 3/2, moist, soft.										
2 CS	60 51		7	ORGANIC SILT (OL), with shells and trace organics, dark greenish gray GLEY1 4/1, moist, soft.	OL									
			10	E.O.B. at 10 feet bgs.										

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Signature	Firm	
	RMT, Inc. 744 Heartland Trail Madison, WI 53717	Tel: 608-831-4444 Fax: 608-831-3334

State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Kewaunee Marsh		M2E

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Toni Kapugi On-Site Environmental Services	3/17/2010	3/17/2010	Geoprobe

WI Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
			Feet MSL	584.0 Feet MSL	2.1 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 243,972 N, 2,616,485 E S/C/N
1/4 of 1/4 of Section , T N, R
Lat ° ' "
Long ° ' "
Local Grid Location ☐ N Feet ☐ S ☐ E Feet ☐ W

Facility ID	County	County Code	Civil Town/City/ or Village
	Kewaunee	31	Kewaunee

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	60 24		1	**PEAT,** dark brown to black (10YR 3/2), wet, soft.										
			2											
			3											
			4											
			5											
2 CS	60 36		6											
			7											
			8	**POORLY GRADED SAND (SP),** medium grained, light brown, wet.	SP									
			9	**PEAT,** dark brown to black (10YR 3/2), wet, soft.										
			10	**ORGANIC SILT (OL),** with shells, dark greenish gray (gley1 4/1), wet, soft. E.O.B. at 10 feet bgs.	OL									

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Department of Natural Resources

SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Kewaunee Marsh		M2F

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Toni Kapugi On-Site Environmental Services	3/17/2010	3/17/2010	Geoprobe

WI Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
			Feet MSL	584.0 Feet MSL	2.1 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 243,943 N, 2,616,511 E S/C/N
1/4 of 1/4 of Section , T N, R
Lat ° ' "
Long ° ' "
Local Grid Location ☐ N Feet ☐ S ☐ E Feet ☐ W

Facility ID	County	County Code	Civil Town/City/ or Village
	Kewaunee	31	Kewaunee

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	60 35		1	**PEAT,** dark brown to black (10YR 3/2), wet, soft.										
			2	**POORLY GRADED SAND (SP),** medium grained, light brown, wet.	SP									
			3	**PEAT,** dark brown to black (10YR 3/2), wet, soft.										
			4											
			5											
2 CS	60 38.4		6											
			7											
			8											
			9	**ORGANIC SILT (OL),** with shells, dark greenish gray (gley1 4/1), soft, wet.	OL									
			10	E.O.B. at 10 feet bgs.										

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Department of Natural Resources

SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Kewaunee Marsh		M3D

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Dusty Harvey On-Site Environmental Services	12/8/2009	12/8/2009	Geoprobe

WI Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
			Feet MSL	583.0 Feet MSL	2.1 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 243,995 N, 2,616,487 E S/C/N
1/4 of 1/4 of Section , T N, R
Lat ° ' "
Long ° ' "
Local Grid Location ☐ N ☐ E Feet ☐ S Feet ☐ W

Facility ID	County	County Code	Civil Town/City/ or Village
	Kewaunee	31	Kewaunee

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	60 24		1–10	PEAT, with organics (wood and root mass), dark brown 10YR 3/2, moist, soft.										
2 CS	60 36			ORGANIC SILT (OL), with shells and trace organics, dark greenish gray GLEY1 4/1, moist, soft.	OL									
				E.O.B. at 10 feet bgs.										

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SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Kewaunee Marsh		M4D

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Dusty Harvey On-Site Environmental Services	12/8/2009	12/8/2009	Geoprobe

WI Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
			Feet MSL	583.0 Feet MSL	2.1 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 244,003 N, 2,616,502 E S/C/N
1/4 of 1/4 of Section , T N, R
Lat ° ' "
Long ° ' "
Local Grid Location ☐ N ☐ E Feet ☐ S Feet ☐ W

Facility ID	County	County Code	Civil Town/City/ or Village
	Kewaunee	31	Kewaunee

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	60 6		1	PEAT, with organics (wood and root mass), dark brown 10YR 3/2, moist, soft.										
			2											
			3											
			4											
			5											
2 CS	60 54		6											
			7											
			8	ORGANIC SILT (OL), with shells and trace organics, dark greenish gray GLEY1 4/1, moist, soft.	OL									
			9											
			10	E.O.B. at 10 feet bgs.										

