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March 16, 2012

Ms. Carmen Anderson
Project Manager
Indiana Department of Environmental Management
Voluntary Remediation Program
Office of Land Quality
100 North Senate Avenue
Indianapolis, Indiana 46204

Re: **Response to IDEM's Request for Revised Remediation Work Plan
Approval Review and Technical Response to
General Notice of Potential Liability Review
Michigan Plaza**
3801-3823 West Michigan Street
Indianapolis, Indiana 46222
IDEM VRP #6061202
MUNDELL Project No. M01046

Dear Ms. Anderson:

This response is being submitted to the Indiana Department of Environmental Management (IDEM) by MUNDELL & ASSOCIATES, INC. (MUNDELL), on behalf of AMMH, as a response to IDEM's letter, '*Request for Revised Remediation Work Plan Approval Review and Technical Response to General Notice of Potential Liability Review*' dated June 22, 2011.

Since the receipt of the IDEM letter, MUNDELL has completed the following scope of additional investigation activities at the Site in coordination with IDEM in order to address IDEM's comments and to determine if additional remedial action was warranted:

- 1) The completion of three (3) additional nested pairs of monitoring wells (MMW-P-011S/D; MMW-P-12S/D; MMW-P-13S/D) west and northwest of the

Michigan Plaza site, according to the *Revised Work Plan for Third Round of CAP 18 METM Injections* dated July 22, 2011 submitted by MUNDELL to IDEM and subsequently approved in a letter dated August 22, 2011.

- 2) The completion of six (6) 2-dimensional resistivity geophysical profile lines supplemented with seismic refraction analysis to aid in the detailed assessment and interpretation of the geologic variability in the vicinity of the site, specifically the distribution of fine-grained glacial till sequences, the unconsolidated sand and gravel units, the top of the lower till surface, and the top of the bedrock surface.
- 3) The completion of fourteen (14) soil borings (GP-20 through GP-29, MMW-P-11DR, MMW-P-14S, MMW-P-14D, and MMW-C-02D) to better establish soil and groundwater conditions to the southeast and southwest of the Site.
- 4) The completion of two (2) soil borings (MMW-P-15S and MMW-P-15D) to better establish soil and groundwater conditions to the northwest of the Site.
- 5) The completion of two (2) soil borings (GP-30 and GP-31) along the north-south sewer line section west of the Michigan Plaza building.
- 6) The installation of six (6) additional monitoring wells (MMW-P-11DR, MMW-P-14S, MMW-P-14D, MMW-P-15S, MMW-P-15D, MMW-C-02D) as outlined in our November 30, 2011 *Notification of Additional Soil and Groundwater Investigation Activities* to improve groundwater level and quality information southeast, southwest, and northwest of Michigan Plaza.
- 7) Downhole geophysical logging of the monitoring wells that had deeper portions of the borings blank drilled were completed to verify proper screen placement within the aquifer and aquifer description.
- 8) New soil boring and monitoring well soil and groundwater sampling and analytical testing.
- 9) Monitoring well groundwater level gauging and groundwater potentiometric surface map development.

The key results of these investigations have been incorporated into the responses to the IDEM comments, and are provided, where appropriate, below each IDEM comment in the following pages. Further details from these investigation activities are provided in the *Additional Investigation Activities Report Michigan Plaza* dated March 16, 2012 submitted to IDEM under separate cover.

Because a number of IDEM's comments and questions concern whether the chlorinated solvent groundwater impacts at Michigan Plaza have been adequately delineated, especially to the west of the Plaza, and whether the depth and behavior of the basal till surface underlying the impacted groundwater has been sufficiently investigated, we have addressed those issues first, and then proceed to address IDEM's specific comments individually.

Pre-2011 Delineation of Chlorinated Groundwater Impacts Overview

Environmental subsurface investigations conducted by a number of environmental consultants since 1992 (e.g., Engineering Science, Inc., 1993; Fluor Daniel GTI, 1997; Keramida Environmental, 2002) have disclosed volatile organic chemical (VOC) impacts to area groundwater from the operations of the former General Motors Corporation Allison Gas Turbine Division (GM AGT) Plant 10 facility at 700 North Olin Avenue due north of the Michigan Meadows Apartments across Little Eagle Creek. The former GM AGT has been entered into the IDEM Voluntary Remediation Program (VRP) by the Genuine Parts Company (herein termed Genuine Site). These previous studies found widespread offsite groundwater impacts south of the Genuine Site of cis-1,2-dichloroethylene (cis-1,2-DCE) and vinyl chloride (VC) beneath nearly all of the Michigan Meadows Apartments and Michigan Plaza Sites as well as certain other properties to the south.

MUNDELL was hired in 2001 to review all site investigation results and remedial work plans for the Genuine Site generated by Keramida. MUNDELL also completed Phase I Environmental Site Assessments for both the Michigan Plaza and the Michigan Meadow Apartments Sites in 2003, and several phases of subsurface investigations and indoor air quality studies for the Plaza and the Apartments including a Phase II Environmental Site Assessment (2005), a Further Site Characterization Study (2006) and a Further Site Investigation Addendum I (2007). These studies confirmed the widespread nature of the shallow and deep cis-1,2-DCE and VC groundwater impacts found from the earlier studies associated with the Genuine Site (see **Figures 1A, 1B, 1C and 1D** for the historic shallow and deep cis-1,2-DCE plume distributions, and **Figures 2A, 2B, 2C and 2D** for the historic shallow and deep groundwater VC plume distributions).

The MUNDELL studies at the Michigan Plaza property also identified distinct and separate perchloroethylene (PCE) groundwater impacts emanating from a leaky sewer

line from the former Accent Cleaners near Michigan Street and Michigan Plaza. The Genuine groundwater impacts differed from those observed from the sewer releases because no detectable PCE concentrations were observed entering the Michigan Meadows Property from the Genuine Site to the north. In addition, the Genuine plumes were distinguished by shallow groundwater with cis-1,2-DCE and VC concentrations of less than 500 ug/L, and deep groundwater with cis-1,2-DCE and VC concentrations of greater than 500 ug/L. This is clearly shown in **Figure 3**, which represents historical concentrations of cis-1,2-DCE and VC that have been observed in the 'heart' of the Genuine plume since 2002 coming across the Michigan Meadows Apartments property line from the north (as seen in monitoring wells MW-165D, MMW-4D, MMW-5D and MMW-6D). As explained below, that plume extends south through the Apartments (MW-166D), and to the west (MW-167D) and southwest (MW-170D) of the Plaza (refer also to the recent 2011 deep groundwater VC plume shown in **Figure 18**).

As a result of these observed distinctions, MUNDELL then undertook delineation efforts focused on PCE as the 'marker chemical' for releases from the Michigan Plaza sewer, but did not attempt to fully delineate the Genuine plumes of cis-1,2-DCE and VC that entered the Michigan Meadows Apartment property from the north and flowed through the Apartment and Plaza properties.

A video inspection conducted by MUNDELL of the sewer pipe leading from the former dry cleaner followed by adjacent sewer soil and downgradient groundwater sampling and testing indicated PCE leakage had occurred at the location of piping joints and connections, and confirmed the presence of three (3) independent PCE chemical sources areas (denoted as **Source Areas A, B and C**). PCE soil impacts indicated the horizontal extent of these releases were limited to relatively localized areas near the sewer (**Figure 4, 2008**), and PCE groundwater impacts were observed downgradient (to the south-southeast) of the release areas (**Figure 5, 2005**).

Groundwater PCE delineation efforts consisted of multiple rounds of Geoprobe water profiling efforts (see Phase II ESA, 2005; Further Site Characterization Study, 2006; and Further Site Investigation Addendum I, 2007) in key directions from the Source Areas based on an understanding of groundwater flow direction to the south-southeast supported by all available area published hydrogeologic data (e.g., Meyer et al., 1975; Herring, 1976; Smith, 1983; Fleming et al., 2000) and several years of area-specific potentiometric maps developed by MUNDELL for AMMH and Keramida Environmental

on behalf of Genuine. The geoprobe locations used to delineate PCE impacts from the drycleaner consisted of:

North Geoprobes: GP-A-01, GP-A-02, GP-A-03, GP-A-04, GP-A-05

Northwest Geoprobes: GP-A-06, GP-A-07, GP-A-08, GP-A-09

South/Southeast Geoprobes: (GP-01, GP-02, GP-03, GP-04, GP-05, GP-06, GP-07, GP-08; GP-C-01, GP-C-02, GP-C-03, GP-C-04, GP-C-05

In addition, each source area was further delineated with downgradient sampling (to the south-southeast) during monitoring well soil boring advancement, and after the installation of the following wells:

Source Area A: MMW-P-02, MMW-P-03S/D, MMW-P-04, MMW-C-01, MMW-P09S/D, MW169S/D

Source Area B: MMW-P-01, MMW-P-05, MMW-P-06, MMW-8S

Source Area C: MMW-1S, MMW-9S, MMW-10S, MW168S/D, MW171S/D

Upgradient (to the north) and cross-gradient (west/southwest) to the chemical source areas, monitoring wells were also installed by MUNDELL and others, which showed the impacted groundwater coming from the Genuine Site:

Upgradient Wells: MMW-2S, MMW-11S, MMW-11D, MMW-12S, MMW-13D, MMW-14D

Cross-gradient Wells: MW167S/D, MW170S/D

These PCE delineation efforts resulted in PCE plume maps in 2005 (**Figure 5**, Further Site Characterization Report), April 2007 (**Figure 6**, Further Site Investigation Report Addendum I), June 2007, (**Figure 7**, the MUNDELL 2007 2nd Quarter Groundwater Monitoring Progress Report), and 2008 (**Figure 8**, Remediation Work Plan). At the time of development, these PCE plume maps were consistent with all of the analytical data generated and with all potentiometric surface maps produced which supported a south-southeast groundwater flow direction from the source areas. Groundwater sampling along the north-south sewer line connector to the main east-west sewer line north of Michigan Street and west of **Source Area B** (in soil boring profiles GP-A-07, GP-A-08, GP-A-09) found no PCE release from that sewer line on the western portion of the Michigan Meadows Apartments property, and the absence of PCE in monitoring wells

west and southwest of Michigan Plaza (MW-167S/D, MW-170S/D) confirmed that any releases from the sewer line system on the Michigan Plaza property did not extend to Holt Road. Hydraulic evaluation of the flow characteristics and surveyed invert elevations of the sewer to the west also ruled out the possibility of discharge flow from the Plaza moving counter-flow direction to the fluid flow in the sewer (Further Site Investigation Report Addendum I, 2007).

In addition to the PCE detected at the Michigan Plaza Site, shallow groundwater samples showed concentrations of TCE, cis-1,2-DCE and VC present in 2007 pre-CAP18™ injection groundwater beneath the Plaza property at maximum concentrations of 356 ug/L, 274 ug/L and 40.6 ug/L, respectively, in the immediately downgradient vicinity of the chemical source areas (MUNDELL, RWP, 2008, Figures 29, 31C and 31D). Deeper groundwater impacts at the property were also observed prior to 2007, with maximum concentrations for cis-1,2-DCE of 42.0 ug/L, and VC of 2.0 ug/L found to be present (refer to previous discussions and **Figures 1A to 1D** and **2A to 2D**).

2011 Further PCE Delineation

After IDEM expressed concern with the completeness of the previous PCE delineations, especially toward the west-southwest in the direction of the Vermont Street drinking water wells, AMMH engaged MUNDELL to advance additional soil borings and install monitoring wells to address these concerns. The additional soil borings and monitoring wells placed south and southwest of Michigan Plaza (specifically MMW-P-11S/D, MMW-P-11DR, MMW-P-13S/D) and west of **Source Area B** (MMW-P-12S/D) during 2011 have further delineated the PCE impacts from the source areas in the southwesterly (cross-gradient) direction (see **Figure 9** discussed below).

In addition to the nested monitoring well set placed near the northwest corner of the property near the north-south sewer line (MMW-P-12S/D), two additional borings (GP-30 and GP-31) were completed along the sewer line. These areas were not accessible for drilling until late 2011 when existing overhead powerlines were removed from the site. Concentrations in soil and grab groundwater in GP-30 were nondetect for PCE and TCE, indicating no significant solvent release had likely occurred in the immediate vicinity or directly upgradient of the boring location. A PCE soil concentration of 68.5 ug/kg at 16.0 to 17.5 ft bgs was detected in GP-31 within the southern half of the western sewer line (note: the IDEM RISC 2009 Default Residential Cleanup Level is

58 ug/kg), and a grab PCE groundwater concentration of 9.5 ug/L at a depth of 26.0 ft, and a nondetect concentration at 36.0 ft. indicate only a very slight release at or slightly north (upgradient) of this location. The groundwater results from the new monitoring well nest MMW-P-11S/DR (a PCE concentration of 592 ug/L in the shallow part of the aquifer) immediately south and downgradient of the sewer joint at the intersection of the north-south sewer line with the east-west leg of the sewer south of the Plaza building indicates that releases of PCE likely occurred north (at or slightly upgradient of GP-31) or near the connection of the two lines. This sewer line segment has been targeted for additional CAP 18 injections during the second quarter of 2012 to treat the remaining PCE impacts (MUNDELL July 22, 2011 *Revised Work Plan for Third Round of CAP18 METM Injections*).

A PCE release at monitoring well MMW-P-12D in the soil (51,300 ug/kg) was observed near the junction of the western sewer line to a short east-west line in **Source Area B** north of the Plaza building. However, no detectable PCE groundwater impacts were observed in either the shallow or deep monitoring wells at that location. A revised CAP18TM injection location plan will be submitted to IDEM to include this area in the upcoming injection activities.

Updated PCE plume delineation maps for shallow and deep groundwater within the sand and gravel unit based on 4th Quarter 2011 groundwater analytical data collected by MUNDELL, are provided as **Figures 9 and 10**, respectively. In addition, the grab groundwater sample obtained by the EPA at EPA boring location SB-5 located in **Source Area B** during December 2011 indicated that a PCE concentration of 9.7 ug/L remains at that location. After two rounds of CAP18TM injections in August 2007 and February 2009 following the Remediation Work Plan recommendation to implement in-situ bioremediation of the PCE source areas and groundwater via the reductive dechlorination pathway, there are currently no detectable concentrations of PCE in the deep groundwater and limited areas of remaining shallow PCE impacts are present in each chemical source area. Additional soil and groundwater sampling along the western property boundary (soil boring GP-31) indicates a PCE source area remains in the vicinity of GP-31 south to the intersection of the north-south sewer line with the east-west leg of the sewer along the southern edge of the Michigan Plaza building. This area of **Source Area A** is an area that has not received CAP18 injections previously, and is already scheduled to receive them during the second quarter 2012. The other three areas of observed residual PCE impacts (two associated with **Source Area B** and one

associated with **Source Area C** as seen in **Figure 9**) are also planned for an additional injection, according to the MUNDELL July 22, 2011 *Revised Work Plan for Third Round of CAP18 METM Injections*.

The additional monitoring wells installed during 2011, which also include new wells MMW-P-14S/D (southwest of the Michigan Plaza site near the intersection of Cossell Road and Holt Road) and MMW-C-02D (southeast and downgradient of the Plaza), have also provided additional groundwater level data to confirm that the groundwater flow direction at Michigan Plaza is to the south-southeast from the original chemical source areas as has been previously represented. **Figures 11** and **12** provide updated potentiometric maps for shallow and deep groundwater within the sand and gravel unit, respectively, using monitoring well data collected east of Holt Road. A review of these updated potentiometric maps indicates a significant new finding: groundwater flow from the northern property line of the Michigan Meadows Apartment initially moves in a southerly direction, then is directed to the southwest in the western half of the site. Groundwater flow south of Michigan Street, however, remains consistent with previous flow interpretations.

A detailed geophysical survey investigation completed by MUNDELL as part of additional investigation activities provides insight into the behavior of the groundwater flow through the area that affects what is considered upgradient, downgradient and cross-gradient from the Michigan Plaza chemical source area delineations (see the attached *Additional Investigation Activities Summary Report*, Appendix C). As a result of the slope and topographic expression of the glacial till surface below the sand and gravel unit, deeper groundwater is forced to move around fine-grained 'knobs' or 'ridges' in the till surface, causing flow directions counter to what would be expected (*i.e.*, directed preferential flow paths) if the till surface was flat. As a result, groundwater flow from a portion of the Genuine Site is directed to the southwest and in the general direction of the Vermont Street residents (see **Figures 11** and **12**, and also Figures 10A, 10B and 10C in the geophysical report).

The distribution of cis-1,2-DCE and VC in both the shallow and deep groundwater appears to have been affected by this geologic condition (see, for example, VC Delineation section, and **Figure 18**), and provides an explanation for the pathway from the originating source of both of these chemicals at the Genuine Site through the Michigan Meadows Apartments property and into all properties south of Michigan

Street. Furthermore, the resulting groundwater flow through the Plaza area confirms the downgradient direction from the Michigan Plaza chemical source areas: south-southeast.

2011 TCE Delineation

Based on sampling and testing data collected during the 4th quarter 2011 by MUNDELL, the extent of TCE concentrations in the shallow and deep groundwater in the area is provided in **Figures 13** and **14**, respectively. As indicated in **Figure 13**, two limited areas of shallow TCE remain within Source Areas B and C, while no detectable TCE remains in the deep groundwater (**Figure 14**). These areas are planned for the additional CAP18TM injection discussed previously (see MUNDELL January 22, 2011 *Revised Work Plan for Third Round of CAP18 METM Injections*).

2011 Cis-1,2-DCE Delineation

Based on sampling and testing data collected during the 4th quarter 2011 by MUNDELL, the extent of cis-1,2-DCE concentrations in the shallow and deep groundwater in the area is provided in **Figures 15** and **16**, respectively. As indicated in both figures, substantial concentrations of cis-1,2-DCE (exceeding 1000 ug/L in the deep groundwater and exceeding 100 ug/L in the shallow groundwater) continue to enter the Michigan Meadows Apartments property from the Genuine Site in both the shallow and deep groundwater (e.g., in monitoring wells MMW-4D and MMW-5D; see also historical concentration summary in **Figure 3**). These impacts are widespread, and pass through most of the Michigan Meadows Apartments property, the Michigan Plaza property and properties to the west to Holt Road.

The effects of the Michigan Plaza in-situ bioremediation remediation (via the reductive dechlorination pathway per the RWP) are shown in the shallow groundwater quality shown in **Figure 15**. Increased Cis-1,2-DCE concentrations have been generated and are present above 100 ug/L since the first injection of CAP18TM in August 2007 in the vicinity of and downgradient of the drycleaner PCE chemical source areas. Trend analysis in the source area and downgradient wells since the time of the injections indicates these cis-1,2-DCE concentrations are continuing to decline as the in-situ bioremediation process continues (see MUNDELL, 4th Quarter 2011 Quarterly Monitoring Report).

2011 Vinyl Chloride Delineation

The extent of VC groundwater impacts in the shallow and deep groundwater in the area is provided in **Figures 17** and **18**, respectively. As indicated in both figures, substantial concentrations of VC (exceeding 100 ug/L) continue to enter the area from the Genuine Site in the deep groundwater (see monitoring wells MW-4D and MW05D). These impacts are significant from the northern property boundary of Michigan Meadows Apartments southward to and extending south of Michigan Street. From the **Figure 18** (and **Figures 3** and **12**) deep groundwater VC concentrations are seen emanating from the Genuine Site and moving to the southwest, acting as the source of VC observed in northwestern and western deep monitoring wells MW166D, MW167D, MW170D, MMW-13D, and likely also the Vermont residential drinking water wells. It should be noted that VC was detected in MW-170D in 2002 at 80 ug/L, six years before CAP18™ injections began at the Michigan Meadows Apartments and Michigan Plaza, and that no PCE has ever been detected in MW170D. As with cis-1,2-DCE, VC contributions from in-situ bioremediation activities at Michigan Plaza are apparent in the shallow and deep groundwater maps, mirroring somewhat the original 'footprint' of the PCE impacted groundwater. VC impacts from the Michigan Plaza remediation extend no farther than the levels observed at MMW-P-11S, with the impacts observed at both MMW-P-13S/D to likely be from the southerly VC plume coming from the Genuine Site. This can be seen by the relative concentrations at MMW-P-11D and MMW-P-12D (84 and 71.3 ug/L, respectively) which are lower than the level observed in MMW-P-13D (116 ug/L). As seen in **Figure 18**, this creates a 'separation' or 'saddle' area between the two deep VC plumes, the western deep Genuine plume, and the eastern, co-mingled Genuine/Michigan Plaza Plume.

Finally, delineation groundwater sampling and testing of shallow and deep groundwater south of Cossell Road within the Floral Park Cemetery at ten (10) additional Geoprobe locations (GP-20 to GP-29) has determined the downgradient extent of deep VC impacts (see **Figure 18** and the attached 2012 *Additional Investigation Activities Summary Report*).

Plume Delineation and Monitoring Summary

The saturated extent of the unconsolidated aquifer system has now been well-defined by the additional advancement of deeper soil borings, the completion of additional geophysical profile lines in the vicinity of the Site, and the installation of additional

downgradient monitoring wells screened in the deeper portions of the aquifer. In addition, additional on-site and off-site monitoring wells downgradient and cross-gradient to groundwater flow have demonstrated the extent of PCE, cis-1,2 and VC plume movement.