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SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Kewaunee Marsh		M5A

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Toni Kapugi On-Site Environmental Services	3/17/2010	3/17/2010	Geoprobe

WI Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
			Feet MSL	582.0 Feet MSL	2.1 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 244,064 N, 2,616,488 E S/C/N
1/4 of 1/4 of Section , T N, R
Lat ° ' "
Long ° ' "
Local Grid Location ☐ N Feet ☐ S ☐ E Feet ☐ W

Facility ID	County	County Code	Civil Town/City/ or Village
	Kewaunee	31	Kewaunee

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	60 30		1	**PEAT,** dark brown to black (10YR 3/2), wet, soft.										
			2											
			3											
			4											
			5											
2 CS	60 55		6											
			7	**ORGANIC SILT (OL),** with shells, dark greenish gray (gley1 4/1), wet, soft.										
			8		OL									
			9											
			10	E.O.B. at 10 feet bgs.										

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm	Tel: 608-831-4444
	RMT, Inc. 744 Heartland Trail Madison, WI 53717	Fax: 608-831-3334

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State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Kewaunee Marsh		M5B

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Toni Kapugi On-Site Environmental Services	3/17/2010	3/17/2010	Geoprobe

WI Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
			Feet MSL	582.0 Feet MSL	2.1 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 244,048 N, 2,616,501 E S/C/N
1/4 of 1/4 of Section , T N, R
Lat ° ' "
Long ° ' "
Local Grid Location ☐ N Feet ☐ S ☐ E Feet ☐ W

Facility ID	County	County Code	Civil Town/City/ or Village
	Kewaunee	31	Kewaunee

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	60 26.4		1–10	**PEAT,** dark brown to black (10YR 3/2), wet, soft. Styrofoam cap material observed at 3 feet bgs.										
2 CS	60 55													
				ORGANIC SILT (OL), with shells, greenish gray (gley1 4/1), wet, soft.	OL									
			10	E.O.B. at 10 feet bgs.										

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm	
	RMT, Inc. 744 Heartland Trail Madison, WI 53717	Tel: 608-831-4444 Fax: 608-831-3334

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Department of Natural Resources

SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Kewaunee Marsh		M5C

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Toni Kapugi On-Site Environmental Services	3/17/2010	3/17/2010	Geoprobe

WI Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
			Feet MSL	582.0 Feet MSL	2.1 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 244,033 N, 2,616,512 E S/C/N
1/4 of 1/4 of Section , T N, R
Lat ° ' "
Long ° ' "
Local Grid Location ☐ N ☐ E Feet ☐ S Feet ☐ W

Facility ID	County	County Code	Civil Town/City/ or Village
	Kewaunee	31	Kewaunee

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	60 26		1	**PEAT,** dark brown to black (10YR 3/2), wet, soft.										
			2											
			3											
			4	Styrofoam cap material present at 3.5 feet bgs.										
2 CS	60 28		5											
			6											
			7											
			8	**ORGANIC SILT (OL),** with shells, greenish gray (gley1 4/1), wet, soft.	OL									
			9											
			10	E.O.B. at 10 feet bgs.										

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Signature	Firm	Tel: 608-831-4444
	RMT, Inc. 744 Heartland Trail Madison, WI 53717	Fax: 608-831-3334

State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Kewaunee Marsh		M5D

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Dusty Harvey On-Site Environmental Services	12/8/2009	12/8/2009	Geoprobe

WI Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
			Feet MSL	582.0 Feet MSL	2.1 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 244,013 N, 2,616,521 E S/C/N
1/4 of 1/4 of Section , T N, R
Lat ° ' "
Long ° ' "
Local Grid Location ☐ N Feet ☐ S ☐ E Feet ☐ W

Facility ID	County	County Code	Civil Town/City/ or Village
	Kewaunee	31	Kewaunee

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	60 12		1	PEAT, with organics (wood and root mass), dark brown 10YR 3/2, moist, soft.										
			2											
			3											
			4											
			5											
2 CS	60 48		6											
			7											
			8											
			9	ORGANIC SILT (OL), with shells and trace organics, dark greenish gray GLEY1 4/1, moist, soft.	OL									
			10											

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm	
	RMT, Inc. 744 Heartland Trail Madison, WI 53717	Tel: 608-831-4444 Fax: 608-831-3334

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Department of Natural Resources

SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Kewaunee Marsh		M5E

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Toni Kapugi On-Site Environmental Services	3/17/2010	3/17/2010	Geoprobe

WI Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
			Feet MSL	582.0 Feet MSL	2.1 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 243,998 N, 2,616,528 E S/C/N
1/4 of 1/4 of Section , T N, R
Lat ° ' "
Long ° ' "
Local Grid Location ☐ N Feet ☐ S ☐ E Feet ☐ W

Facility ID	County	County Code	Civil Town/City/ or Village
	Kewaunee	31	Kewaunee

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	60 30		1	**PEAT,** dark brown to black (10YR 3/2), wet, soft.										
			2											
			3											
			4											
2 CS	60 60		5											
			6											
			7											
			8	**ORGANIC SILT (OL),** with shells, dark greenish gray (gley1 4/1), wet, soft.	OL									
			9											
3 CS	60 60		10											
			11											
			12											

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm	
	RMT, Inc. 744 Heartland Trail Madison, WI 53717	Tel: 608-831-4444 Fax: 608-831-3334

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Department of Natural Resources

SOIL BORING LOG INFORMATION SUPPLEMENT
Form 4400-122A

Boring Number M5E — Use only as an attachment to Form 4400-122. — Page 2 of 2

Sample: Number and Type	Sample: Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Soil Properties: Moisture Content	Soil Properties: Liquid Limit	Soil Properties: Plasticity Index	Soil Properties: P 200	RQD/ Comments
			13		OL									
			14	**SANDY LEAN CLAY WITH GRAVEL (CL),** medium grained sand, small to medium gravel, redish brown gray (2.5YR 4/2), wet, moderately stiff.	CL									
			15		GP									
			16	**POORLY GRADED GRAVEL (GP),** with clay, small to medium gravel, redish brown gray (2.5YR 4/2), wet. E.O.B. at 15 feet bgs.									

WDNR SBL 1998 07201DNR.GPJ WI DNR 2003.GDT 4/22/10

State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Kewaunee Marsh		M5F

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Toni Kapugi On-Site Environmental Services	3/17/2010	3/17/2010	Geoprobe

WI Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
			Feet MSL	582.0 Feet MSL	2.1 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 243,975 N, 2,616,552 E S/C/N
1/4 of 1/4 of Section , T N, R
Lat ° ' "
Long ° ' "
Local Grid Location ☐ N Feet ☐ S ☐ E Feet ☐ W

Facility ID	County	County Code	Civil Town/City/ or Village
	Kewaunee	31	Kewaunee

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	60 30		1	**PEAT,** dark brown to black (10YR 3/2), wet, soft										
			2											
			3	Styrofoam cap material present at 2.5 feet bgs.										
			4											
2 CS	60 60		5											
			6											
			7											
			8	**ORGANIC SILT (OL),** dark greenish gray (gley1 4/1), wet, soft.	OL									
			9											
			10	E.O.B. at 10 feet bgs.										

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm	
	RMT, Inc. 744 Heartland Trail Madison, WI 53717	Tel: 608-831-4444 Fax: 608-831-3334

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State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Kewaunee Marsh		M6E

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Toni Kapugi On-Site Environmental Services	3/17/2010	3/17/2010	Geoprobe

WI Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
			Feet MSL	582.0 Feet MSL	2.1 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 244,007 N, 2,616,581 E S/C/N
1/4 of 1/4 of Section , T N, R
Lat ° ' "
Long ° ' "
Local Grid Location ☐ N Feet ☐ S ☐ E Feet ☐ W

Facility ID	County	County Code	Civil Town/City/ or Village
	Kewaunee	31	Kewaunee

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	48 14.4		1	**PEAT,** dark brown to black (10YR 3/2), wet, soft.										
			2											
			3											
2 CS	48 24		4											
			5											
			6											
			7											
			8	**ORGANIC SILT (OL),** with shells, dark greenish gray (gley1 4/1), moist, soft. E.O.B. at 8 feet bgs.	OL									

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm	
	RMT, Inc. 744 Heartland Trail Madison, WI 53717	Tel: 608-831-4444 Fax: 608-831-3334

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State of Wisconsin
Department of Natural Resources

SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Kewaunee Marsh		M7E

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Toni Kapugi On-Site Environmental Services	3/17/2010	3/17/2010	Geoprobe

WI Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
			Feet MSL	582.0 Feet MSL	2.1 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 244,006 N, 2,616,623 E S/C/N
1/4 of 1/4 of Section , T N, R
Lat ° ' "
Long ° ' "
Local Grid Location ☐ N Feet ☐ S ☐ E Feet ☐ W

Facility ID	County	County Code	Civil Town/City/ or Village
	Kewaunee	31	Kewaunee

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	48 24		1	**PEAT,** dark brown to black (10YR 3/2), wet, soft.										
			2											
			3											
			4											
2 CS	48 24		5											
			6											
			7											
			8	E.O.B. at 8 feet bgs.										

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm	
	RMT, Inc. 744 Heartland Trail Madison, WI 53717	Tel: 608-831-4444 Fax: 608-831-3334

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SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Kewaunee Marsh		M8E

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Toni Kapugi On-Site Environmental Services	3/17/2010	3/17/2010	Geoprobe

WI Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
			Feet MSL	582.0 Feet MSL	2.1 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 244,004 N, 2,616,670 E S / C / N
1/4 of 1/4 of Section , T N, R
Lat ° ' "
Long ° ' "
Local Grid Location ☐ N Feet ☐ S ☐ E Feet ☐ W

Facility ID	County	County Code	Civil Town/City/ or Village
	Kewaunee	31	Kewaunee

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	48 22.5		1	**PEAT**, dark brown to black (10YR 3/2), moist, soft.										
2 CS	48 43.2		4	As above, wet.										
			8	E.O.B. at 8 feet bgs.										

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm	
	RMT, Inc. 744 Heartland Trail Madison, WI 53717	Tel: 608-831-4444 Fax: 608-831-3334

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SOIL BORING LOG INFORMATION

Form 4400-122 Rev. 7-98

Route To: Watershed/Wastewater ☐ Waste Management ☐
Remediation/Redevelopment ☐ Other ☐

Facility/Project Name	License/Permit/Monitoring Number	Boring Number
Kewaunee Marsh		M9F

Boring Drilled By: Name of crew chief (first, last) and Firm	Date Drilling Started	Date Drilling Completed	Drilling Method
Toni Kapugi On-Site Environmental Services	3/17/2010	3/17/2010	Geoprobe

WI Unique Well No.	DNR Well ID No.	Common Well Name	Final Static Water Level	Surface Elevation	Borehole Diameter
			Feet MSL	582.0 Feet MSL	2.1 inches

Local Grid Origin ☐ (estimated: ☐) or Boring Location ☒
State Plane 243,969 N, 2,616,703 E S/C/N
1/4 of 1/4 of Section , T N, R
Lat ° ' "
Long ° ' "
Local Grid Location ☐ N ☐ E Feet ☐ S Feet ☐ W

Facility ID	County	County Code	Civil Town/City/ or Village
	Kewaunee	31	Kewaunee

Sample Number and Type	Sample Length Att. & Recovered (in)	Blow Counts	Depth In Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties: Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index	P 200	RQD/ Comments
1 CS	48 14.4		1	**PEAT,** dark brown to black (10YR 3/2), wet, soft. Cap material present from 1-1.3 feet bgs.										
2 CS	48 43.2		4	As above very wet from 4-6.5 feet bgs.										
			8	E.O.B. at 8 feet bgs.										

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature	Firm	
	RMT, Inc. 744 Heartland Trail Madison, WI 53717	Tel: 608-831-4444 Fax: 608-831-3334

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WDNR SBL 1998 07201DNR.GPJ WI DNR 2003.GDT 4/22/10

Appendix H
Memo: 2011 Baseline Monitoring – Colloid and Long-Term Stability Evaluation

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

Main 608.826.3600
Fax 608.826.3941

Memorandum

From: Bob Stanforth, Ph.D.

Subject: 2011 Baseline Monitoring – Colloid and Long-Term Stability Evaluation
Kewaunee Marsh Source Area Remediation

Date: January 2012

Project No.: 186467.0000.0000.000003

Background

The arsenic source area in Kewaunee Marsh was remediated in October 2011 and baseline performance monitoring was completed in November 2011 using 16 site monitoring wells. The arsenic results of the water analysis were much higher than expected for the wells constructed in or near the treatment area. These include MW11-1, MW11-2 and MW11-3 completed in the peat, and nested wells MW11-1i and MW11-3i completed in the underlying silt. The results for the wells in question are presented below in Table 1.