We are planning to install two additional monitoring wells south and southeast of the Plaza property to further delineate PCE (one shallow well to the south of MMW-P-11S/DR along the eastern edge of the Floral Park Cemetery) and VC (one deep well to the southeast of MMW-P-9D in the Floral Park Cemetery near boring GP-23). These wells will also allow enhanced monitoring of the continuing remediation activities at the Plaza. A proposal for these additional wells will be submitted to IDEM under separate cover.

Depth and Behavior of the Basal Till Unit

IDEM expressed a concern about whether the depth and behavior of the basal till surface have been sufficiently investigated to determine if a DNAPL arising from the former drycleaner release may be moving in a cross-gradient/westerly direction toward the Vermont Street residential wells.

After the completion of all the 2011 additional site investigation activities, MUNDELL developed a detailed 'top of till' map from all of the data gathered to date (**Figure 19**). This includes specific measurements of the top of till from the following information:

Soil borings: 43 locations (Mundell, Keramida, Environ, U.S. EPA)

Remedial injection points: 110 (in vicinity of Source Areas)

Geophysical profile lines: 513 points (mapped top of till layer along profiles)

Based on this data, the top of till is relatively level beneath Michigan Plaza, and is at about elevation 680 over most of the site. Southeast of the site, the till surface slopes downward to the southeast. As indicated in **Figure 19**, the basal till surface does not slope downward toward the west in the direction of the Vermont Street residential wells, and would not provide any cross-gradient pathway for a hypothetical DNAPL release that reached its surface. As such, IDEM's hypothesized release mechanism is not a pathway for impacts to the residential wells. Further discussion of the influence of this till surface on both groundwater flow direction and plume orientation is provided in the

2012 *Additional Investigation Activities Summary Report* submitted under separate cover.

MUNDELL'S SPECIFIC RESPONSES TO IDEM'S SPECIFIC COMMENTS

The following paragraphs provide MUNDELL's additional specific responses to IDEM's specific comments in the June 22, 2011 response letter:

IDEM Comment No.1. *"Reviewing this report prompted IDEM to perform a confirmatory review of the soil and groundwater sampling completed prior to the CAP 18 injections in August 2007. From this review, IDEM cannot concur that the Michigan Plaza source areas and groundwater plume are fully defined. IDEM also cannot agree that the deep contamination across the site is wholly the responsibility of Genuine Parts or that Michigan Plaza cannot be the source of the vinyl chloride contamination in the residential drinking water wells. Additionally, a review of the 2005 sewer line investigation shows that the line along the immediate west side of the Michigan Plaza building was in poor condition, with worn joints and sags in the line. Since this part of the line was in similar condition to the lines in the known source area, is closer to the dry cleaner, and has not been investigated, it is inaccurate to definitively state that the source areas are fully delineated or that the vinyl chloride in the residential drinking water well cannot be from the Michigan Plaza source areas. Additional investigation to the west of the Plaza is required."*

MUNDELL Response:

Refer to MUNDELL delineation summary discussion at the beginning of the letter for a detailed response. Since IDEM's comment letter, MUNDELL has completed significant additional investigation in the vicinity of the Site, and in particular along the western sewer line referenced in this comment, and in monitoring wells southwest and west of the Plaza. In addition, investigations completed by Genuine's consultant and the U.S. EPA have also yielded additional useful information.

First, two soil borings advanced along the western sewer line (GP-30 and GP-31), in an area that was previously inaccessible due to the presence of power lines, indicate that it is likely that some limited release of PCE occurred either at or just north of GP-31 but south of GP-30, and also at or near the junction where the north-south sewer joins the east-west sewer line extending from the former Accent Dry Cleaner. In addition, a PCE soil release was observed in the MMW-P-12 area. The western sewer line segment has

been targeted for additional CAP 18 injections during the second quarter of 2012 to treat the remaining PCE impacts (MUNDELL July 22, 2011 *Revised Work Plan for Third Round of CAP18 ME™ Injections*) and a revised CAP18™ injection location plan will be submitted to IDEM to include the area in the vicinity of MMW-P-12.

Recent (2011) groundwater sampling results from the new nested monitoring well pairs MMW-P-11S/D, MMW-P-12S/D and MMW-P-13S/D have further defined the PCE release area impacts, and indicate that PCE concentrations in the shallow portion of the aquifer do not extend to the western property line in the northern portion of the site (both MMW-P-12S and MW167S are non-detect for PCE), but do extend to a point between MMW-P-11S and MMW-P-13S. MUNDELL proposes to install an additional shallow monitoring well for the area directly south of MMW-P-11S/D (half way to MW169S/D along the eastern edge of the Floral Park Cemetery parking lot) in order to more closely delineate the southern shallow groundwater PCE extent and monitor the effects of the in-situ bioremediation.

During the 2011 groundwater sampling, no PCE was detected in the deeper portion of the aquifer along the western portions of the site (see **Figure 10**).

No detectable concentrations of PCE and TCE were observed in the recently completed groundwater sampling at location EB-1 completed by Genuine in the northeast corner of the intersection of Holt Road and Michigan Street. Again, if there had been past releases of PCE in this area from the east-west sewer line, they would have been detected, as they had been in *Source Areas A, B and C*.

Finally, no detectable concentrations of PCE and TCE soil or groundwater impacts were observed adjacent to the Michigan Street east-west sewer line beyond **Source Area B** during the recent U.S. EPA conducted study (e.g., in borings SB-01, SB-02, SB-06). As such, no releases along these portions of the sewer lines are indicated, and delineation of PCE and TCE is consistent with that previously determined by MUNDELL. A limited PCE groundwater impact was observed remaining in **Source Area B** at the U.S. EPA SB-05 location (9.7 ug/L of PCE; 5.8 ug/L of cis-1,2-DCE).

IDEM Comment No.2. *“Pre-remedial 2007 grab sample borings MMW-8S and MMW-P-03D contained PCE at depths of up to 40 ft. Based on these data, Michigan Plaza is a source of contamination in the deeper zones of the aquifer. IDEM has not conceded that all of the deep contamination is related to the Genuine Parts release. Shallow soil samples in the vicinity were indicative of DNAPL levels of PCE up to 26 ppm (MMW-P-07, 19-20 ft 26,000 ug/kg) so basal aquifer samples are vital to the*

characterization of the site. IDEM has requested deep wells in correspondence from 2007 (May 4, 2007) and 2008 (November 17, 2008) but to date, MMW-P-03D is the only deep well in a source area. Without quantitative groundwater data from the source areas, the plume cannot fully be delineated. Additional deep wells in the source areas are necessary."

MUNDELL Response:

Refer to MUNDELL delineation summary discussion at the beginning of the letter for a detailed response. IDEM has identified a lack of quantitative groundwater data from deeper zones of the aquifer, and indicates that deep wells need to be installed in the Source Areas to further aid in the groundwater delineation. MUNDELL believes that a significant amount of deeper groundwater sampling and testing has been completed throughout the aquifer immediately downgradient of the identified Source Areas to fully understand and delineate significant impacts from the sewer line PCE leakage.

MUNDELL's technical approach for deeper delineation was first to complete a detailed review of the sewer line coming from the Accent Cleaners location and identify potential locations for chemical releases to have occurred. Detailed video examination of the sewer line revealed the available general locations for possible leakage (joints and connections of the sewer). With those locations known, aquifer water profiling was then completed by obtaining shallow, intermediate and deep groundwater samples directly downgradient of each of those potential Source Areas. Finally, monitoring well locations and screen depths were selected based on the distribution of observed impacts. Specifically:

- 1) *Vertical groundwater profiling was completed for **Source Area A** in boring GP-03 (20 ft, 30 ft, 40 ft) eventually becoming MMW-P-03S/D, and in offsite boring MMW-C-02 (20 ft, 30 ft, 40 ft, 50ft). PCE groundwater concentrations decreased with depth in GP-03 from 730 ug/L at 20 ft, to 500 ug/L at 30 ft to 11 ug/L at 40 ft. Historically, pre-remediation groundwater concentrations in MMW-P-03S varied from about 67 to 397 ug/L, while the deeper MMW-P-03D varied from 11 to 48.9 ug/L. The depth to the basal till varied within Source Area A is from about 34 to 40 ft below ground surface as determined from more than 25 borings completed in the area during the investigation and remediation phases.*
- 2) *Vertical groundwater profiling was completed in **Source Area B** in MMW-8S (20 ft, 30 ft, 40 ft), MMW-P-07 (20 ft, 30 ft, 40 ft), and MMW-P-08 (20 ft, 30 ft, 40 ft). Deeper well MMW-P-10D immediately downgradient of Source Area B*

was completed as a result of that sampling. PCE groundwater concentrations decreased with depth in MMW-8S profiling from 1,400 ug/L at 20 ft to 260 ug/L at 40 ft. PCE concentrations decreased with depth in MMW-P-07 from 2,500 ug/L at 20 ft to 270 ug/L at 40 ft. PCE concentrations ranged from 6,000 ug/L at a depth of 20 ft in MMW-P-08 to 130 ug/L at 40 ft. The depth to the top of the lower basal till within the Source Area B ranged from about 34 to 40 ft based on the results of over 65 borings completed in the area during the investigation and remediation phases.

- 3) Vertical groundwater profiling was completed for **Source Area C** in MMW-9S (20 ft, 30 ft, 40 ft) and MMW-10S (20 ft, 30 ft, 40 ft) prior to selecting the final well screen depths. Deep well MW-168D was already located downgradient of this source area. PCE concentrations decreased with depth in MMW-9S, from 65 ug/L at 20 ft, to 7.7 ug/L at 30 ft, to less than 5 ug/L at 40 ft. PCE concentrations were non-detect at depths of 20, 30 and 40 ft in profile samples taken during the advancement of the soil boring for MMW-10S. Depth to the top of the basal till ranged from about 31 to 40 ft below ground surface in Source Area C as determined from over 50 borings completed during the investigation and remediation phases.*

Based upon the vertical profiling sampling described above, which indicated the decreasing trends of PCE with depth in the groundwater, and the PCE groundwater concentrations being less than what would be expected for the presence of DNAPL (i.e., less than 1% of PCE solubility), PCE DNAPL did not ever reach the till surface. In addition, the positive observed effects of deep in-situ bioremediation within the three chemical source areas, which now does not indicate the presence of any remaining dissolved PCE concentrations near the till surface, also supports this (since remediation design for CAP18TM injection did not assume the presence of DNAPL in the estimation of treatment quantities).

A more detailed discussion of the decision-making process used regarding the selection of well locations and construction details grouped according to the associated **Source Area** is provided below.

Monitoring Well Location and Screen Depth Selection

Source Area A

Monitoring Wells MMW-P-02, MMW-P-03D and MMW-P-04

These monitoring wells were installed as groundwater plume delineation locations. A vertical groundwater sampling profile was conducted at MMW-03-D (GP-03) with groundwater samples collected at 20 ft, 30 ft and 40 ft. Analytical results confirm that parent compound concentrations (PCE and TCE) are highest in the upper saturated zone (20 ft groundwater sample). While PCE concentrations exist in the deeper aquifer zone at 30 ft and 40 ft, concentrations are lower than those observed in the upper interval, and not at the level (1 % of PCE solubility) to indicate the presence of a DNAPL. Daughter compound VC was detected solely in the 40 ft groundwater sample, and not at a level to be indicative of the presence of DNAPL.

MMW-P-02 and MMW-P-04 were installed and have been monitored quarterly since 2005 to further delineate and monitor groundwater conditions in the upper saturated zone. Both wells are screened in the 20 to 30 ft interval, which was previously identified exhibiting the highest parent compound concentrations in groundwater. In these instances, data gathered were intended to clarify upper saturated zone conditions, not those occurring immediately above the basal clay till located approximately 36 to 40 ft bgs (as indicated by multiple CAP 18 injection points completed in the vicinity of Source Area A).

Conversely, MMW-P-03D was installed to 35 ft specifically to monitor and further delineate deep groundwater concentrations immediately downgradient of Source Area A and also Source Area B. As previously mentioned, the basal till unit has been confirmed via CAP 18 injection logs at approximately 36 to 40 ft bgs in the vicinity of Source Area A. In addition, GP-C-06 located 40 feet southeast of MMW-P-03D, was continuously sampled to a depth of 50 ft bgs and documents the presence of the basal till unit at approximately 42 ft, confirming the interpreted southeastern trend of subtle depressions in the till surface downgradient of Source Area A.

Monitoring Well MMW-P-09S

MMW-P-09S serves as a shallow groundwater delineation and monitoring location. This well was installed in concert with MMW-P-09D, intended to monitor the deep saturated zone and delineate potential impacts originating from the Michigan Plaza.

Tiered geoprobe groundwater samples were collected from MMW-P-09 (GP-C-03) at 20 ft, 30 ft and 40 ft bgs. No parent compounds were detected in any groundwater samples collected at this location. The 40 ft sample interval initially indicated the presence of the daughter product VC with a concentration of 27.5 ug/L. Soil description and screening were completed to a depth of 20 ft in GP-C-03, confirming the depth to groundwater in addition to the absence of chlorinated hydrocarbons in the unsaturated zone immediately above the water table. Based upon the established vertical groundwater concentration profile and the behavior of the potentiometric surface in this area, MMW-P-09S was installed to 28 ft with a screened interval of 18 to 28 ft. This interval was selected solely to monitor the continued absence of chlorinated hydrocarbons in the shallow saturated zone downgradient of the Plaza Site. MMW-P-09D was installed with a screened interval of 35 to 45 ft. This interval was selected to monitor VC impacts in the deep saturated zone, indicated in the previously mentioned vertical groundwater concentration profile. Vertical chlorinated hydrocarbon impacts have been delineated in these locations from the ground surface to a depth of 40 ft bgs. Screened intervals were selected based on field and laboratory analytical data and indicate that both MMW-P-09S and MMW-P-09D are screened at the proper intervals to monitor both shallow and deep groundwater impacts in the vicinity.

Source Area B - Upgradient

Monitoring Wells MMW-11D, MMW-13D and MMW-14D

The deep saturated zone exhibiting impacts from the upgradient Genuine Parts Site was identified extending to depths of approximately 50 ft during August 2004 drilling activities (MMW-4D, MMW-5D and MMW-6D). Accordingly, the installation depths (50 ft) and screened intervals (40 to 50 ft) of both MMW-13D and MMW-14D were selected based upon these historical upgradient drilling activities and recurring groundwater sampling events. MMW-4D, MMW-5D and MMW-6D have consistently shown daughter product migration within the 40 to 50 ft screened interval.

Per discussion with IDEM in late 2008/early 2009, MMW-11D, MMW-13D and MMW-14D are considered deep wells, all installed at the contact between the deep saturated zone and basal clay till unit. It was agreed during a meeting with IDEM on October 29, 2008, that data from these new upgradient deep wells would establish a full vertical groundwater profile north of Source Areas B and C, as well as aid in characterization of daughter compounds (cis-1,2-DCE and VC) entering the Site from the upgradient Genuine Parts Site.

Additionally, MUNDELL utilized the installation of MMW-13D and MMW-14D to verify the absence of soil and groundwater impacts related to the upgradient and adjacent sewer laterals serving the western and northeastern Michigan Apartment buildings, respectively. Shallow groundwater and soil samples collected from GP-A-08 (MMW-13D) at 14 to 15 ft and 16 ft showed no evidence of chlorinated hydrocarbon impacts immediately above or within the upper saturated zone. Shallow soil samples (4 to 5 ft) collected from GP-A-01 (MMW-14D), located adjacent to and downgradient from the eastern sewer lateral, showed no evidence of chlorinated hydrocarbon soil impacts. In addition, a vertical groundwater concentration profile was completed at GP-A-01 with samples collected at 16 ft, 26 ft and 36 ft. These samples indicated the limited presence of vinyl chloride in the deep saturated zone (26 to 36 ft) further delineating groundwater impacts immediately north of **Source Area C**. No other parent or daughter compounds were detected in the GP-A-01 groundwater samples.

Again, these monitoring wells were installed as groundwater plume delineation locations.

Source Area B - Downgradient

Monitoring Wells MMW-P-01, MMW-P-05, MMW-P-06, MMW-P-07, MMW-P-8, MMW-10S/D1D

A vertical groundwater sampling profile was conducted at MMW-P-07 with groundwater samples collected at 20 ft, 30 ft and 40 ft. Analytical results confirmed that parent compound concentrations (PCE and TCE) were highest in the upper saturated zone (20 ft groundwater sample). While PCE, TCE and DCE concentrations existed in the deeper aquifer zone at 40 ft, concentrations were lower than those observed in the upper interval. Daughter compound VC was detected solely in the 40 ft groundwater sample.

Vertical groundwater concentration profiles were also completed during installation of MMW-P-08 and MMW-P-01. MMW-P-08 is located approximately 25 ft north of the MMW-P-10S/D well nest and MMW-P-01 is located approximately 60 ft south of MMW-P-07.

Groundwater analytical results for MMW-P-01 collected at 21 ft and 30 ft confirmed the presence of PCE, TCE, and DCE in the upper saturated unit (21 ft) and VC solely in groundwater collected from the deeper sampling interval (30 ft). The VC concentration was not indicative of the presence of a DNAPL. Accordingly, MMW-P-07 was installed at a depth of 28 ft and screened from 18 to 28 ft, specifically to monitor the identified

parent compound behaviors in the shallow saturated zone as observed during drilling activities.

Monitoring well nest MMW-P-10S/D serves to monitor and delineate groundwater impacts in both the shallow and deep saturated zones. In addition to groundwater analytical data collected from MMW-P-01 and MMW-P-07, vertical groundwater profile data from MMW-P-08 was used to further understand the behavior of chlorinated hydrocarbon impacts in the aquifer beneath the Site. Tiered geoprobe groundwater samples were collected from MMW-P-08 at 20 ft, 30 ft and 40 ft bgs. All sampled intervals confirmed the presence of parent and daughter compounds throughout the entire saturated thickness of the aquifer. Again, PCE and TCE groundwater concentrations were higher in the upper saturated zone, while cis-1,2-DCE and VC were more significant in the lower saturated zone (30 to 40 ft). Accordingly, MMW-P-10S was installed to straddle the upper saturated zone (18 to 28 ft), and MMW-P-10D was installed to delineate and monitor the deep saturated zone (28 to 38 ft).

Additional monitoring wells MMW-P-05 and MMW-P-06 were placed further downgradient of **Source Area B** (and upgradient of **Source Area A**) to provide delineation information. Neither of these wells had detections of shallow or deep PCE in the groundwater sampling during the original boring advancement. As such, it was determined that deeper monitoring of PCE at those locations was not necessary. In addition, since installation, PCE has only been detected once in MMW-P-05 (2/22/2007, 23.7 ug/L) and never in MMW-P-06.

Further support of proper well installation depths and screened intervals is again provided in logs of more than 60 CAP 18 injection points located in the vicinity of **Source Area B**. Basal till has been identified at approximately 37 ft bgs in the vicinity of MMW-P-10D confirming its termination depth of 38 ft at the base of the aquifer unit beneath the Site.

Based on all historic concentration levels at these locations, there is no evidence that a DNAPL release made its way to the top of the till surface.

Source Area C

Monitoring Wells MMW-8S, MMW-9S and MMW-10S

These three monitoring wells were installed as groundwater plume delineation locations. Vertical groundwater sampling profiles were conducted at all three monitoring well locations with groundwater samples collected at 20 ft, 30 ft and 40 ft. Analytical results

confirm that parent compound concentrations (PCE and TCE) are highest in the upper saturated zone (20 ft groundwater sample). While PCE concentrations exist in the deeper aquifer zone at 30 ft and 40 ft, concentrations are lower than those observed in the upper interval, and below (much less than 1 % solubility of PCE) concentrations indicative of DNAPL. In addition, MMW-8S MMW-9S and MMW-10S were installed specifically to delineate and monitor groundwater impacts in the shallow saturated zone and were not intended to extend to the base of the aquifer. As described earlier in this letter response, the basal till location in the vicinity of these monitoring wells and **Source Area C** has been well established at 35 to 40 ft bgs via more than 70 CAP 18 injection points. The local understanding of the basal till surface depth and topography coupled with the vertical concentration profiles established via tiered geoprobe groundwater sampling confirm that these wells are screened within the upper saturated zone, as intended, where the highest primary parent compound impacts have been identified.

In addition to these wells, monitoring of the shallow and deep groundwater is also provided by MW168S/D and MW171S/D downgradient of the source areas.

In summary, all well locations and screens were selected based on extensive knowledge of vertically distributed groundwater impacts and nearby geologic conditions obtained from previous borings in close proximity to the wells. Each well was constructed utilizing a combination of lithologic data, vertical groundwater concentration profiles, and cumulative analytical data collected from known sampling intervals in the Source Area vicinities.