Table 1
2011 Baseline Water Monitoring Results

WELL	COLOR	pH	CONDUCTIVITY	ARSENIC	CALCIUM	IRON	SULFATE
			µmhos/cm	mg/L			
Wells in Peat Material							
MM11-1	Light yellow	6.41	6,462	304	590	112	3,340
MW11-2	Light yellow	6.88	5,322	108	429	165	3,120
MW11-3	Light yellow	7.12	2,197	360	285	1.28	<2
Wells in Organic Silt							
MW11-1i	Light gray	6.99	1,209	121	128	3.94	124
MW11-3i	Clear	7.12	1,299	153	154	3.70	15.9

Treated Material

Water collected from MW11-1 and MW11-2 is from area that was treated, as indicated both by their location and by the high sulfate and calcium concentrations in the water. Both sulfate and calcium are contributed to the water by the treatment process (sulfate from the ferrous sulfate and calcium from the limestone). The presence of the calcium and sulfate indicate that the marsh material has been treated and the high arsenic numbers are not the results of incomplete treatment. Based on all the previous treatability results and on the SPLP tests on treated material collected during the remediation, there is no reason to believe that the arsenic stabilization would not be successful. Two possible explanations for the high arsenic levels are evaluated below.

Colloid Evaluation

Based on all the previous treatability results and on the SPLP tests on treated cell material during the remediation, there is no reason to believe that the treatment would not be successful. However, iron concentrations are also much higher than would be expected in the water, and this provides a possible explanation for the high arsenic levels. Most likely, the high arsenic concentrations are due to colloidal ferric hydroxide or ferric arsenate solids which may be passing through the 0.45µ filter used to differentiate dissolved and particulate metals and is being measured as "dissolved" iron. Iron hydroxide solids often occur in the colloidal size range, and can pass through the filter.

As mentioned, the iron concentrations in the water are unexpectedly high. At the pH values of the samples, the dissolved iron concentrations under oxic conditions where ferric iron is the stable form should be very low – much less than 1 mg/L. The presence of such high iron concentrations – in the 100 mg/L range – suggests that the iron is not truly dissolved. While ferrous iron is more soluble than ferric iron, these concentrations are above what would be expected for ferrous iron in the presence of carbonate. A calculation of the theoretical ferrous iron concentration in water under these conditions illustrates the point. Since the treatment process involved the addition of calcium carbonate, the carbonate concentration in the water will be controlled by the dissolved calcium concentration, as shown from the following dissolution reaction for limestone.

$$CaCO_3 \leftrightarrow Ca^{2+} + CO_3^{2-}$$

$$K_{sp,\ CaCO3} = [Ca^{2+}][CO_3^{2-}] = 5 \times 10^{-9}$$

The ferrous iron concentration, in turn will be controlled by the precipitation of ferrous carbonate, as follows:

$$FeCO_3 \leftrightarrow Fe^{2+} + CO^{2-}$$

$$K_{spFeCO3} = [Fe^{2+}][CO_3^{2-}] = 2 \times 10^{-11}$$

The concentrations for all three species (calcium, ferrous iron and carbonate) are described by their respective solubility constants (K_{sp}). Since there is solid calcium carbonate present in the treated material, the concentrations of both calcium and carbonate will be controlled by the dissolution of the limestone. The carbonate concentration is the same for both solubility equations, which means that we can calculate the theoretical ferrous iron concentrations from the K_{sp}s and the calcium concentration, as follows:

$$[Fe^{2+}][CO_3^{2-}] \ / \ [Ca^{2+}][CO_3^{2-}] = K_{spFeCO3} / K_{sp,\ CaCO3}$$

$$([Fe^{2+}][CO_3^{2-}]) / ([Ca^{2+}][CO_3^{2-}]) = 2 \times 10^{-11} / 5 \times 10^{-9}$$

$$[Fe^{2+}] / \ [Ca^{2+}] = 4 \times 10^{-3}$$

$$[Fe^{2+}] = 4 \times 10^{-3} ([Ca^{2+}])$$

In the presence of 500 mg/L calcium (or 0.0125 M Ca^{2+}), the dissolved iron concentration in the water should be

$$0.0125 \times 4 \times 10^{-3} = 5 \times 10^{-5} \text{ M, or } 2.8 \text{ mg/L}$$

Iron concentrations are orders of magnitude higher than the theoretical solubility value, indicating that it is unlikely that the iron concentrations are due to dissolved ferrous iron in the water.