Based on the intensity of profile samples obtained and the network of both monitoring wells and the extensive injection boring program, the vertical and horizontal extent of the PCE, TCE, cis-1,2-DCE and vinyl chloride plumes within the three identified **Source Areas** have been accurately depicted and no evidence of DNAPL has been found. An extensive injection program which advanced more than 125 borings in those same areas subsequently confirmed the thickness of the aquifer and the depth to the top surface of the basal till.

Finally, as discussed previously, the additional investigation work previously completed during 2011, has delineated the observed impacts and accurately mapped the surface of the basal till to provide added confidence in the delineation and remediation of impacts. The downgradient deeper monitoring wells at MMW-P-03D, MME-P-09D, MMW-P-10D, MMW-P11DR, MMW-P-12D, MMW-C-02D, MMW-168D, MW171D, and

MW169D provide a robust monitoring system for the ongoing remediation of the site. In addition, as noted above, MUNDELL proposes to augment the existing monitoring well network with the addition of two additional monitoring wells (south of the southwest corner of **Source Area A**, and in the Floral Park Cemetery south of Cossell Road).

IDEM Comment No.3. *“Given that the lower portion of the aquifer has not been adequately monitored in the source areas and that the depth to basal till has not been confirmed, it is possible that NAPL is present at the till surface. It could be moving at some angle to groundwater flow. IDEM has been informed that the basal till is shallower near Michigan Street, which could be a basal divide. Since the CAP 18 injections were completed before the plume was completely delineated, the injections may have further mobilized contamination that was already present. Additional delineation is required west of the Plaza toward Holt Road on the residential properties. As stated in IDEM’s March 30, 2011, Quarterly Monitoring letter, vinyl chloride concentrations are above the 1-year groundwater screening level for vapor intrusion. The residential properties to the west of the Plaza must be investigated for vapor intrusion immediately. Additionally, a utility conduit investigation may be necessary to the west of the Plaza along Michigan Street to completely evaluate the vapor intrusion pathway.”*

MUNDELL Response:

Delineation and Basal Till

Refer to the discussions of delineation and basal till presented above. Refer to MUNDELL Response to IDEM Comment No. 2 regarding the absence of evidence of DNAPL.

Mobilization Through Cap18 Injections

With respect to IDEM’s suggestion that the injection of CAP18™ could have mobilized contamination that was already present and, presumably, pushed it in the direction of the residential houses, neither the available chemical data (see delineation summary discussion at the beginning of the letter), nor water level and soybean oil observations during and following the CAP18™ injections support any theory of contamination mobilization to the west during the injection programs.

First, the fact that PCE impacts have only been detected near the Michigan Plaza and Michigan Meadows Apartment buildings and not to the west (*i.e.*, no PCE was detected at MMW-P-13S/D, MMW-P-14S/D and MW-170S/D) confirms that CAP18™ injections did not mobilize chlorinated impacts.

Second, the volume of material injected would not have been enough to mobilize the contamination to travel cross-gradient towards the residences. The following summarizes the injection quantities and rates for the two events:

2007 TOTAL Injection Quantity = 6,506 gallons

- **Source Area A:** 1,962 gallons CAP 18™ over 8 days of field time.
 - ~ 245 gallons per day.
- **Source Area B:** 2,815 gallons CAP 18™ over 12 days of field time.
 - ~ 235 gallons per day.
- **Source Area C:** 1,729 gallons CAP 18™ over 5 days of field time.
 - ~ 346 gallons per day.

2009 TOTAL Injection Quantity = 1,884 gallons

- **Source Area A:** 455 gallons CAP 18 ME™ over 2 days of field time.
 - ~ 228 gallons per day.
- **Source Area B:** 585 gallons CAP 18 ME™ over 2 days of field time.
 - ~ 293 gallons per day.
- **Source Area C:** 844 gallons CAP 18 ME™ over 2 days field time.
 - ~ 422 gallons per day.

These quantities and injection rates indicate average injection rates of between 0.38 to 0.70 gallons per minute (gpm) over the 10-hour workdays on each of the injections days, or average rates of more than one order of magnitude less than a small, low-flowing garden hose (3/4 in diameter), which is typically rated at about 10 gpm. MUNDELL used a water level meter and an oil/water interface probe to measure water level changes and observe the presence of any oil on the groundwater surface in the vicinity of the injection locations as the injections were occurring. These observations indicated no measurable groundwater level mounding effects or the presence of oil (*i.e.*, no rise in groundwater level of more than 0.01 ft or the presence of a measurable soybean oil thickness of greater than 0.01 ft) beyond a 10 ft radius from the point of injection was observed in nearby monitoring wells associated with **Source Area A** (MMW-1S, MMW-9S, MMW-10S), **Source Area B** (MMW-P-01, MMW-P-07, MMW-P-08, MMW-P10S/D, MMW-8S) and **Source Area C** (MMW-P-02, MMW-P-03S/D, MMW-P-04, MMW-P-05, MMW-P06, MMW-C-01) as the injections were occurring. Indeed, the remedial design called for a 10 ft radius of influence for the vegetable oil itself. (MUNDELL RWP, 2008).

In summary, the injections caused no significant rise in groundwater levels, no change in groundwater flow direction, and no movement of PCE or vegetable oil beyond the injection radius of influence for all the injection points. As such, the injection of CAP18™ itself could not have caused chemical impacts from the Site to impact the residences west of Holt Road.

Utility Conduit Investigation

IDEM's comment also suggests that IDEM believes a utility conduit investigation may be necessary to the west of the Plaza along Michigan Street to completely evaluate the vapor intrusion pathway. Since receiving IDEM's letter in June 2011, MUNDELL has made multiple attempts over several months to obtain a response to allow for access for vapor intrusion (VI) testing from the adjacent resident at 3817 West Michigan Street (Ms. Aferocina Cox). Three (3) direct conversations with the resident and the mailing of a certified letter on October 24, 2011 resulted in no response. As such, we are not able to gain access to the property to conduct any utility line evaluation or perform any VI testing in the house.

Vapor Intrusion

As noted above, AMMH has repeatedly attempted to gain access to the property at 3817 West Michigan Street for the purposes of investigating vapor intrusion, but without success. In the absence of data from the residential property, the vapor results from the Michigan Plaza building, where subsurface chlorinated solvent impacts are higher, may be an indicator for the potential for VI concerns at the nearby resident. As the result of active remediation activities being completed at Michigan Plaza, the vapor mitigation system testing and VI testing at the Michigan Plaza building over the last several years has indicated a dramatic decline in the untreated chlorinated solvent vapors coming into the system and the levels present in the commercial spaces (see MUNDELL 2011 4th Quarterly Monitoring Report, Figures 7 to 15). This trend is expected to continue as remediation progresses

MUNDELL will periodically continue to contact the resident for access and testing approval for their property.

IDEM Comment No.4. *"After reviewing the monitoring well logs, IDEM noted that the following monitoring wells were blind drilled in violation of DNR Rule 312 IAC 13-2-6: MMW-8S, 9S, 10S, 11D (20-32'), 13D (24-50'), 14D (24-50'), P-02 (12-30'), P-03D (30-35'), P-04 (20-28'), P-07 (20-28'), P-09D (25-45'), P-10S and D (24-38'). Monitoring wells without basic geologic and field screening data are not useful for site*

characterization. Since the wells were blind drilled in these locations, it is unclear whether they truly reached the base of the aquifer at these locations. IDEM will determine at a later time if the data from these wells will be used for screening purposes only and if additional properly logged monitoring wells will be required for remediation and closure purposes."

MUNDELL Response:

In response to IDEM's comments, MUNDELL has now completed downhole geophysical logging of each of the monitoring wells in question and confirmed the monitoring well construction, well screen placement, and the classification of the aquifer material. These logs are attached as part of the attached *Additional Investigation Activities Summary Report* documentation (see **Appendix C**). In every case, the wells were determined to be constructed properly, with well screens located in the optimal position for continued monitoring. Detailed mapping of the basal till surface (**Figure 19**) confirmed this conclusion (see earlier discussion of till surface)

In summary, all well locations and screens were selected based on extensive knowledge of vertically distributed groundwater impacts and nearby geologic conditions obtained from previous borings in close proximity to the wells. Each well was constructed utilizing a combination of lithologic data, vertical groundwater concentration profiles, and cumulative analytical data collected from known sampling intervals in the Source Area vicinities.

IDEM Comment No.5. *"Additionally, the report states that groundwater samples were collected using low flow methods. The field sheets were not provided for these sampling events which would confirm the methodology. Specifically, since all the Michigan Plaza wells have 10 foot screens, IDEM is concerned with the depth of sampling intake. Since many of the wells were not properly logged, it is not clear whether the most contaminated zone is being monitored."*

MUNDELL Response:

All Michigan Meadows Apartment and Michigan Plaza monitoring wells have been sampled utilizing low flow techniques since 3rd quarter 2007. 'Sample Pro Portable MicroPurge Pumps' were utilized in concert with a Troll 9500 multi-parameter meter and in-line flow cell until the installation of dedicated bladder pumps following 2nd quarter 2009 sampling activities. Pump installation details including depth of intake are included in **Table 1**. Low-flow sampling sheets and parameter data are included as

Attachment A and have been provided in all quarterly monitoring reports since 3rd Quarter 2011.

Please refer to delineation discussion, including vertical groundwater concentration profiling and the selection of proper monitoring well screened intervals. In addition, refer to the response to IDEM Comment No. 4 regarding downhole geophysical logging of each of the monitoring wells in question and confirmation of the monitoring well construction, well screen placement, and the classification of the aquifer material.

IDEM Comment No.6. *"In addition to complete delineation to the west of the Plaza, the plume is also not delineated south of MMW-P-09D, which contains vinyl chloride above RISC Industrial Default Closure levels. As requested in IDEM's November 17, 2008, comment letter additional delineation is necessary to determine the extent of VC."*

MUNDELL Response:

MUNDELL has completed downgradient delineation of the deep VC impacts in 2011 with a series of geoprobe borings as previously described (see **Figure 18** and *Additional Investigation Activities Summary Report*). Based on the results of this investigation, the VC extent in the deeper portion of the aquifer has been delineated. As noted above, MUNDELL proposes to augment the existing monitoring well network with the addition of two additional monitoring wells (south of the southwest corner of **Source Area A** and in the Floral Park Cemetery south of Cossell Road).

IDEM Comment No.7. *"IDEM does not agree with the statement that the U.S. EPA is in conflict with the Superfund Memorandum of Agreement (MOA). The MOD states, "At sites successfully completing a remediation under the VRP, Region 5 does not plan or anticipate any federal action under the Superfund law (CERCLA) unless, in exceptional circumstances, the site poses and immediate threat to human health and the environment." The site is currently undergoing remediation efforts and has not completed a successful remediation yet. Also, given that drinking water wells have been impacted with vinyl chloride, an imminent threat to human health has already occurred. At this point in the EPA's investigation, and with the pending General Notice of Potential Liability letter, it is not clear that the source of the vinyl chloride is not coming from the plumes emanating from the Michigan Plaza site's release or from the remediation thereof."*

MUNDELL Response:

As noted above, the scientific data do not support the conclusion that Michigan Plaza is the source of the chemical impacts at the residential properties. To the extent Comment 7 raises legal issues, MUNDELL defers the response to IDEM's Comment No. 7 to AMMH's legal counsel.

IDEM Comment No. 8. *"The proposed monitoring well locations on Figure 1 are acceptable and should be installed as soon as possible. Additionally, the proposed well nest approximately 250 ft directly east of MW-170, as discussed during the June 21, 2011, conference call, is acceptable as well. As stated in the comment #1 above, additional delineation to define the nature and extent of contamination is required. All newly installed monitoring wells must be logged appropriately and soil samples should be taken for laboratory analysis as well. Note that additional wells may still be necessary if the extent of the contamination is not delineated after these well nests are installed."*

MUNDELL Response:

MUNDELL agrees and has installed the requested wells.

IDEM Comment No. 9. *"IDEM is not opposed to additional CAP 18 injections as stated in IDEM's March 30, 2011, letter in response to the Revised Work Plan for Third Round CAP 18 ME Injections report. Comment #1 in that letter should still be followed (i.e. sample the newly installed wells before injecting CAP 18, monitor water levels closely during injections, sample the wells again after CAP 18 injection)."*

MUNDELL Response:

MUNDELL agrees and intends to complete the CAP18TM injection in the second quarter of 2012.

IDEM Comment No.10. *"The report requested that IDEM revisit the current status of the Remediation Work Plan submitted in 2008, and subsequent response submittals. After reviewing the January 14, 2009, response submittal, IDEM spoke with the former Mundell project manager Leena Lothe and discussed the next steps to take. IDEM stated that after additional monitoring wells were installed and sampled, IDEM would review several quarters of data to determine the effectiveness of the CAP 18 injections on the source areas. IDEM did not receive another report for this site until October 2009, which were the 4th Quarter 2008 and 1st Quarter 2009 reports. By October 2009,*

IDEM and EPA had already found out about the drinking water wells contaminated with vinyl chloride and IDEM's focus changed to working with the EPA to determine the source of the vinyl chloride. IDEM will again focus on the status of the Remediation Work Plan when the nature and extent of contamination has been fully delineated at and surrounding the Michigan Plaza site."

MUNDELL Response:

MUNDELL suggests that in light of the additional work undertaken since this comment was written, it would be beneficial for the parties to meet to discuss the results of that investigation and next steps.

IDEM Conclusion: *"IDEM would again like to encourage full cooperation with the EPA regarding additional measures that have been requested by both IDEM and EPA that might lead to discovering the source of vinyl chloride in the drinking water wells. IDEM and EPA requested an additional monitoring well be installed in a January 22, 2010, letter. Also, IDEM and EPA requested that monitoring wells be screened with a combustible gas meter (CGI) via email correspondence on April 1, 2011. Given the high methane levels that are being generated from the CAP 18 injections, IDEM and EPA requested utilizing the CGI simply as a precaution and to protect human health and worker safety. This action item as well as the monitoring well requested in the January 22, 2010, letter have not been completed."*

MUNDELL Response:

The additional wells have been installed. Regarding methane concentrations at the Site, a request was made on April 1, 2011, by IDEM and the U.S. EPA that monitoring wells be screened with a (CGI) in upcoming groundwater sampling events. MUNDELL challenged this request using published theoretical relationships and Site-specific dissolved methane concentrations to demonstrate that methane concentrations in air due to the dissolved methane in groundwater at the Site would be approximately 2% of the published LEL (April 6, 2011). In an email response to this request IDEM and U.S. EPA "recommended opening the wells with caution and if methane levels continue to increase, we would again recommend screening the wells with a CGI" (April 7, 2011). During the 2nd quarter annual sampling event, methane soil gas levels were collected from three gas well locations using summa canisters. The samples were analyzed for VOCs (including methane, ethylene and ethane) via U.S. EPA Method TO-15. All sampled gas monitoring wells (including MMW-5, located in the heart of the plume on the Michigan Plaza property) were non-detect for methane, ethylene and ethane

(< 10 ug/m³). (MUNDELL, 2nd Quarter 2011 Quarterly Monitoring Report) These soil gas analytical data confirm that methane vapor concentrations are not an issue at the Site and that CGI monitoring during groundwater sampling events is indeed unnecessary.

MUNDELL and AMMH have in the past and will continue to work in the future closely with IDEM in good faith regarding all completed and ongoing investigation and remediation activities at the Site. The record of activities and communications clearly demonstrates this. Indeed, the MUNDELL remediation program to date has targeted treatment throughout the entire thickness of the upper sand and gravel unit despite the fact that cis-1,2-DCE and vinyl chloride concentrations significantly above commercial and residential cleanup goals have continued since at least 2002 to enter the northern property boundary from the Genuine Site and move in the sand and gravel unit throughout the Michigan Meadows Apartments and Plaza properties. Furthermore, the additional investigation activities completed during 2011 have confirmed that the investigations completed were sufficient to accurately portray the extent of the PCE impacts from the drycleaner to initiate remediation at Michigan Plaza, and that the progress of the in-situ bioremediation alternative is proceeding according to the intended design. Continued groundwater monitoring after the third CAP18TM injection event will be completed to ensure that this remains to be the case.

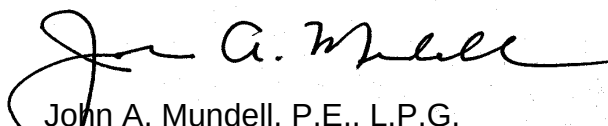
We appreciate the opportunity to provide additional information regarding IDEM's concerns for remedial activities and progress pertaining to the Site. If you have any questions regarding the content presented in this *Response to IDEM's Request for Revised Remediation Work Plan Approval Review and Technical Response to General Notice of Potential Liability Review*, please do not hesitate to contact us at (317) 630-9060 or via email (jmundell@MundellAssociates.com; swebb@MundellAssociates.com).

Sincerely,

MUNDELL & ASSOCIATES, INC.



Sarah E. Webb, L.P.G.
Project Hydrogeologist



John A. Mundell, P.E., L.P.G.
President/Senior Environmental Consultant

cc: Mr. Peter Cappel, AMMH
Mr. Nick Billings, AMMH

TABLES

Table 1. Monitoring Well Pump Installation Details

Table 1
Monitoring Well Pump Installation Details
Michigan Plaza
3801-3823 West Michigan Street
Indianapolis, Indiana
MUNDELL Project No. M01046

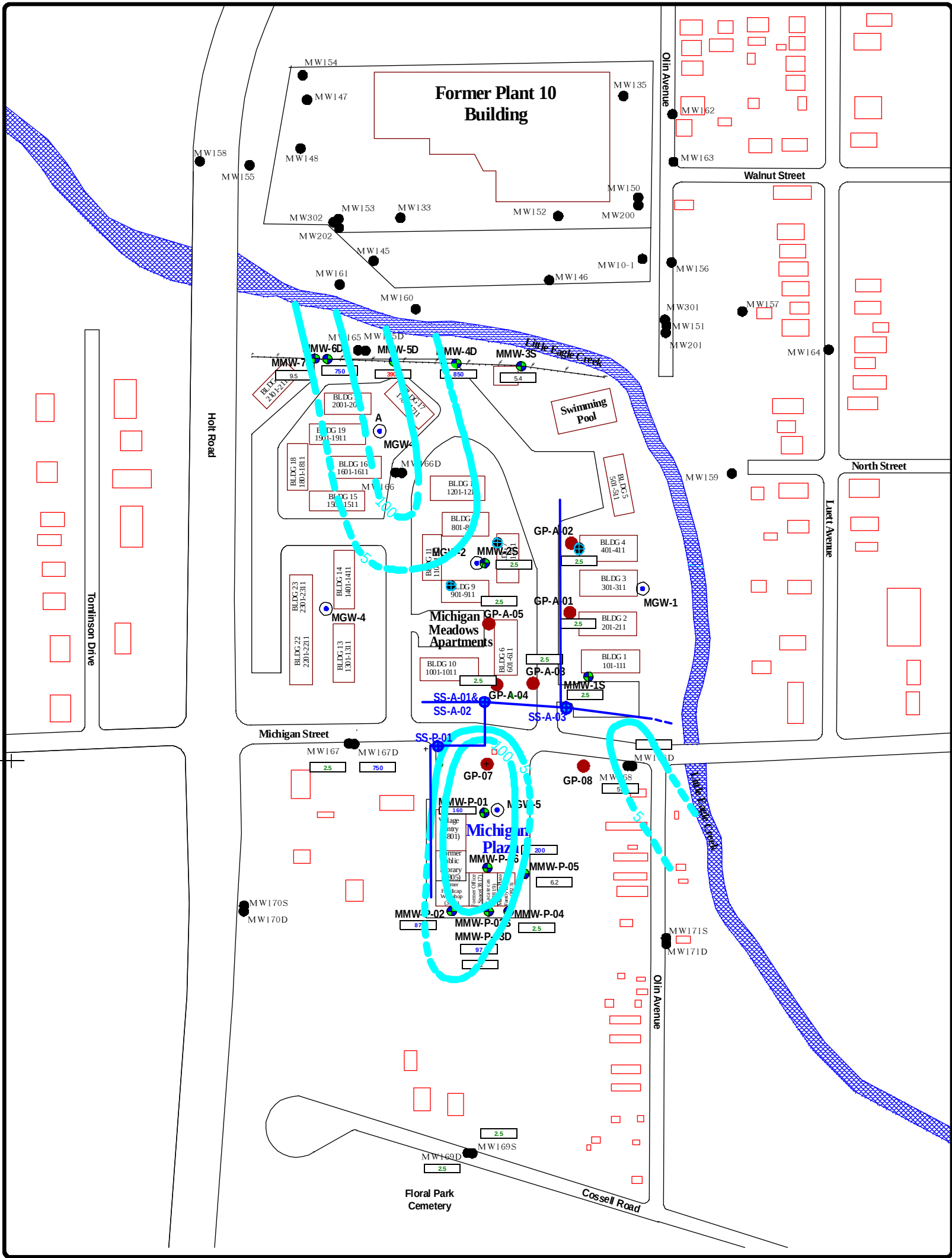
Monitoring Well ID	Total Well Depth (feet bgs)	Screen Length (feet)	Final Intake Depth (feet bgs)
MMW-P-01	28	10.00	24
MMW-P-02	30	10.00	25
MMW-P-03S	28	10.00	25
MMW-P-03D	35	10.00	30
MMW-P-04	28	10.00	25
MMW-P-05	28	10.00	25
MMW-P-06	28	10.00	25
MMW-P-07	28	10.00	23
MMW-P-08	28	10.00	23
MMW-P-09S	28	10.00	23
MMW-P-09D	45	10.00	40
MMW-P-10S	28	10.00	23
MMW-P-10D	38	10.00	33
MMW-1S	20	10.00	19
MMW-8S	24	10.00	22
MMW-9S	25	10.00	22
MMW-10S	25	10.00	21
MMW-11S	24	10.00	21
MMW-11D	33	10.00	28
MMW-12S	24	10.00	20
MMW-13D	50	15.00	43
MMW-14D	50	10.00	45
MMW-C-01	28	10.00	25
MMW-C-02	45	10.00	40

bgs - below ground surface

FIGURES

- Figure 1A. Horizontal Extent of cis-1,2-DCE Impacts to Groundwater (Shallow System)
Further Site Characterization 2005
- Figure 1B. Horizontal Extent of cis-1,2-DCE Impacts to Groundwater (Deep System)
Further Site Characterization 2005
- Figure 1C. Horizontal Extent of cis-1,2-DCE Impacts to Groundwater (Shallow System)
Further Site Characterization 2007
- Figure 1D. Horizontal Extent of cis-1,2-DCE Impacts to Groundwater (Deep System)
Further Site Characterization 2007
- Figure 2A. Horizontal Extent of VC Impacts to Groundwater (Shallow System)
Further Site Characterization 2005
- Figure 2B. Horizontal Extent of VC Impacts to Groundwater (Deep System)
Further Site Characterization 2005
- Figure 2C. Horizontal Extent of VC Impacts to Groundwater (Shallow System)
Further Site Characterization 2007
- Figure 2D. Horizontal Extent of VC Impacts to Groundwater (Deep System)
Further Site Characterization 2007
- Figure 3. Historical Groundwater Concentrations of Cis-1,2-DCE and VC within
the Heart of the Genuine Plume
- Figure 4. PCE Soil Impacts, Soil Boring Analytical Data
- Figure 5. Horizontal Extent of PCE Impacts to Groundwater (Deep and Shallow)
Further Site Characterization, 2005
- Figure 6. Horizontal Extent of PCE Impacts to Groundwater (Shallow System)
Further Site Characterization 2007
- Figure 7. Revised PCE Plume Map (June 2007), Further Site Characterization
Report Addendum I, 2007
- Figure 8. Proposed Remedial Design, Remediation Work Plan 2008
- Figure 9. PCE Distribution in Shallow Groundwater (October 2011)
- Figure 10. PCE Distribution in Deep Groundwater (October 2011)
- Figure 11. Shallow Potentiometric Surface Map, January 18, 2012