Thus the most likely explanation for the high iron concentrations is that particulate ferric iron particles are passing through the filter, and these carry arsenic with them.

Long Term Stability Evaluation

Stabilization of arsenic using ferric iron can be reversed if the iron is reduced to the ferrous oxidation state. Thus, an alternative explanation for the elevated arsenic concentrations in the treated hot spot area could be that the iron has been reduced. However, this explanation does not appear likely for several reasons.

1. As discussed above, ferrous iron is not soluble in the water to the concentrations observed due to the presence of carbonate from the limestone.
2. To reduce that much iron (100 mg/L or more) would require a significant amount of reducing agent. While the organics in the marsh will favor reducing conditions over time, the organics are stable at this point (since they have been in the marsh for an extended time period and the readily reduced material has already reacted), and it is highly doubtful that they would react this quickly.
3. Ferrous iron oxidizes very quickly at the pH values observed in the sample once it is exposed to air. Acid is generated during this oxidation process. If the iron were in the

ferrous oxidation state, one would expect that some of the iron would oxidize during sampling using a bailer and the pH would drop. In contrast, the pH values are where they are expected to be following treatment, and there is no suggestion that ferrous iron oxidation has occurred.

4. Iron reduction was not observed in the treatability testing completed for the site in 2010, including samples that were incubated under conditions that should have encouraged reduction if it were going to occur. These samples from the 2010 treatability study were stored in anaerobic conditions in the lab, and analyzed for SPLP arsenic in January 2012 to evaluate the potential for iron reduction. The results from the 2010 treatability study, including the analysis from January 2012, are summarized below in Table 2. The results from the bench scale test suggest that even after two years reaction time, iron reduction is not observed, and the SPLP arsenic concentrations are near or below detection and consistent with the level of stabilization seen in at the time of original treatment in 2010.

Table 2
Results of Long-term Stability Treatability Study Results

SAMPLE		SCREENING SPLP	
		pH	As, mg/L
Ballast			
Untreated		8.91	13
Treated	Immediate	6.56	<0.013
	10 Day	7.46	<0.013
	1 month	7.63	<0.013
	3 month	7.74	<0.013
	7 month	7.8	0.020
	23 months	7.7	0.020
Peat Under Ballast			
Untreated		8.36	11
Treated	Immediate	6.71	<0.013
	10 Day	7.31	<0.013
	1 month	7.44	<0.013
	3 month	7.54	<0.013
	7 month	7.4	0.025
	23 months	7.7	0.02

Table 2
Results of Long-term Stability Treatability Study Results

SAMPLE		SCREENING SPLP	
		pH	As, mg/L
Peat in Marsh			
Untreated		8.33	18
Treated	Immediate	5.70	<0.013
	10 Day	6.93	<0.013
	1 month	6.97	<0.013
	3 month	7.45	<0.013
	7 month	7.1	0.033
	23 months	7.5	0.02
Organic Silt in Marsh			
Untreated		8.76	2.5
Treated	Immediate	7.21	<0.013
	10 Day	7.46	<0.013
	1 month	7.56	<0.013
	3 month	7.77	<0.013
	7 month	7.65	0.022
	23 months	7.7	<0.013

Notes:
Treatability study methods are described in the Hot Spot Investigation and Remedial Options Analysis Report (RMT, 2010).

Conclusions

The most likely explanation describing the elevated arsenic concentrations in MW11-1 and MW11-2, is that arsenic is not truly dissolved (and mobile), but rather is associated with finely divided iron particles that have passed through the filter. If this is the explanation, then the high arsenic levels noted in the water samples are not mobile at the site. The colloids do not travel very far in most groundwater and certainly would not be transported far in the marsh given the slow groundwater flow. Further, the colloidal concentrations should decrease over time as the colloids settle out, and the concentrations should be much lower in future sampling events.