- Figure 12. Deep Potentiometric Surface Map, January 18, 2012
- Figure 13. TCE Distribution in Shallow Groundwater (October 2011)
- Figure 14. TCE Distribution in Deep Groundwater (October 2011)
- Figure 15. Cis-1,2-DCE Distribution in Shallow Groundwater (October 2011)
- Figure 16. Cis-1,2-DCE Distribution in Deep Groundwater (October 2011)
- Figure 17. Vinyl Chloride Distribution in Shallow Groundwater (October 2011)
- Figure 18. Vinyl Chloride Distribution in Deep Groundwater (October 2011)
- Figure 19. Top of Till Map from the Geophysical and Boring Data



LEGEND

- Fence
- MW160 Keramida Monitoring Wells
- SS-P-01 MUNDELL Sewer Sampling Locations (September & November 2005)
- GP-A-04 MUNDELL Soil Boring Locations (September 2005)
- MMW-P-06 MUNDELL Monitoring Wells, Michigan Plaza (September 2005)
- cis-1,2-DCE concentration in groundwater, ppb
- 9.5 cis-1,2-DCE Concentration, ppb
- Sewer Line Location



SCALE
0 200
feet

Keramida Monitoring Well Locations Referenced
from Keramida Environmental, Inc.
Project No. 2829
March 13, 2002

MUNDELL & ASSOCIATES, INC.

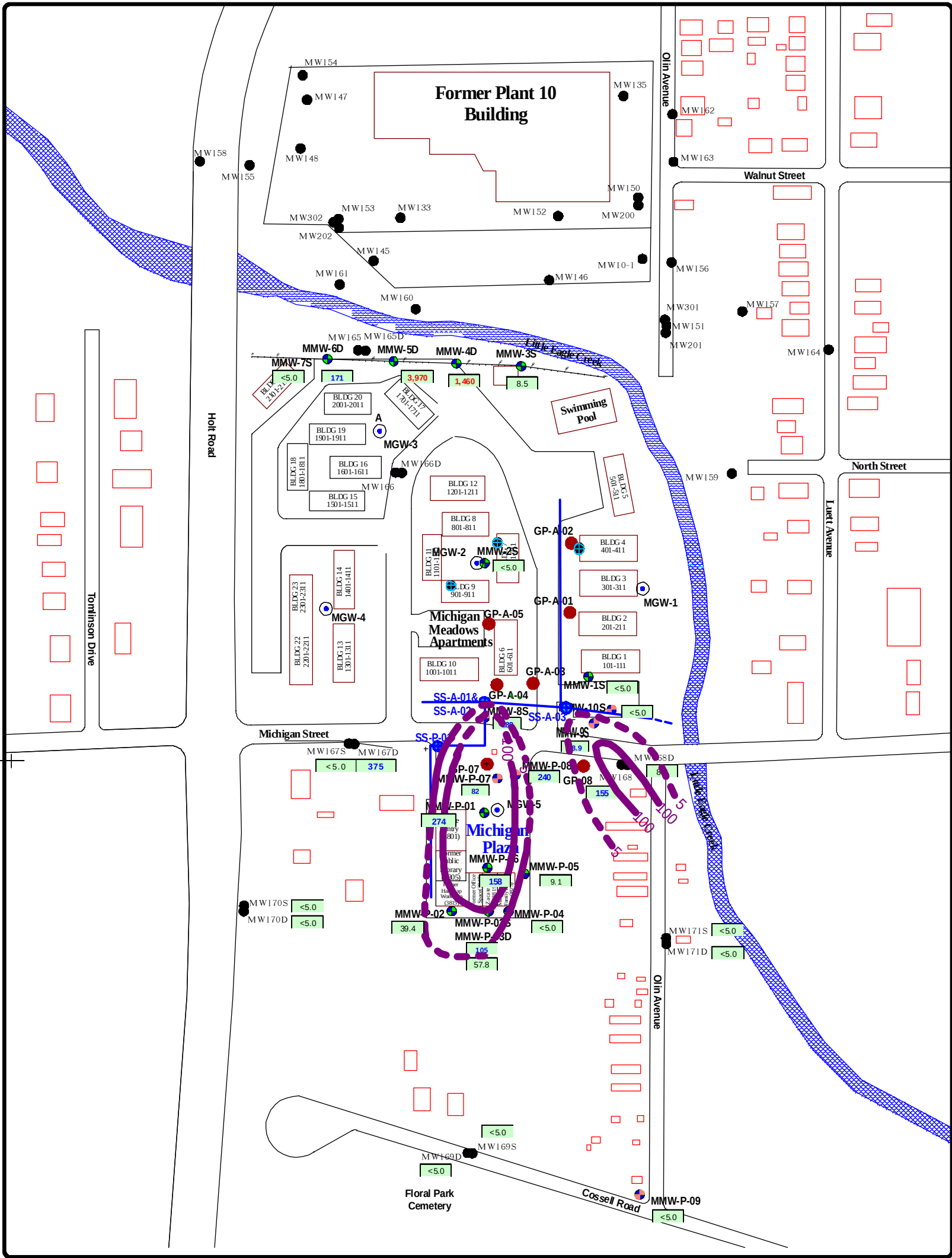
Consulting Professionals for the Earth & Environment

429 East Vermont Street, Suite 200
Indianapolis, Indiana 46202-3688
317-630-9060, fax 317-630-9065

Project Number:
M01046
Drawing File:
Base Map.SKF
Date Prepared:
11/03/05
Scale:
1"=200' ±

**HORIZONTAL EXTENT OF cis-1,2-DCE IMPACTS
TO GROUNDWATER (SHALLOW SYSTEM)**
Further Site Characterization, 2005
Michigan Plaza
3801-3823 West Michigan Street
Indianapolis, Indiana

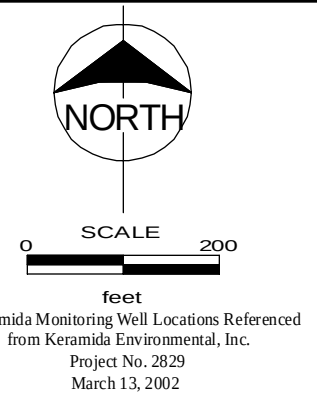
FIGURE
1A



LEGEND

- Fence
- MW160 ● Keramida Monitoring Wells
- SS-P-01 ● MUNDELL Sewer Sampling Locations (September & November 2005)
- GP-07 ● MUNDELL Soil Boring Locations (September 2005)
- MMW-P-06 ● MUNDELL Monitoring Wells, Michigan Plaza (September 2005)
- MMW-P-07 ● MUNDELL Monitoring Wells (January 2007)
- cis-1,2-DCE concentration in groundwater, ppb
- Sewer Line Location
- <5.0 cis-1,2-DCE Concentration, ppb

NOTE:
Values in **RED** are above RISC Industrial Cleanup Goals and those in **BLUE** are above RISC Residential Cleanup Goals

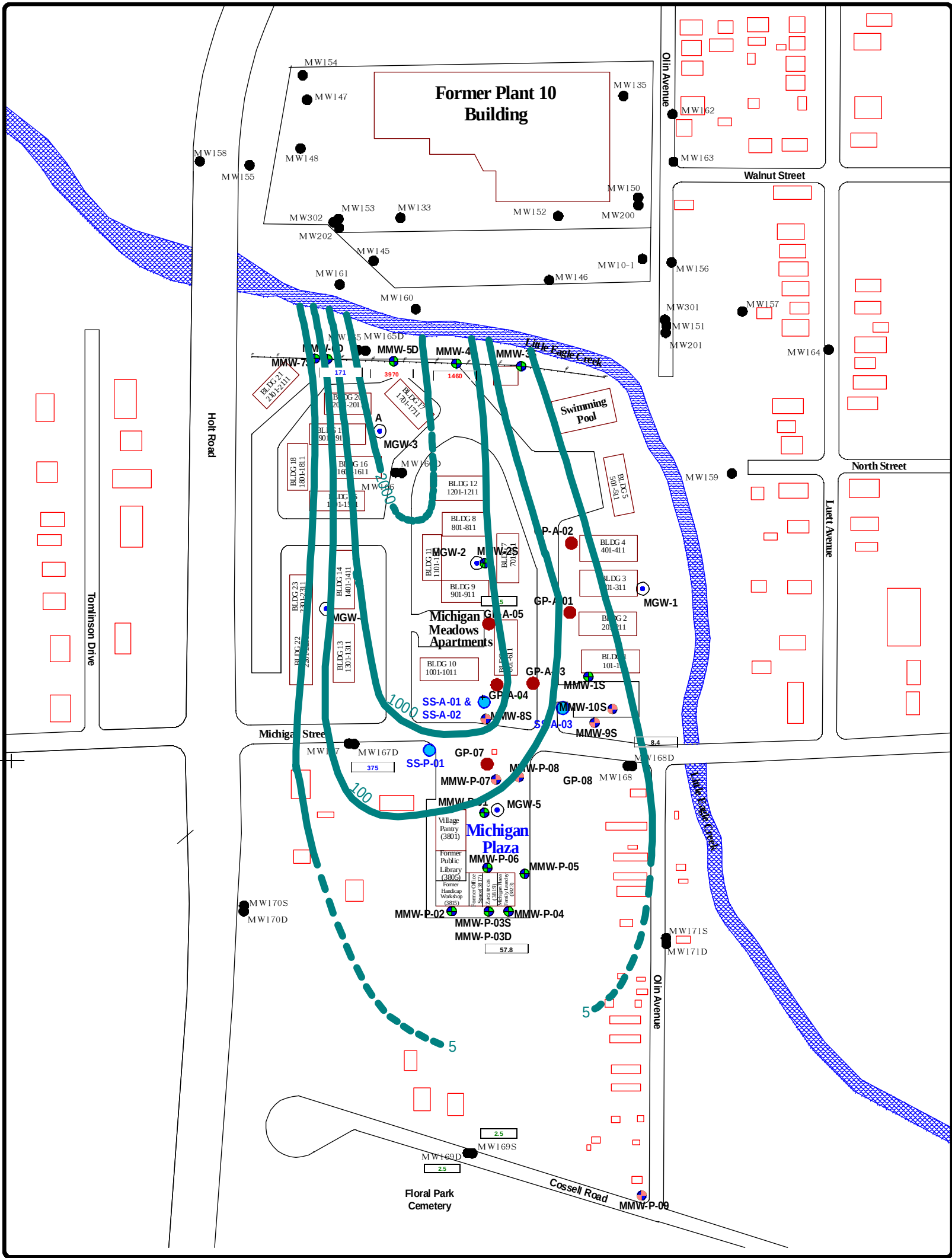


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317-630-9060, fax 317-630-9065

Project Number: M01046
Drawing File: Base Map.SKF
Date Prepared: 4/02/07
Scale: 1"=200' ±

HORIZONTAL EXTENT OF cis-1,2-DCE IMPACTS TO GROUNDWATER (SHALLOW SYSTEM)
Further Site Characterization Addendum I, 2007
Michigan Plaza
3801-3823 West Michigan Street
Indianapolis, Indiana

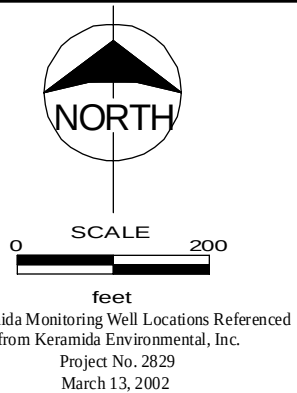
FIGURE 1C



LEGEND

- Fence
- MW160 ● Keramida Monitoring Wells
- SS-P-01 ● MUNDELL Sewer Sampling Locations (September & November 2005)
- GP-07 ● MUNDELL Soil Boring Locations (September 2005)
- MMW-P-06 ● MUNDELL Monitoring Wells, Michigan Plaza (September 2005)
- MMW-P-07 ● MUNDELL Monitoring Wells (January 2007)
- cis-1,2-DCE Concentration in groundwater, ppb
- 95 cis-1,2-DCE Concentration, ppb

NOTE:
Values in RED are above
RISC Industrial Cleanup
Goals and those in BLUE
are above RISC Residential
Cleanup Goals



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M01046

Drawing File:
Base Map.SKF

Date Prepared:
04/03/07

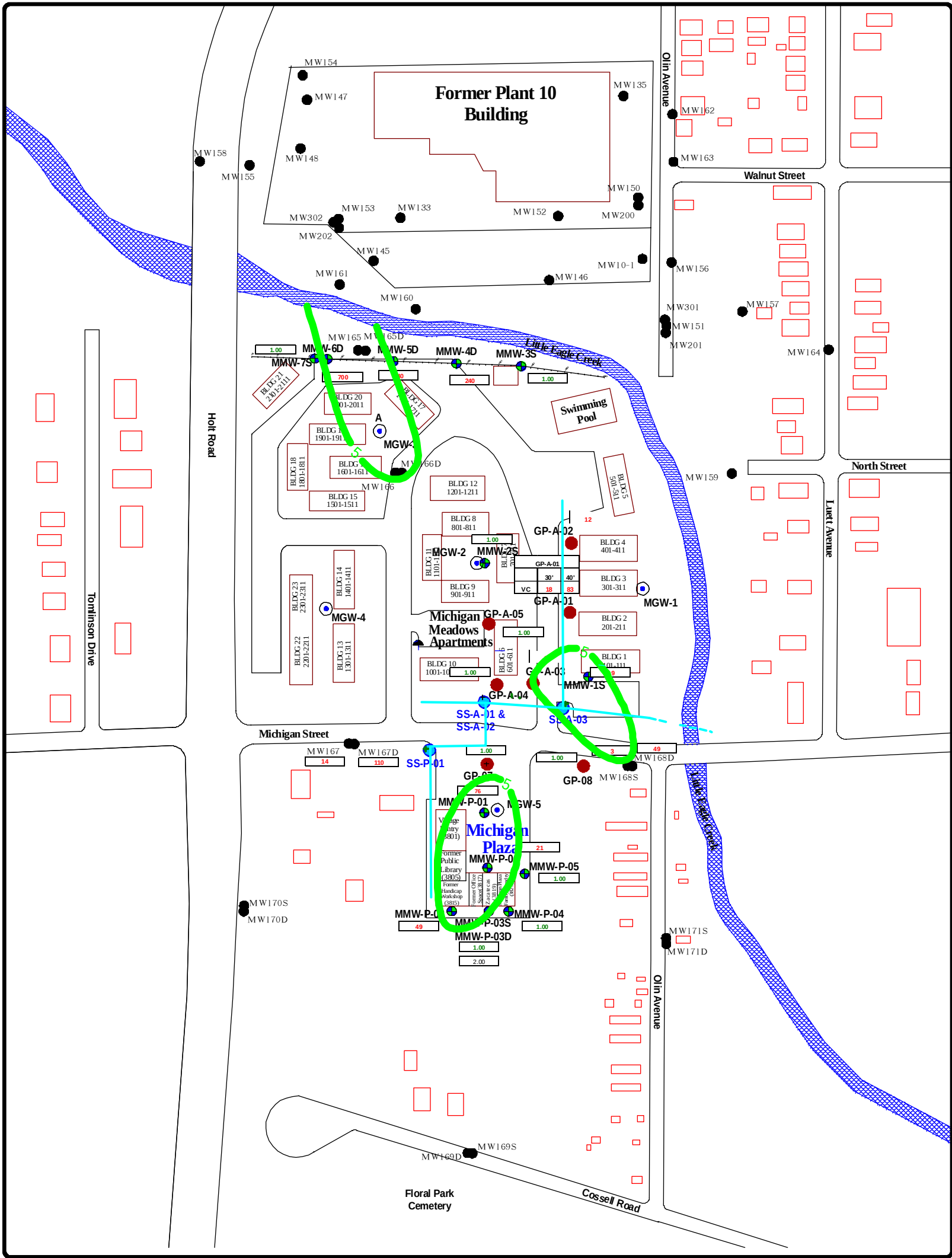
Scale:
1"=200' ±

HORIZONTAL EXTENT OF cis-1,2-DCE IMPACTS
TO GROUNDWATER (DEEP SYSTEM)

Further Site Characterization, 2007

Michigan Plaza
3801-3823 West Michigan Street
Indianapolis, Indiana

FIGURE
1D



LEGEND

- Fence
- MW160 Keramida Monitoring Wells
- SS-P-01 MUNDELL Sewer Sampling Locations (September & November 2005)
- GP-A-04 MUNDELL Soil Boring Locations (September 2005)
- MMW-P-06 MUNDELL Monitoring Wells, Michigan Plaza (September 2005)
- Vinyl Chloride Concentration in groundwater, ppb
- 1.00 Vinyl Chloride Concentration, ppb
- Sewer Line Location



SCALE
0 200
feet

Keramida Monitoring Well Locations Referenced
from Keramida Environmental, Inc.
Project No. 2829
March 13, 2002

MUNDELL & ASSOCIATES, INC.