Appendix I
Proposed Spring 2012 Sampling Methods

Appendix I
Proposed Water Sampling Methods – Spring 2012 Evaluation
Kewaunee Marsh – Kewaunee, Wisconsin

Purpose

To evaluate if the elevated arsenic concentrations in the water in the treatment area are associated with colloidal particles, and determine if changes are needed in the sampling protocol to obtain representative samples of the dissolved phase arsenic concentrations at the Kewaunee Marsh.

Low Flow Sampling Evaluation

Evaluate options for low flow water collection methods to minimize disturbance of groundwater during sampling. The low hydraulic conductivity and slow recovery of the water in wells at the Kewaunee marsh may require that modified low flow sampling methods be used. TRC proposes evaluating the three general methods described below during the Spring 2012 sampling event. In all cases water levels will need to be monitored closely, using a water level indicator, in order to maintain adequate well volume prior to sampling. The methods listed below would be evaluated such that a low flow sampling protocol could be developed for the site.

1. **Low flow sampling using a peristaltic pump and flow through cell**. Collect sample using standard low flow sampling protocol, but allow for adjustment in pumping rates and frequency of parameter readings due to low well volume yields.
2. **Well volume purge and low flow sampling combination**. Remove initial stagnant well volume, or until well goes dry. Once the well has recovered, perform low flow stabilization/sampling using a peristaltic pump and flow through cell.
3. **Low flow sampling using a peristaltic pump and submerged meter probes**. Collect sample using low flow sampling protocol, but set meter down the well with sample tubing placed just above the meter. This method would allow for a significantly slower pump rates. Decontamination of the meter would be required between each well.

Filter Size Evaluation

Evaluate effect filter size has on the concentration of arsenic in water to determine if elevated arsenic concentrations are associated with colloidal particles (typical colloid size ranges from 0.001 and 1 micron). The methods listed below would be evaluated such that a modified filtration process could be developed for water sampling protocol at the site.

1. **Use a 0.20 micron field filter.** In addition to the current 0.45 micron field filtering process, samples would be run through a 0.20 micron filter after the 0.45 micron.

2. **Use laboratory filters less than 0.20 micron.** A 0.20 micron filter is the smallest filter size that can be applied in the field. Smaller filters (e.g. 0.02 micron) can be used in the laboratory following passing of a sample through a field filter. A subset of samples would be field filtered at the site and then subjected to further laboratory filtering prior to analysis for arsenic.

Sampling Plan

A systematic sampling approach is recommended to isolate components of the water sampling at Kewaunee Marsh that may be contributing to the measurement of elevated arsenic concentrations in the treatment area, and to determine modifications to the sampling protocol, if any, that would be recommended for water sampling at Kewaunee Marsh. The sampling program summarized below could be completed as part of the semi-annual performance monitoring program for the in situ treatment, or could be completed as an interim sampling event. All water samples would be analyzed for arsenic and iron.

FLOW METHOD	FILTER SAMPLING METHOD	SUGGESTED MONITORING WELLS	PURPOSE
Bailer (Current Method)	Field Filter: 0.45 µm	MW11-1 (treated) MW11-3 (untreated, high arsenic) MW04-9 (untreated, low arsenic)	Establish control conditions for current method
Bailer [(1)]	Field Filter: 0.2 µm Lab Filter: 0.02 µm	MW11-1 MW11-3 MW04-9	Determine effect of filter size on arsenic concentration without altering flow method
Low Flow 1 Low Flow 2 Low Flow 3	No Sample[(2)]	MW11-2 MW11-3i MW02-3 (or any well not sampled)	Evaluate feasibility of suggested low flow methods on typical wells and select one method to use for sample collection
Selected Low Flow Method	Field Filter: 0.45 µm	MW11-1 (treated) MW11-3 (untreated, high arsenic) MW04-9 (untreated, low arsenic)	Determine effect flow method on arsenic concentration without altering filter size
Selected Low Flow Method [(1)]	Field Filter: 0.2 µm Lab Filter: 0.02 µm	MW11-1 MW11-3 MW04-9	Determine effect of combination of flow method and filter size on arsenic concentration

Notes
(1) The samples from smaller filter sizes should be collected in series following the 0.45 µm filters using the suggested flow method.
(2) No sample to be collected for laboratory analysis during evaluation of low flow sampling method.