Consulting Professionals for the Earth & Environment

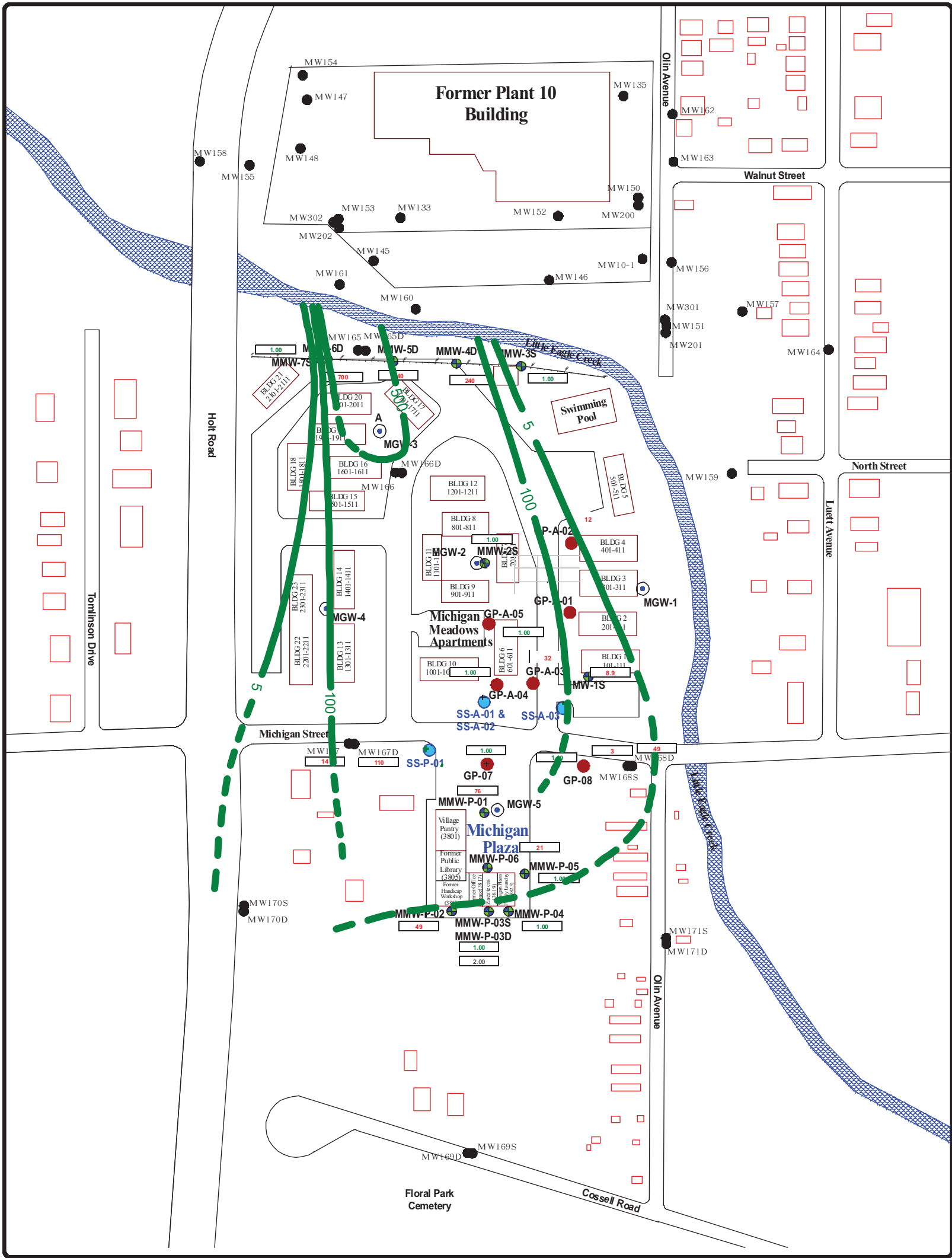
429 East Vermont Street, Suite 200
Indianapolis, Indiana 46202-3688
317-630-9060, fax 317-630-9065

Project Number:
M01046
Drawing File:
Base Map.SKF
Date Prepared:
12/30/05
Scale:
1"=200' ±

**HORIZONTAL EXTENT OF VC IMPACTS
TO GROUNDWATER (SHALLOW SYSTEM)**

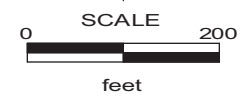
Further Site Characterization
Michigan Plaza, 2005
3801-3823 West Michigan Street
Indianapolis, Indiana

FIGURE
2A



LEGEND

- Fence
- MW160 ● Keramida Monitoring Wells
- MMW-5D ● MUNEDELL Monitoring Wells (August 2004)
- SS-P-01 ● MUNEDELL Sewer Sampling Locations (September & November 2005)
- GP-A-04 ● MUNEDELL Soil Boring Locations (September 2005)
- MMW-P-06 ● MUNEDELL Monitoring Wells, Michigan Plaza (September 2005)
- Vinyl Chloride Concentration in groundwater, ppb
- 40 Vinyl Chloride Concentration, ppb



Keramida Monitoring Well Locations Referenced from Keramida Environmental, Inc. Project No. 2829 March 13, 2002

MUNDELL & ASSOCIATES, INC.

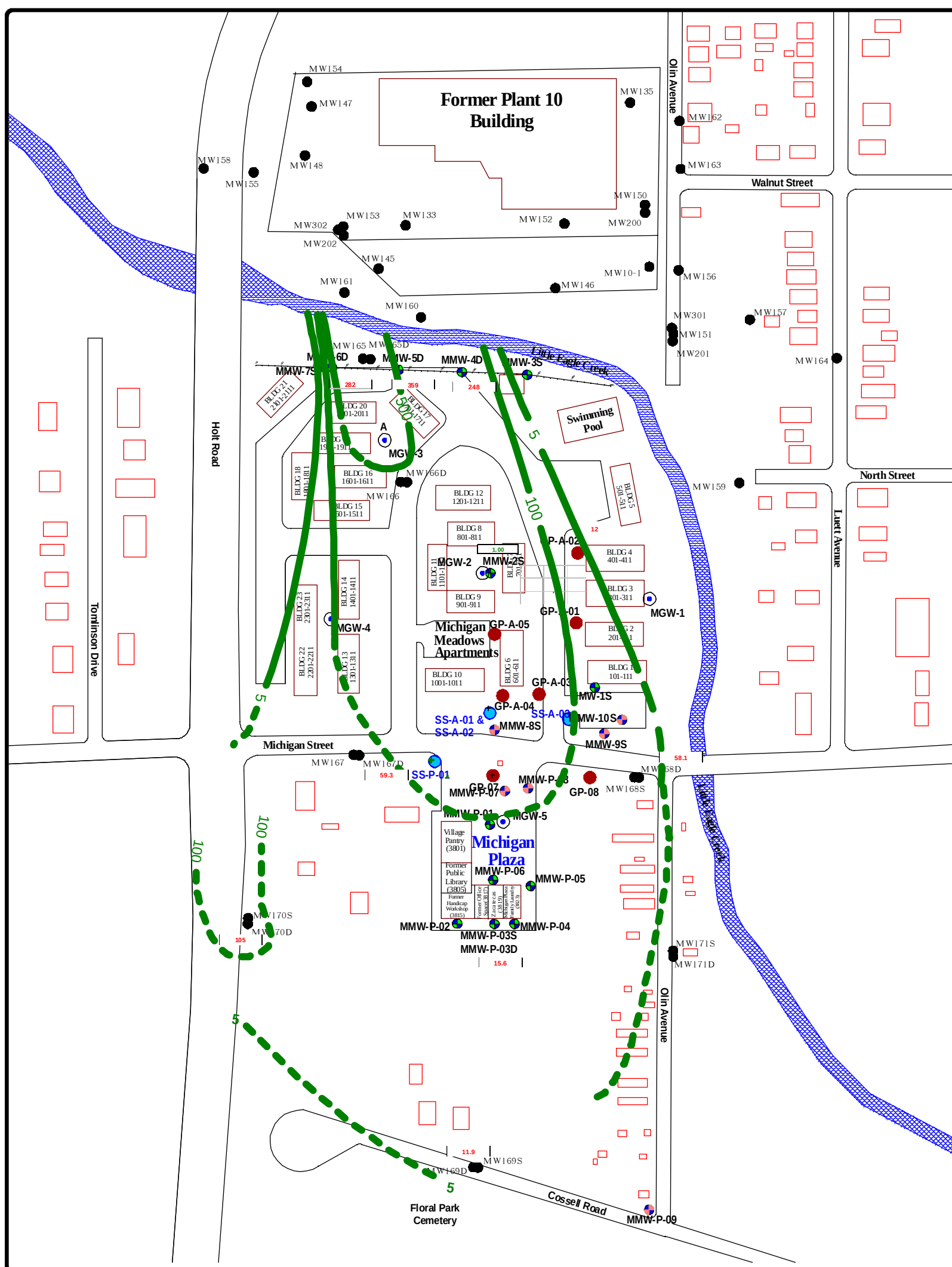
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317-630-9060, fax 317-630-9065

Project Number: M01046
Drawing File: Base Map.SKF
Date Prepared: 12/30/05
Scale: 1"=200' ±

HORIZONTAL EXTENT OF VC IMPACTS TO GROUNDWATER (DEEP SYSTEM)
Further Site Characterization, 2005
Michigan Plaza
3801-3823 West Michigan Street
Indianapolis, Indiana

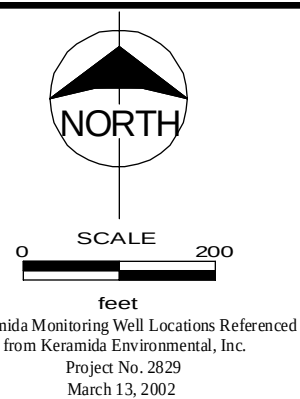
FIGURE
2B



LEGEND

-

NOTE:
Values in **RED** are above
RISC Industrial Cleanup
Goals and those in **BLUE**
are above RISC Residential
Cleanup Goals



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Project Number:
M01046

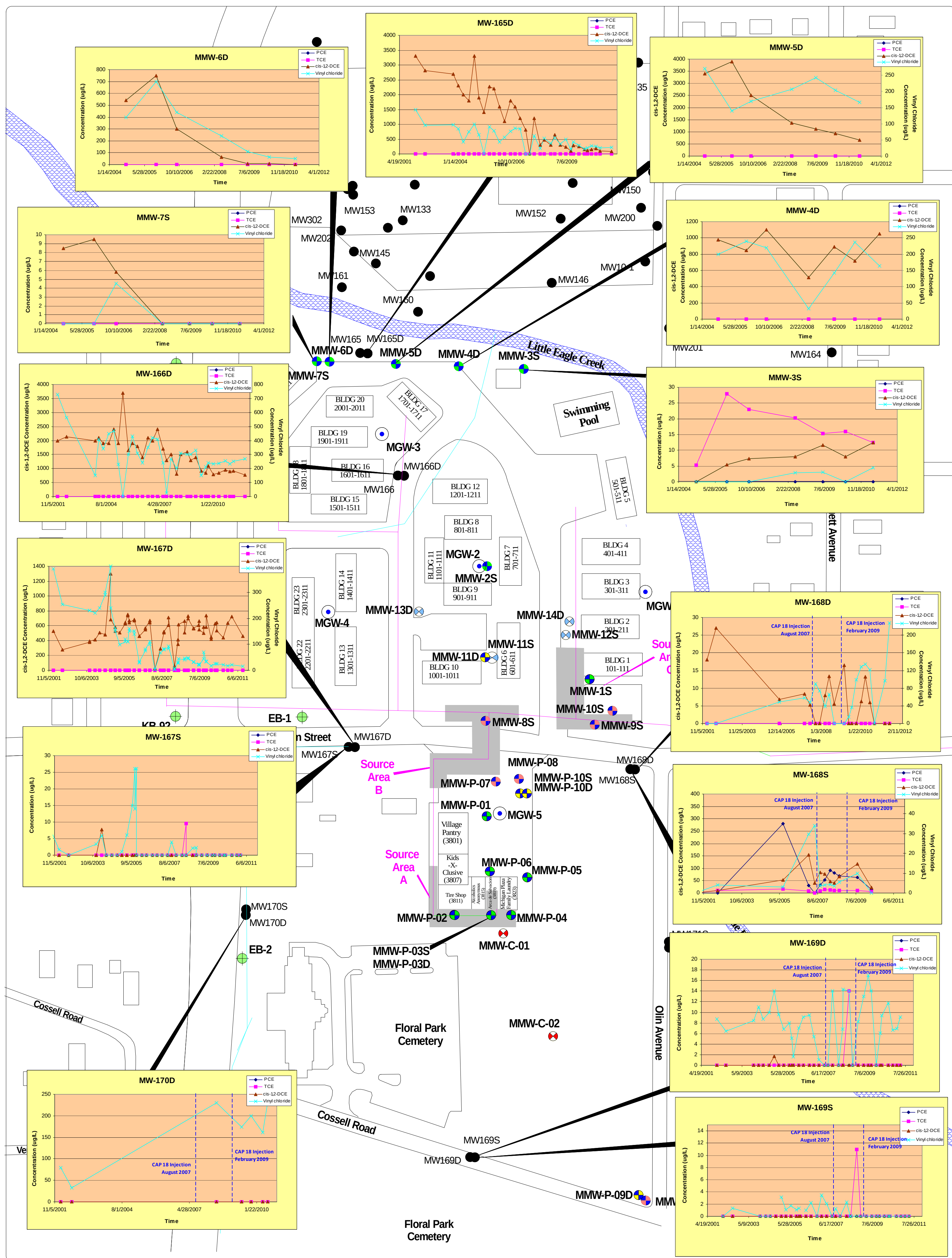
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Base Map.SKF

Date Prepared:
12/30/05

Scale:
1"=200' ±

**HORIZONTAL EXTENT OF VC IMPACTS
TO GROUNDWATER (DEEP SYSTEM)**
Further Site Characterization, 2007
Michigan Plaza
3801-3823 West Michigan Street
Indianapolis, Indiana

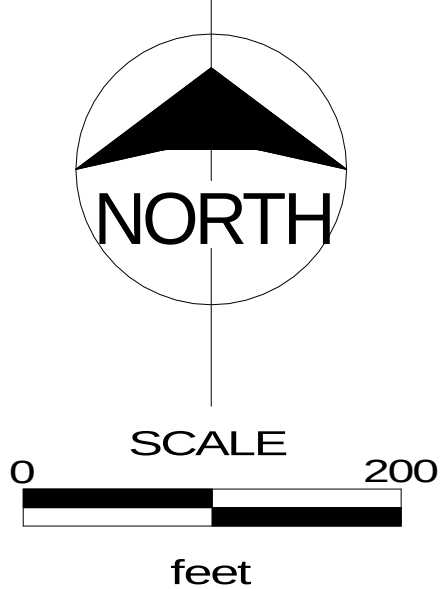
FIGURE
2D



LEGEND

- Fence
- MW160 ● Keramida/Environ Monitoring Wells
- MMW-P-06 ● MUNDELL Monitoring Wells, Michigan Plaza (September 2005)
- MMW-P-07 ● MUNDELL Monitoring Wells (January 2007)
- MMW-P-09D ● MUNDELL Monitoring Wells (May-June 2007)
- MMW-C-01 ● MUNDELL Monitoring Wells (July/August 2008)
- MMW-11S ● MUNDELL Monitoring Wells (November/December 2008)
- MGW-1 ● MUNDELL Soil Gas Well

- Environ Soil Borings
- Sanitary Sewer
- Storm Sewer



Keramida Monitoring Well Locations Referenced from Keramida Environmental, Inc. Project No. 2829 March 13, 2002



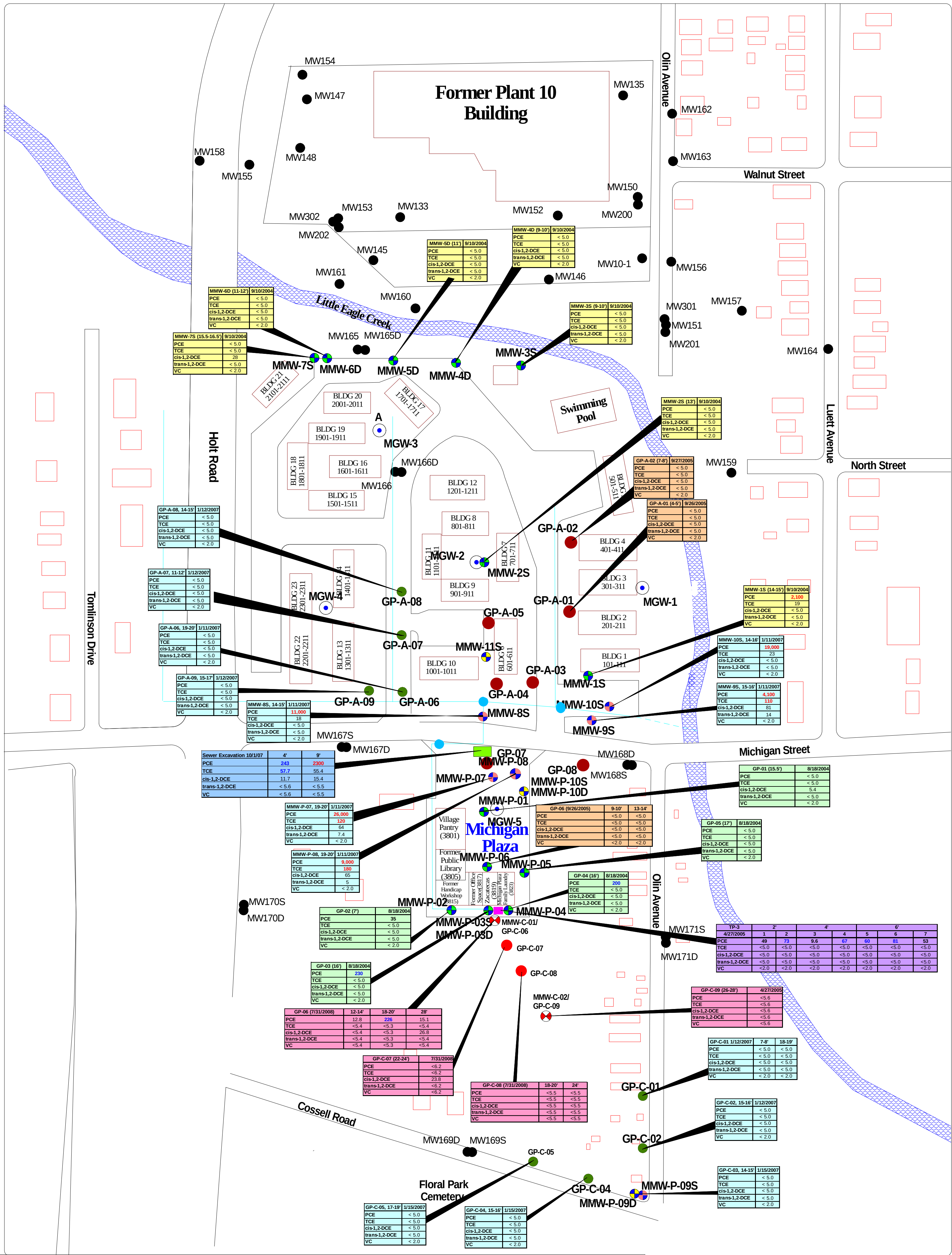
110 South Downey Avenue
Indianapolis, Indiana 46219-6406
317-630-9060, fax 317-630-9065

Project Number:
M01046
Drawing File:
Fig 4 IndicatorTrends .skf
Date Prepared:
2/17/2011

Historical Chlorinated Solvent
Concentration Trends

Michigan Plaza
3801 - 3823 West Michigan Street
Indianapolis, Indiana

FIGURE
3



LEGEND

- Mundell Test Pit (TP-3) Sampling Locations (April 2005)
- Sewer Excavation Sampling Locations (October 2007)
- Fence
- Sewer Line
- MMW-11S MUNEDELL Monitoring Wells (May-June 2007)
- MW160 Keramida Monitoring Wells
- SS-P-01 MUNEDELL Sewer Sampling Locations/manholes (September & November 2005)
- GP-07 MUNEDELL Soil Boring Locations (September 2005)
- MMW-P-06 MUNEDELL Monitoring Wells, Michigan Plaza (September 2005)
- GP-C-04 MUNEDELL Soil Boring Locations (January 2007)
- MMW-P-07 MUNEDELL Monitoring Wells (January 2007)
- MMW-C-01 MUNEDELL Monitoring Wells (July/August 2008)
- GP-C-06 MUNEDELL Soil Boring Locations (July/August 2008)

Boring ID (depth in feet)	
PCE	Tetrachloroethene (ug/kg)
TCE	Trichloroethene (ug/kg)
cis-DCE	cis-1,2-Dichloroethene (ug/kg)
VC	Vinyl Chloride (ug/kg)

NOTE:
Values in **RED** are above RISC Industrial Cleanup Goals and those in **BLUE** are above RISC Residential Cleanup Goals



0 SCALE 200
feet

Keramida Monitoring Well Locations Referenced from Keramida Environmental, Inc.
Project No. 2829
March 13, 2002

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Project Number:
M01046

Drawing File:
Base Map.SKF

Date Prepared:
11/4/2008

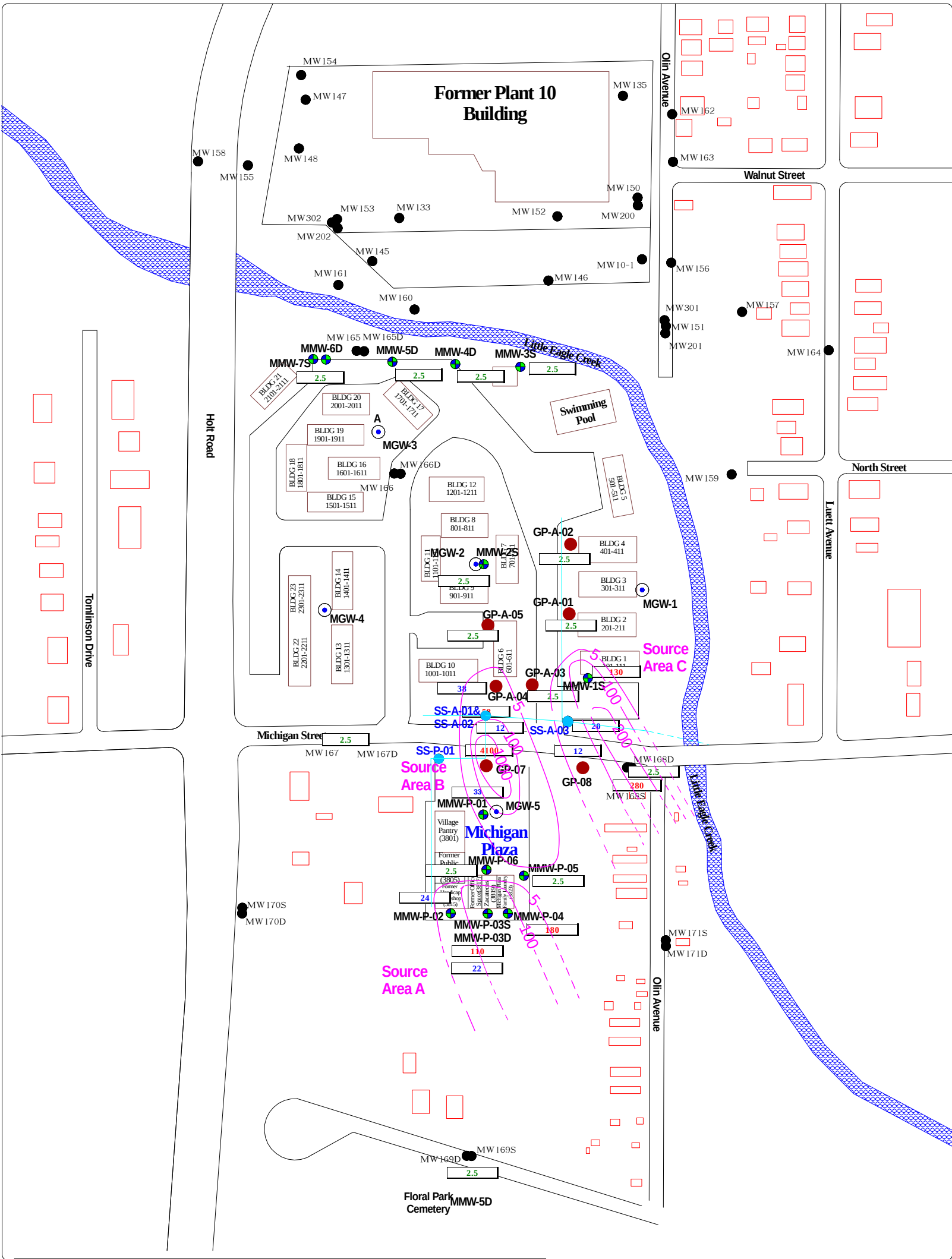
Scale:

PCE Soil Impacts
Soil Boring Analytical Data
Michigan Plaza

3801-3823 West Michigan Street
Indianapolis, Indiana

FIGURE

4



LEGEND

- Fence
- MW 160 Keramida Monitoring Wells
- SS-P-01 MUNDELL Sewer Sampling Locations (September & November 2005)
- GP-07 MUNDELL Soil Boring Locations (September 2005)
- MMW-P-06 MUNDELL Monitoring Wells, Michigan Plaza (September 2005)
- Total PCE concentration in groundwater, ppb
- 20 Total PCE concentration in groundwater, ppb
- Sewer Line Location



SCALE
0 200
feet

Keramida Monitoring Well Locations Referenced
from Keramida Environmental, Inc.
Project No. 2829
March 13, 2002

MUNDELL & ASSOCIATES, INC.

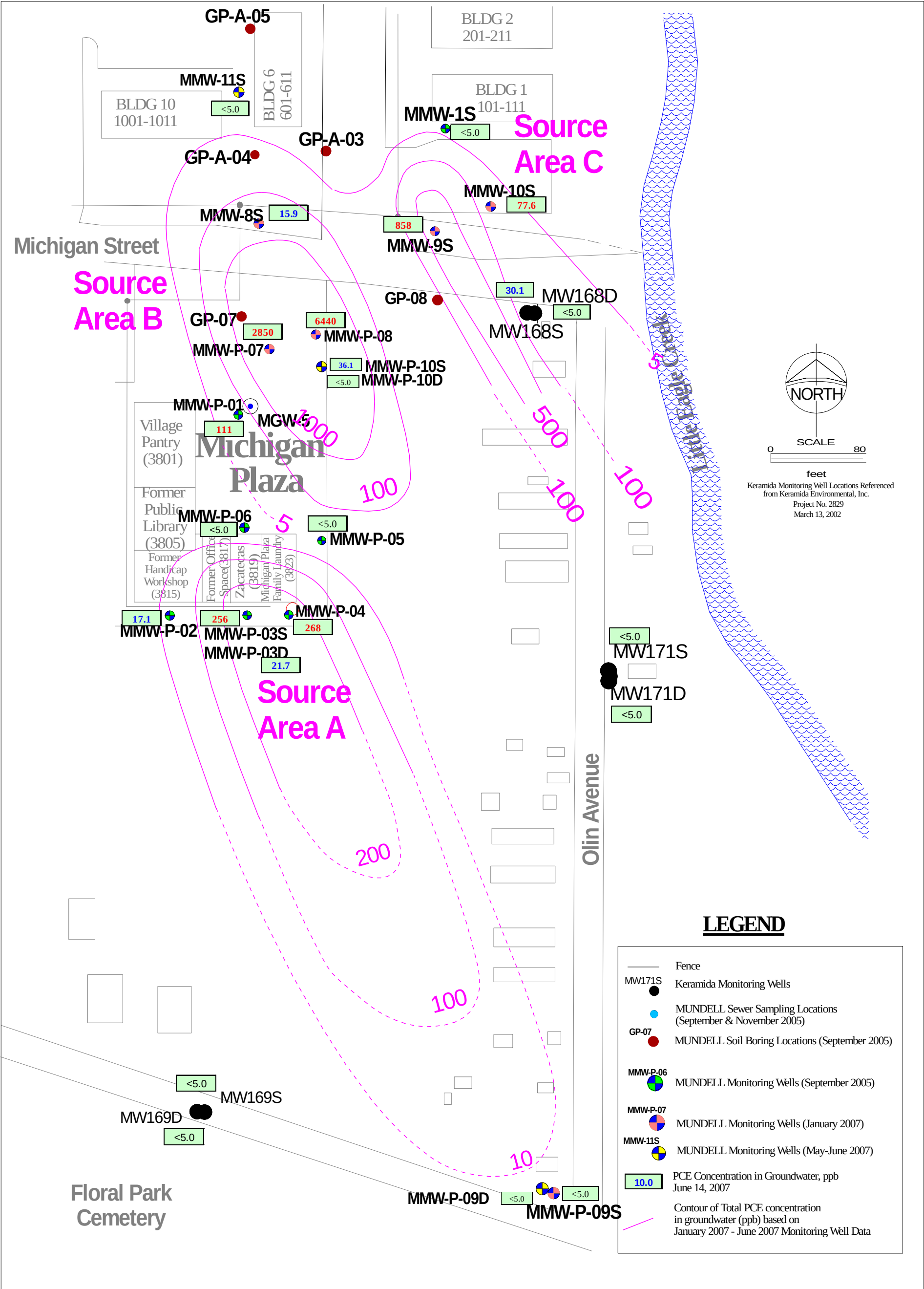
Consulting Professionals for the Earth & Environment

429 East Vermont Street, Suite 200
Indianapolis, Indiana 46202-3688
317-630-9060, fax 317-630-9065

Project Number:
M01046
Drawing File:
Base Map.SKF
Date Prepared:
12/30/05
Scale:
1"=200' ±

**HORIZONTAL EXTENT OF PCE IMPACTS TO
GROUNDWATER (DEEP & SHALLOW SYSTEM)**
Further Site Characterization
Michigan Plaza
3801-3823 West Michigan Street
Indianapolis, Indiana

FIGURE
5



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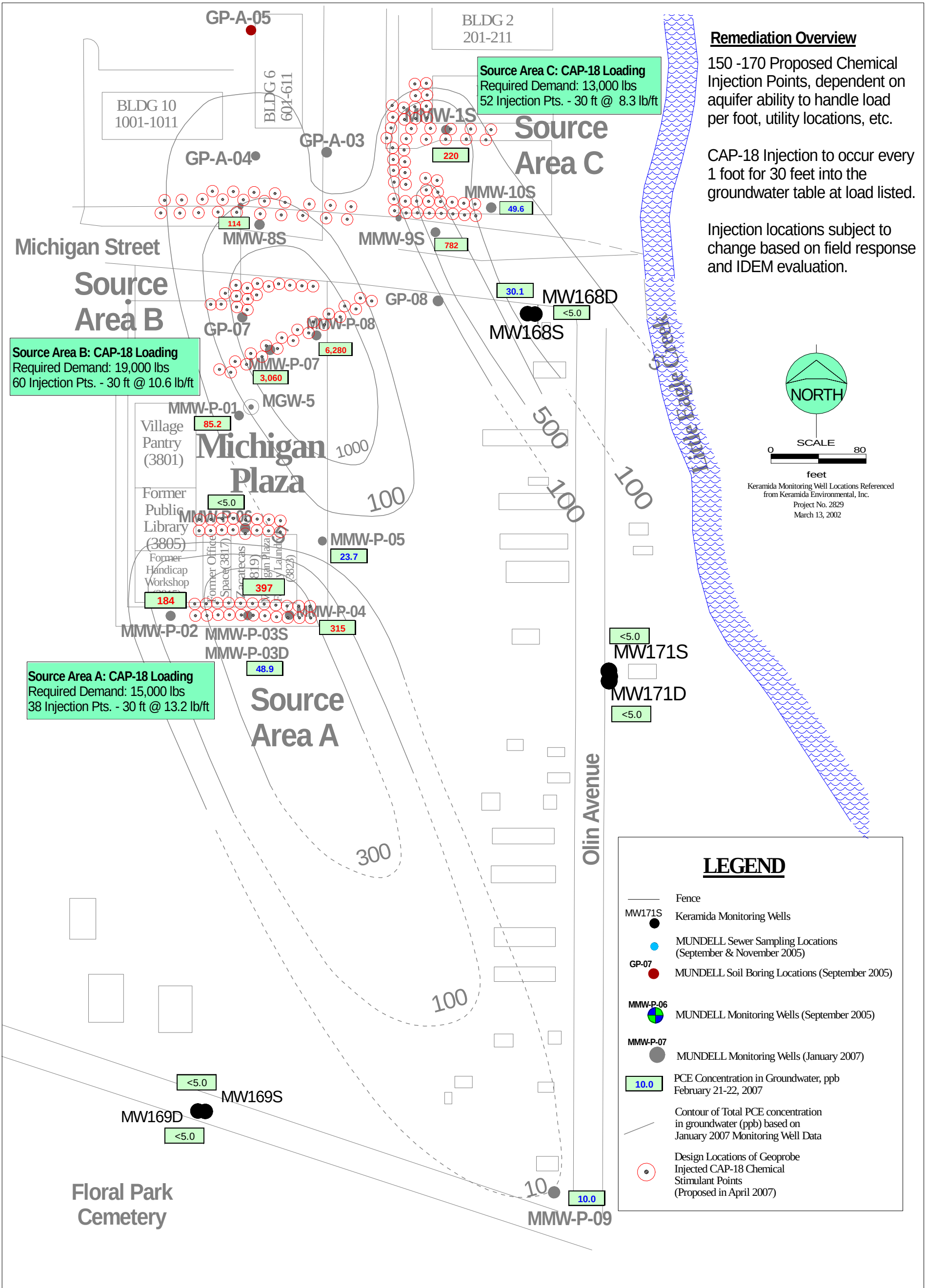
429 East Vermont Street, Suite 200
Indianapolis, Indiana 46202-3688
317-630-9060, fax 317-630-9065

Project Number:
M01046
Drawing File:
Remediation Opt 3
Date Prepared:
4/27/07
Scale:
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Revised PCE Plume Map (June 2007)
Further Site Characterization Report
Addendum I
Michigan Plaza
3801-3823 West Michigan Street
Indianapolis, Indiana

FIGURE

7



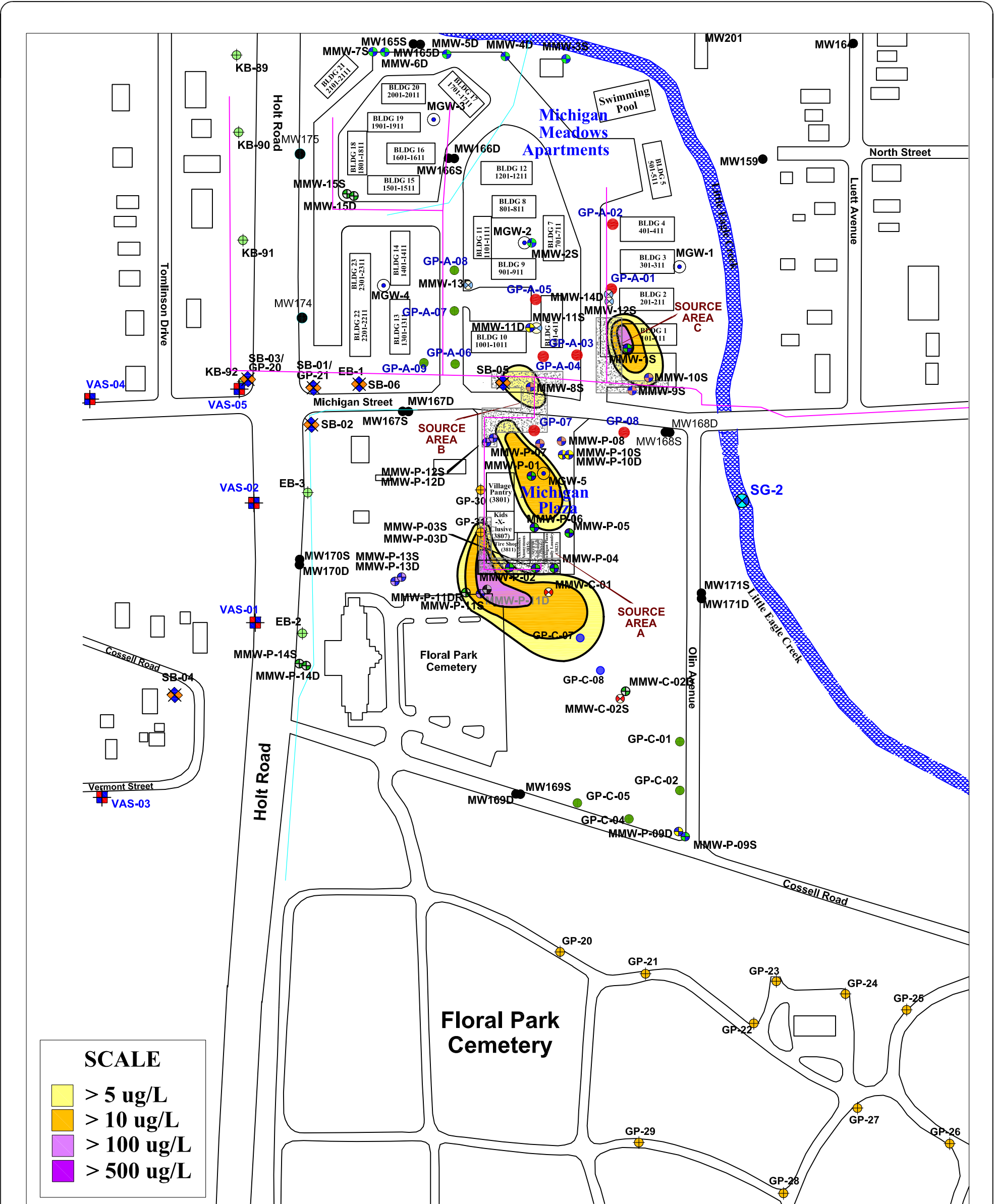
MUNDELL & ASSOCIATES, INC.
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429 East Vermont Street, Suite 200
Indianapolis, Indiana 46202-3688
317-630-9060, fax 317-630-9065

Project Number:
M01046
Drawing File:
Remediation Opt 3
Date Prepared:
4/27/07
Scale:
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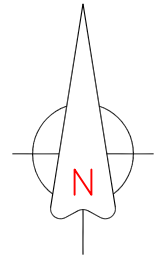
PROPOSED REMEDIAL DESIGN
Michigan Plaza
3801-3823 West Michigan Street
Indianapolis, Indiana

FIGURE
8



LEGEND

—	Fence	GP-29	MUNDELL Soil Boring Location (December 2011)
MW160	Keramida/Environ Monitoring Wells	MMW-P-11D	MUNDELL Monitoring Wells (December 2011)
MMW-P-06	MUNDELL Monitoring Wells, Michigan Plaza (September 2005)	VAS-01	EPA Vertical Aquifer Sampling Well Locations (November 2011)
MMW-P-07	MUNDELL Monitoring Wells (January 2007)	SB-03	EPA Soil Borings
MMW-P-09D	MUNDELL Monitoring Wells (May-June 2007)		
MMW-C-01	MUNDELL Monitoring Wells (July/August 2008)		
MMW-11S	MUNDELL Monitoring Wells (November/December 2008)		
GP-C-05	MUNDELL Soil Boring Locations (January 2007)	MMW-P-11D	Abandoned Monitoring Well Location
GP-07	MUNDELL Soil Boring Locations (September 2005)	EB-2	Environ Soil Borings
GP-C-08	MUNDELL Soil Boring Locations (August 2008)	—	Sanitary Sewer
MMW-P-11D	MUNDELL Monitoring Wells (September 2011)	—	Storm Sewer
MGW-1	MUNDELL Soil Gas Well		



SCALE
200
feet

Keramida Monitoring Well Locations
Referenced from Keramida
Environmental, Inc.
Project No. 2829
March 13, 2002

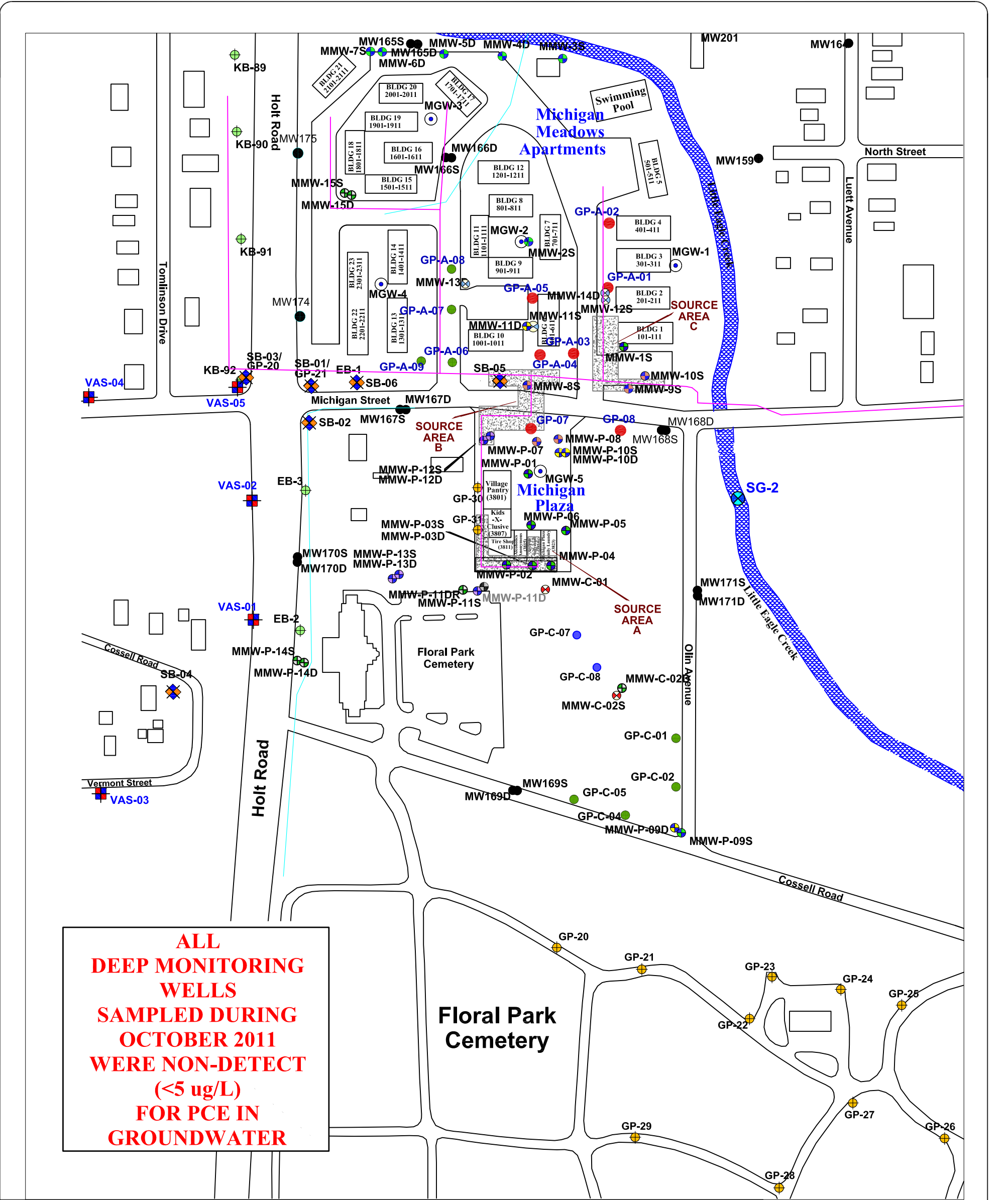


110 South Downey Avenue
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Project Number:
M01046
Drawing File:
Basemap 2011
Date Prepared:
3/15/2012
Scale:
1"=200'

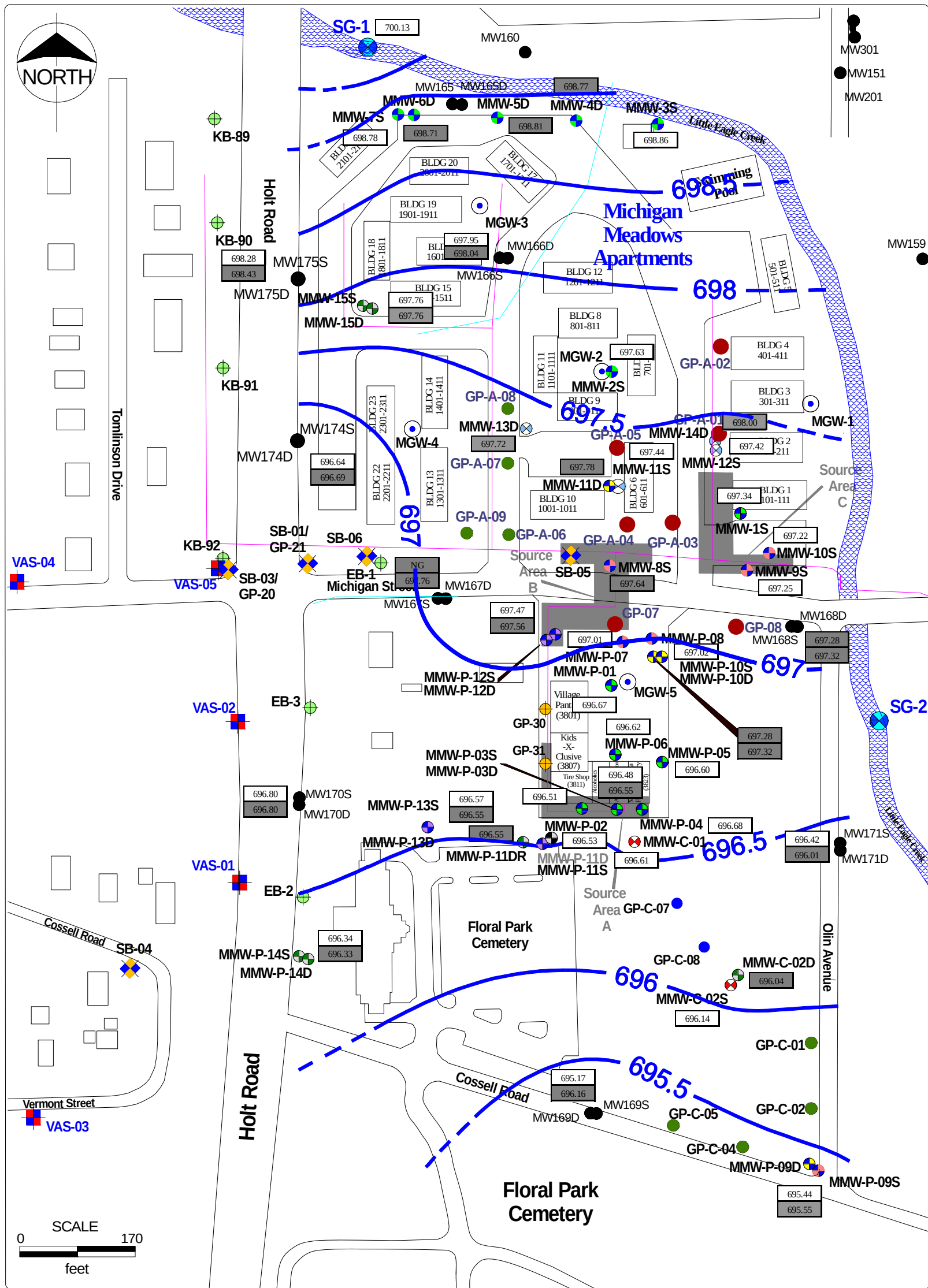
PCE DISTRIBUTION IN
SHALLOW GROUNDWATER
(OCTOBER 2011)
Michigan Plaza
3801 - 3823 West Michigan Street
Indianapolis, INDIANA

FIGURE
9



LEGEND			
	Fence		MUNDELL Soil Boring Location (December 2011)
	Keramida/Environ Monitoring Wells		MUNDELL Monitoring Wells (December 2011)
	MUNDELL Monitoring Wells, Michigan Plaza (September 2005)		EPA Vertical Aquifer Sampling Well Locations (November 2011)
	MUNDELL Monitoring Wells (January 2007)		EPA Soil Borings
	MUNDELL Monitoring Wells (May-June 2007)		Abandoned Monitoring Well Location
	MUNDELL Monitoring Wells (July/August 2008)		Environ Soil Borings
	MUNDELL Monitoring Wells (November/December 2008)		Sanitary Sewer
	MUNDELL Soil Boring Locations (January 2007)		Storm Sewer
	MUNDELL Soil Boring Locations (September 2005)		
	MUNDELL Soil Boring Locations (August 2008)		
	MUNDELL Monitoring Wells (September 2011)		
	MUNDELL Soil Gas Well		

Keramida Monitoring Well Locations
Referenced from Keramida
Environmental, Inc.
Project No. 2829
March 13, 2002



LEGEND

- | | | | | | |
|-----------|---|-----------|--|-----|---|
| — | Fence | GP-21 | MUNDELL Soil Boring Locations (December 2011) | 698 | Potentiometric Surface Equipotential Lines
Contour Interval = 0.5 feet |
| MW160 | Keramida/Environ Monitoring Wells | MMW-P-11D | MUNDELL Monitoring Wells (December 2011) | | |
| MMW-P-06 | MUNDELL Monitoring Wells, Michigan Plaza (September 2005) | VAS-01 | EPA Vertical Aquifer Sampling Well Locations (November 2011) | | |
| MMW-P-07 | MUNDELL Monitoring Wells (January 2007) | SB-01 | EPA Soil Boring Locations (November 2011) | | |
| MMW-P-09D | MUNDELL Monitoring Wells (May-June 2007) | | | | |
| MMW-C-01 | MUNDELL Monitoring Wells (July/August 2008) | | | | |
| MMW-11S | MUNDELL Monitoring Wells (November/December 2008) | | | | |
| GP-C-05 | MUNDELL Soil Boring Locations (January 2007) | | | | |
| GP-07 | MUNDELL Soil Boring Locations (September 2005) | MMW-P-11D | Abandoned Monitoring Well Location | | Water Level as Measured on January 18, 2012
(gray boxes indicate groundwater elevation values
not used for the creation of the Shallow
Potentiometric Surface Map) |
| GP-C-08 | MUNDELL Soil Boring Locations (August 2008) | EB-2 | Environ Soil Borings | | |
| MMW-P-11D | MUNDELL Monitoring Wells (September 2011) | | Sanitary Sewer | | |
| MGW-1 | MUNDELL Soil Gas Well | | Storm Sewer | | NG - Not Gauged |



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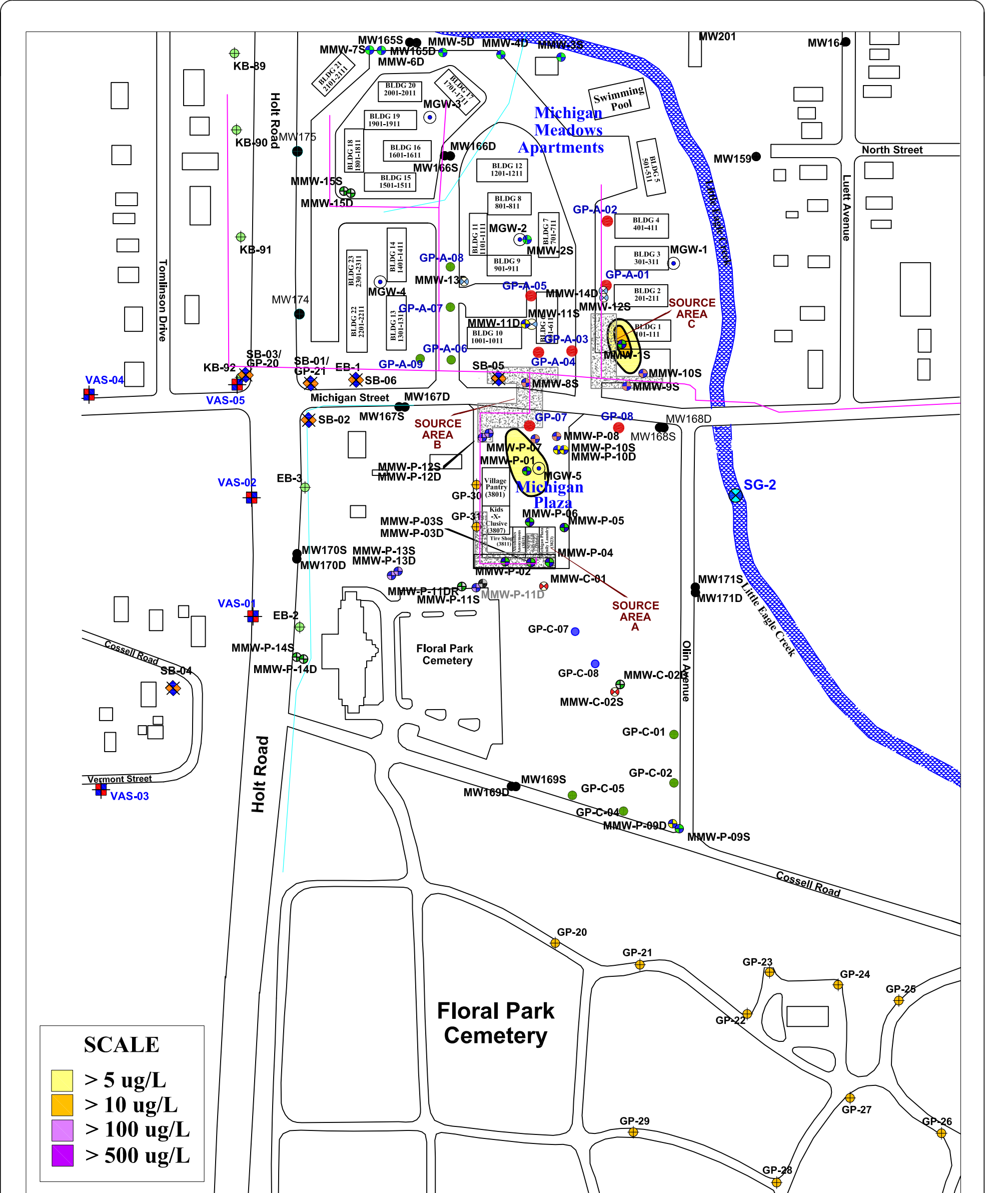
Project Number:
M01046
Drawing File:
GWE_1Q2012
Date Prepared:
2/18/2012
Scale:
1"=170'

Shallow Potentiometric Surface Map January 18, 2012

Michigan Plaza
3801 - 3823 West Michigan Street
Indianapolis, Indiana

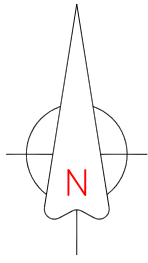
FIGURE

11

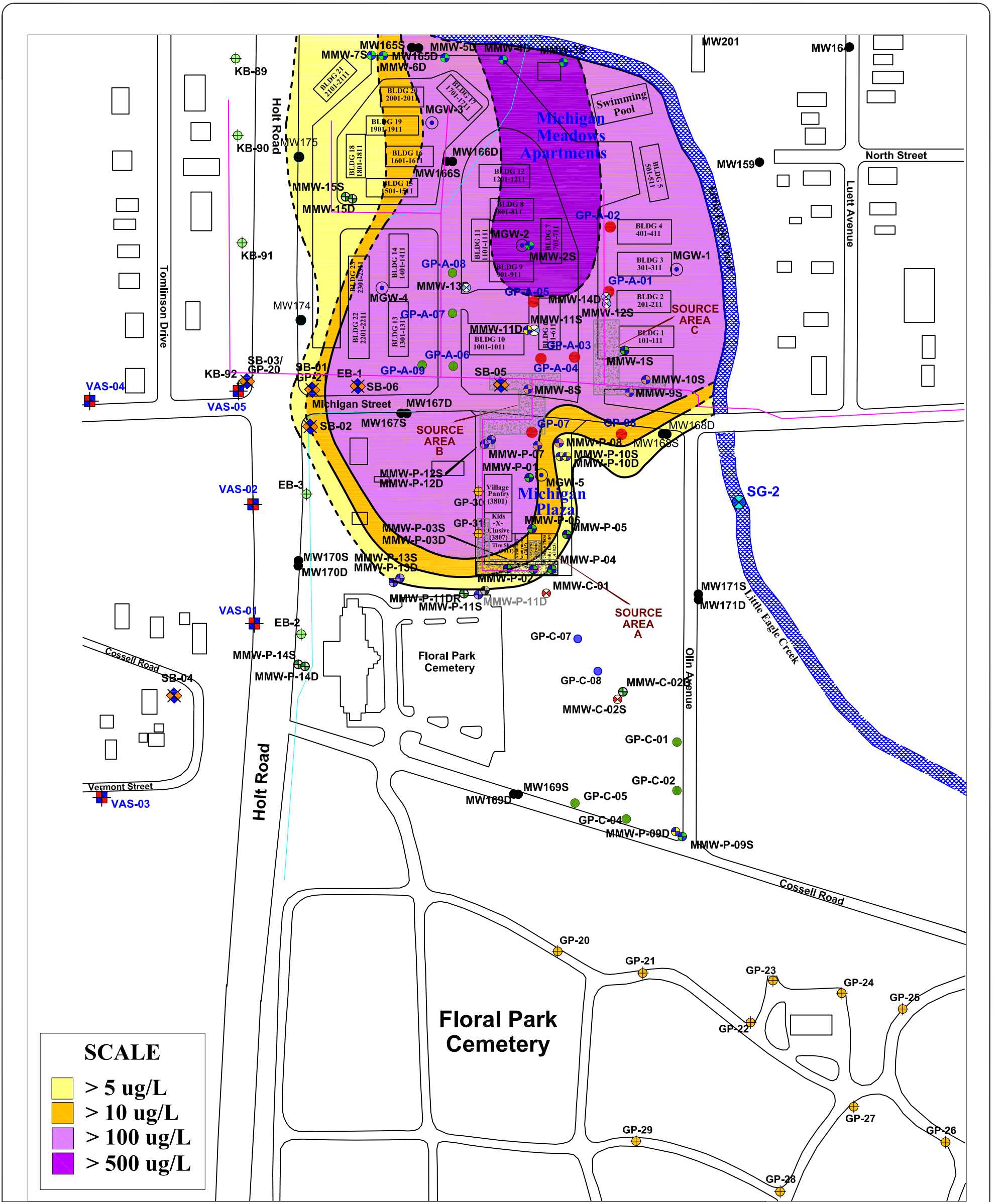


LEGEND

—	Fence	GP-29	MUNDELL Soil Boring Location (December 2011)
MW160	Keramida/Environ Monitoring Wells	MMW-P-11D	MUNDELL Monitoring Wells (December 2011)
MMW-P-06	MUNDELL Monitoring Wells, Michigan Plaza (September 2005)	VAS-01	EPA Vertical Aquifer Sampling Well Locations (November 2011)
MMW-P-07	MUNDELL Monitoring Wells (January 2007)	SB-03	EPA Soil Borings
MMW-P-09D	MUNDELL Monitoring Wells (May-June 2007)		
MMW-C-01	MUNDELL Monitoring Wells (July/August 2008)		
MMW-11S	MUNDELL Monitoring Wells (November/December 2008)		
GP-C-05	MUNDELL Soil Boring Locations (January 2007)	MMW-P-11D	Abandoned Monitoring Well Location
GP-07	MUNDELL Soil Boring Locations (September 2005)	EB-2	Environ Soil Borings
GP-C-08	MUNDELL Soil Boring Locations (August 2008)		Sanitary Sewer
MMW-P-11D	MUNDELL Monitoring Wells (September 2011)		Storm Sewer
MGW-1	MUNDELL Soil Gas Well		

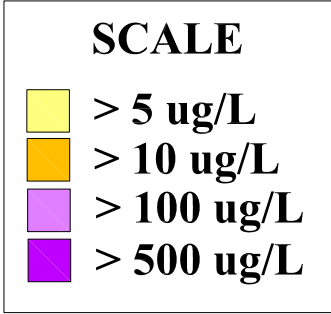
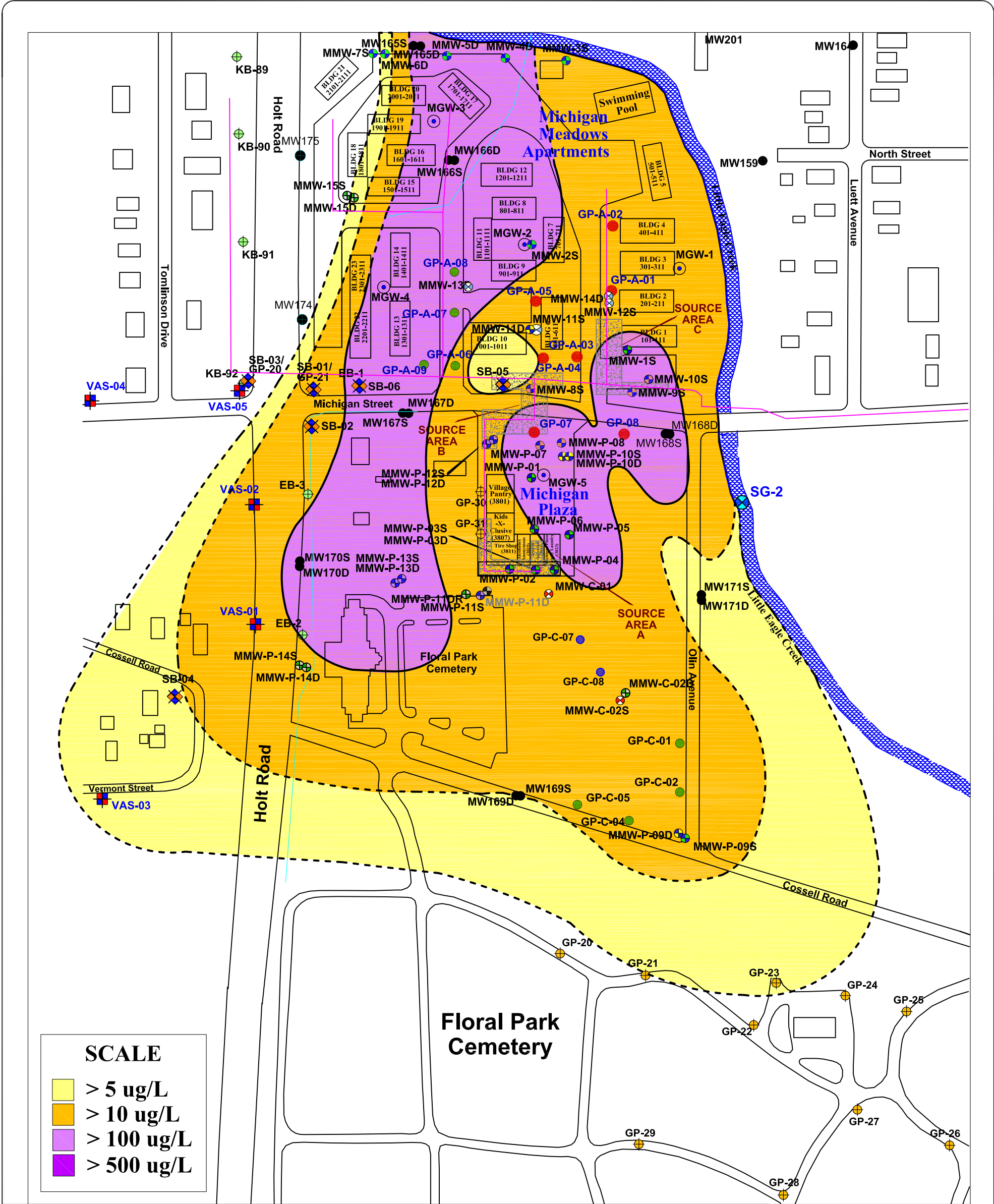


Keramida Monitoring Well Locations
Referenced from Keramida
Environmental, Inc.
Project No. 2829
March 13, 2002



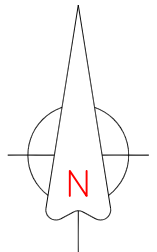
LEGEND			
	Fence		MUNDELL Soil Boring Location (December 2011)
	Keramida/Environ Monitoring Wells		MUNDELL Monitoring Wells (December 2011)
	MUNDELL Monitoring Wells, Michigan Plaza (September 2005)		EPA Vertical Aquifer Sampling Well Locations (November 2011)
	MUNDELL Monitoring Wells (January 2007)		EPA Soil Borings
	MUNDELL Monitoring Wells (May-June 2007)		Abandoned Monitoring Well Location
	MUNDELL Monitoring Wells (July/August 2008)		Environ Soil Borings
	MUNDELL Monitoring Wells (November/December 2008)		Sanitary Sewer
	MUNDELL Soil Boring Locations (January 2007)		Storm Sewer
	MUNDELL Soil Boring Locations (September 2005)		
	MUNDELL Soil Boring Locations (August 2008)		
	MUNDELL Monitoring Wells (September 2011)		
	MUNDELL Soil Gas Well		

Keramida Monitoring Well Locations
Referenced from Keramida
Environmental, Inc.
Project No. 2829
March 13, 2002



LEGEND

- | | | | |
|-----------|---|-----------|--|
| — | Fence | GP-29 | MUNDELL Soil Boring Location (December 2011) |
| MW160 | Keramida/Environ Monitoring Wells | MMW-P-11D | MUNDELL Monitoring Wells (December 2011) |
| MMW-P-06 | MUNDELL Monitoring Wells, Michigan Plaza (September 2005) | VAS-01 | EPA Vertical Aquifer Sampling Well Locations (November 2011) |
| MMW-P-07 | MUNDELL Monitoring Wells (January 2007) | SB-03 | EPA Soil Borings |
| MMW-P-09D | MUNDELL Monitoring Wells (May-June 2007) | | |
| MMW-C-01 | MUNDELL Monitoring Wells (July/August 2008) | | |
| MMW-11S | MUNDELL Monitoring Wells (November/December 2008) | | |
| GP-C-05 | MUNDELL Soil Boring Locations (January 2007) | MMW-P-11D | Abandoned Monitoring Well Location |
| GP-07 | MUNDELL Soil Boring Locations (September 2005) | EB-2 | Environ Soil Borings |
| GP-C-08 | MUNDELL Soil Boring Locations (August 2008) | | |
| MMW-P-11D | MUNDELL Monitoring Wells (September 2011) | | |
| MGW-1 | MUNDELL Soil Gas Well | | |
| | | | Sanitary Sewer |
| | | | Storm Sewer |



SCALE
feet
200

Keramida Monitoring Well Locations
Referenced from Keramida
Environmental, Inc.
Project No. 2829
March 13, 2002



110 South Downey Avenue
Indianapolis, Indiana 46219
317-630-9060, fax 317-630-9065
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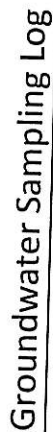
Project Number:
M01046
Drawing File:
Basemap 2012
Date Prepared:
3/13/12
Scale:
1"=200'

VINYL CHLORIDE DISTRIBUTION IN
DEEP GROUNDWATER
(OCTOBER 2011)
Michigan Plaza
3801 - 3823 West Michigan Street
Indianapolis, INDIANA

FIGURE
18

ATTACHMENT A

Low-Flow Sampling Sheets and Parameter Data

[illegible]

**Attachment A
Low Flow Data
Quarter 3 2007
Michigan Plaza
3801-3823 West Michigan Street
Indianapolis, Indiana
MUNDELL Project No. M01046**

Well ID	Date	Water Level Depth (Feet BTOC)	pH	Conductivity	Temperature (°F)	Dissolved Oxygen (ug/L)	Oxygen Reduction Potential (mV)
MMW-1S	9/19/2007	16.360	7.2	1071.3	72.84	3082	244
MMW-8S	9/19/2007	17.410	7.8	777.8	63.10	2179	-48
MMW-9S	9/20/2007	17.450	7.8	1546.5	65.40	2914	263
MMW-10S	9/19/2007	16.170	7.4	1356.0	68.25	1901	262
MMW-11S	9/19/2007	16.430	7.6	882.9	61.52	2302	216
MMW-P-01	9/20/2007	19.690	7.6	1462.6	64.48	3446	208
MMW-P-02	9/19/2007	20.900	7.5	1046.3	63.84	2481	95
MMW-P-03S	9/20/2007	20.790	6.6	1285.8	64.94	4370	349
MMW-P-03D	9/19/2007	20.630	7.6	1281.9	63.98	2190	2
MMW-P-04	9/20/2007	20.490	7.2	1016.0	63.43	4739	367
MMW-P-05	9/19/2007	20.140	7.5	974.2	64.43	2469	188
MMW-P-06	9/19/2007	20.570	7.4	1471.8	64.34	2988	197
MMW-P-07	9/20/2007	18.840	7.6	1586.4	65.26	2460	291
MMW-P-08	9/20/2007	18.610	7.6	1312.0	65.80	2608	300
MMW-P-09S	9/19/2007	20.170	7.6	997.1	58.79	3040	165
MMW-P-09D	9/19/2007	20.350	7.7	932.4	57.65	2063	68
MMW-P-10S	9/19/2007	18.300	7.3	1911.4	64.88	3019	229
MMW-P-10D	9/19/2007	18.690	7.4	851.8	63.29	3722	141
MMW-168S	9/19/2007	18.340	6.5	1557.3	80.64	3475	304
MMW-168D	9/19/2007	18.260	7.5	977.8	62.99	4153	26

BTOC - Below Top of Casing

ug/L - micrograms per liter

mV - millivolts

**Attachment A
Low Flow Data
Quarter 4 2007
Michigan Plaza
3801-3823 West Michigan Street
Indianapolis, Indiana
MUNDELL Project No. M01046**

Well ID	Date	Water Level Depth (Feet BTOC)	pH	Conductivity	Temperature (°F)	Dissolved Oxygen (ug/L)	Oxygen Reduction Potential (mV)
MMW-1S	12/13/2007	15.68	4.0	900.65	74.35	6435	428
MMW-8S	12/13/2007	16.78	6.0	1.45	59.65	91753	230
MMW-9S	12/12/2007	16.45	5.0	1339.87	66.14	9525	172
MMW-10S	12/12/2007	15.58	5.3	1279.48	67.94	6165	253
MMW-11S	12/13/2007	15.77	4.3	734.48	60.48	40779	397
MMW-P-01	12/14/2007	19.13	3.8	1326.96	64.38	2671	360
MMW-P-03S	12/13/2007	20.19	6.4	1185.54	62.87	6153	273
MMW-P-03D	12/13/2007	20.10	5.4	789.51	58.30	10627	265
MMW-P-04	12/13/2007	23.33	5.7	519.68	63.89	11920	300
MMW-P-05	12/14/2007	19.57	5.8	1155.00	62.83	8247	286
MMW-P-06	12/14/2007	20.06	5.6	1574.95	63.72	8032	305
MMW-P-07	12/13/2007	18.17	3.5	1060.61	63.79	8224	208
MMW-P-08	12/14/2007	18.03	5.8	722.63	63.84	6935	158
MMW-P-09S	12/12/2007	19.98	3.9	930.96	58.91	6039	406
MMW-P-09D	12/12/2007	19.76	5.1	866.12	56.60	10632	316
MMW-P-10S	12/12/2007	17.58	5.3	1279.48	67.94	6165	253
MMW-P-10D	12/14/2007	17.95	5.9	831.77	62.61	7541	157
MMW-168D	12/12/2007	17.22	5.3	1061.99	63.27	11511	263

BTOC - Below Top of Casing

ug/L - micrograms per liter

mV - millivolts

Attachment A
Low Flow Data
Quarter 1 2008
Michigan Plaza
3801-3823 West Michigan Street
Indianapolis, Indiana
MUNDELL Project No. M01046

Well ID	Date	Water Level Depth (Feet BTOC)	pH	Conductivity	Temperature (°F)	Dissolved Oxygen (ug/L)	Oxygen Reduction Potential (mV)
MMW-1S	3/21/2008	14.150	2.2	3752.58	59.08	1650	230
MMW-8S	3/20/2008	15.310	2.8	0.29	63.35	2754	180
MMW-9S	3/21/2008	15.190	2.0	5173.38	60.25	918	44
MMW-10S	3/21/2008	14.080	2.0	5519.90	63.03	1251	102
MMW-11S	3/20/2008	14.180	1.8	3617.55	48.80	14.74	200
MMW-P-02	3/20/2008	18.610	1.4	5619.07	62.11	1656	211
MMW-P-03S	3/20/2008	18.390	1.3	4637.44	62.02	1635	155
MMW-P-03D	3/20/2008	18.280	1.4	5093.33	61.99	1568	-110
MMW-P-04	3/20/2008	18.520	1.6	1715.12	59.56	1644	44
MMW-P-05	3/20/2008	17.920	2.1	0.28	53.40	3253	233
MMW-P-06	3/20/2008	18.340	1.9	6086.21	61.77	1475	-143
MMW-P-07	3/21/2008	16.690	2.1	4293.47	345.70	900	29
MMW-P-08	3/21/2008	16.440	1.8	6062.47	60.10	933	4
MMW-P-09S	3/21/2008	18.600	2.0	5173.38	60.25	918	44
MMW-P-09D	3/20/2008	18.330	2.5	3920.33	55.30	2151	230
MMW-P-10S	3/20/2008	15.650	1.4	8898.20	58.57	1934	104
MMW-P-10D	3/20/2008	16.390	1.7	4589.68	61.52	1560	-92
MMW-168S	3/20/2008	15.830	1.9	5636.62	58.34	1689	250
MMW-168D	3/20/2008	15.650	2.2	4065.21	61.58	1432	222

BTOC - Below Top of Casing

ug/L - micrograms per liter

mV - millivolts

**Attachment A
Low Flow Data
Quarter 2 2008
Michigan Plaza
3801-3823 West Michigan Street
Indianapolis, Indiana
MUNDELL Project No. M01046**

Well ID	Date	Water Level Depth (Feet BTOC)	pH	Conductivity	Temperature (°F)	Dissolved Oxygen (ug/L)	Oxygen Reduction Potential (mV)
MMW-1S	6/6/2008	14.80	-3.7	3346.10	65.15	6165	1286
MMW-2S	6/2/2008	14.20	7.0	867.68	57.26	4402	-147
MMW-4D	6/2/2008	12.52	7.1	1091.63	57.18	2942	-269
MMW-5D	6/2/2008	12.59	7.1	1091.63	57.18	2942	-269
MMW-8S	6/6/2008	15.74	-0.6	3385.17	64.28	7697	1271
MMW-9S	6/6/2008	15.50	6.9	1223.00	61.15	48.13	-180
MMW-10S	6/6/2008	14.90	6.7	1604.62	65.35	4463	-230
MMW-11S	6/5/2008	13.84	7.1	723.78	62.82	4351	-229
MMW-P-01	6/5/2008	17.91	7.1	1003.45	62.94	4351	-229
MMW-P-05	6/5/2008	18.34	6.9	1416.91	67.47	3952	-226
MMW-P-06	6/5/2008	18.44	6.9	1150.56	63.12	4357	-236
MMW-P-07	6/5/2008	17.00	7.1	980.38	63.65	4330	-206
MMW-P-09S	6/5/2008	18.65	7.0	1118.24	69.87	4765	-130
MMW-P-09D	6/5/2008	18.48	7.0	963.64	60.28	4210	-197
MMW-168S	6/5/2008	16.72	6.8	1395.01	60.18	5235	-142
MMW-168D	6/5/2008	16.70	6.9	1283.44	82.49	4498	-167
MMW-170S	6/3/2008	19.69	7.1	1442.53	58.71	3706	-186
MMW-170D	6/3/2008	19.61	7.1	969.53	59.48	3384	-174

BTOC - Below Top of Casing

ug/L - micrograms per liter

mV - millivolts

**Attachment A
Low Flow Data
Quarter 3 2008
Michigan Plaza
3801-3823 West Michigan Street
Indianapolis, Indiana
MUNDELL Project No. M01046**

Well ID	Date	Water Level Depth (Feet BTOC)	pH	Conductivity	Temperature (°F)	Dissolved Oxygen (ug/L)	Oxygen Reduction Potential (mV)
MMW-9S	9/10/2008	15.50	7.3	0.31	72.30	7965	481
MMW-10S	9/10/2008	14.90	6.5	4517.29	69.04	8796	308
MMW-11S	9/10/2008	13.84	6.8	0.34	64.72	10030	338
MMW-P-01	9/11/2008	17.91	7.0	0.40	80.35	6234	14
MMW-P-03S	9/11/2008	18.88	6.9	0.27	79.64	6369	-101
MMW-P-05	9/11/2008	18.34	7.0	0.46	78.15	6667	-168
MMW-P-06	9/11/2008	18.44	7.1	0.25	69.78	8600	-266
MMW-P-07	9/11/2008	17.00	6.8	0.69	81.72	5980	-439
MMW-P-08	9/11/2008	16.85	6.7	0.74	76.18	7077	-344
MMW-P-09S	9/10/2008	18.65	7.3	0.25	69.71	8617	467
MMW-P-09D	9/10/2008	18.48	7.1	0.30	62.91	10601	200
MMW-P-10D	9/11/2008	17.01	7.0	0.37	72.18	7995	45
MMW-C-01	9/10/2008	-	7.5	0.26	70.97	8293	477

BTOC - Below Top of Casing

ug/L - micrograms per liter

mV - millivolts

**Attachment A
Low Flow Data
Quarter 4 2008
Michigan Plaza
3801-3823 West Michigan Street
Indianapolis, Indiana
MUNDELL Project No. M01046**

Well ID	Date	Water Level Depth (Feet BTOC)	pH	Conductivity	Temperature (°F)	Dissolved Oxygen (ug/L)	Oxygen Reduction Potential (mV)
MMW-1S	11/20/2008	16.38	6.8	3046.01	60.43	533	829
MMW-8S	11/20/2008	17.28	7.1	2761.42	62.48	515	487
MMW-9S	11/20/2008	17.43	6.5	4141.29	64.28	558	419
MMW-10S	11/20/2008	16.53	6.6	4320.54	67.34	585	545
MMW-11S	11/20/2008	16.36	7.0	2954.86	61.19	518	782
MMW-P-01	11/19/2008	19.68	6.9	-	63.64	2183	1070
MMW-P-02	11/19/2008	20.91	6.7	-	62.16	3885	221
MMW-P-03S	11/19/2008	20.73	6.9	-	63.40	3027	574
MMW-P-03D	11/19/2008	20.61	6.8	-	62.37	3453	127
MMW-P-05	11/19/2008	20.14	7.0	-	62.17	3050	811
MMW-P-06	11/19/2008	20.57	6.8	-	62.93	2652	870
MMW-P-07	11/19/2008	18.56	6.9	-	63.56	2397	715
MMW-P-08	11/19/2008	18.42	6.5	-	64.85	2027	846
MMW-P-09S	11/19/2008	20.44	7.0	-	58.45	1628	1129
MMW-P-09D	11/19/2008	20.25	7.1	-	56.35	1534	1108
MMW-P-10S	11/19/2008	18.12	6.9	-	64.84	1872	1106
MMW-P-10D	11/19/2008	18.67	6.9	-	62.61	1973	1034
MMW-C-01	11/20/2008	20.25	6.8	2907.86	61.81	480	491
MMW-C-02	11/20/2008	19.60	6.9	2806.68	57.23	476	931
MMW-168D	11/20/2008	18.23	6.9	3318.77	62.41	504	530

BTOC - Below Top of Casing

ug/L - micrograms per liter

mV - millivolts

**Attachment A
Low Flow Data
Quarter 1 2009
Michigan Plaza
3801-3823 West Michigan Street
Indianapolis, Indiana
MUNDELL Project No. M01046**

Well ID	Date	Water Level Depth (Feet BTOC)	pH	Conductivity	Temperature (°F)	Dissolved Oxygen (ug/L)	Oxygen Reduction Potential (mV)
MMW-1S	3/16/2009	16.17	6.7	2794.00	60.18	4879	484
MMW-8S	3/16/2009	16.92	6.6	2647.01	60.85	2188	698
MMW-9S	3/16/2009	17.06	6.8	3678.06	62.36	4601	222
MMW-10S	3/16/2009	16.17	6.9	3510.36	64.09	5003	159
MMW-11S	3/16/2009	15.95	6.6	2887.15	59.77	2540	738
MMW-11D	3/16/2009	16.02	6.6	2745.44	61.10	2969	715
MMW-12S	3/16/2009	15.18	6.6	2817.69	59.91	4079	606
MMW-13D	3/16/2009	-	6.6	2420.56	61.50	3463	662
MMW-14D	3/18/2009	14.95	6.7	2190.74	61.60	850	780
MMW-P-01	3/17/2009	19.09	6.8	3419.37	63.25	929	468
MMW-P-02	3/17/2009	20.19	6.7	3641.02	62.48	852	858
MMW-P-03S	3/17/2009	20.05	6.7	3372.09	62.75	812	809
MMW-P-03D	3/17/2009	19.94	6.7	3253.15	62.97	806	757
MMW-P-05	3/17/2009	19.52	6.6	2669.54	60.88	864	838
MMW-P-06	3/17/2009	19.91	6.7	3884.36	62.27	1063	710
MMW-P-07	3/17/2009	18.10	6.8	4022.29	63.10	880	745
MMW-P-08	3/17/2009	17.99	6.8	4083.50	62.16	876	674
MMW-P-09S	3/17/2009	18.02	6.5	2248.31	55.70	1019	858
MMW-P-09D	3/17/2009	19.62	6.6	2615.95	56.90	819	834
MMW-P-10S	3/17/2009	17.82	6.8	3958.16	60.94	863	653
MMW-P-10D	3/17/2009	18.21	6.6	2733.68	62.47	838	574
MMW-C-01	3/17/2009	19.47	6.6	2701.97	61.77	770	693
MMW-C-02	3/17/2009	18.89	6.6	2506.91	57.22	811	867
MMW-168D	3/17/2009	17.89	6.6	2948.13	61.86	871	795

BTOC - Below Top of Casing

ug/L - micrograms per liter

mV - millivolts

**Attachment A
Low Flow Data
Quarter 2 2009
Michigan Plaza
3801-3823 West Michigan Street
Indianapolis, Indiana
MUNDELL Project No. M01046**

Well ID	Date	Water Level Depth (Feet BTOC)	pH	Conductivity	Temperature (°F)	Dissolved Oxygen (ug/L)	Oxygen Reduction Potential (mV)
MMW-1S	6/15/2009	14.76	No Low Flow Data Recorded for this Quarter				
MMW-8S	6/15/2009	15.61					
MMW-9S	6/15/2009	15.85					
MMW-10S	6/15/2009	15.01					
MMW-11S	6/15/2009	14.64					
MMW-P-01	6/15/2009	17.44					
MMW-P-02	6/15/2009	18.38					
MMW-P-03S	6/15/2009	18.25					
MMW-P-03D	6/15/2009	18.15					
MMW-P-04	6/15/2009	18.01					
MMW-P-05	6/15/2009	18.83					
MMW-P-06	6/15/2009	18.17					
MMW-P-07	6/15/2009	16.54					
MMW-P-08	6/15/2009	16.50					
MMW-P-09S	6/15/2009	18.20					
MMW-P-09D	6/15/2009	18.40					
MMW-P-10S	6/15/2009	16.50					
MMW-P-10D	6/15/2009	16.74					
MMW-168S	6/15/2009	16.80					
MMW-168D	6/15/2009	16.71					

BTOC - Below Top of Casing

ug/L - micrograms per liter

mV - millivolts

**Attachment A
Low Flow Data
Quarter 3 2009
Michigan Plaza
3801-3823 West Michigan Street
Indianapolis, Indiana
MUNDELL Project No. M01046**

Well ID	Date	Water Level Depth (Feet BTOC)	pH	Conductivity	Temperature (°F)	Dissolved Oxygen (ug/L)	Oxygen Reduction Potential (mV)
MMW-8S	8/5/2009	15.97	7.1	1024.33	61.63	2439	-160
MMW-11S	8/5/2009	15.09	7.0	951.53	62.49	2457	127
MMW-11D	8/5/2009	14.89	7.1	830.12	61.65	2358	41
MMW-13D	8/5/2009	14.85	7.2	866.95	63.29	2502	-49
MMW-14D	8/5/2009	13.92	7.1	763.82	62.02	2440	-83

BTOC - Below Top of Casing

ug/L - micrograms per liter

mV - millivolts

**Attachment A
Low Flow Data
Quarter 4 2009
Michigan Plaza
3801-3823 West Michigan Street
Indianapolis, Indiana
MUNDELL Project No. M01046**

Well ID	Date	Water Level Depth (Feet BTOC)	pH	Conductivity	Temperature (°F)	Dissolved Oxygen (ug/L)	Oxygen Reduction Potential (mV)
MMW-1S	11/2/2009	15.73	6.7	1235.44	64.60	1900	-28
MMW-8S	11/2/2009	16.80	7.0	955.41	64.25	1805	-71
MMW-9S	11/2/2009	17.04	6.6	1396.37	66.55	1861	35
MMW-10S	11/2/2009	-	6.6	1683.57	67.65	1970	-15
MMW-11S	11/2/2009	-	6.9	981.81	63.23	1847	40
MMW-11D	11/2/2009	-	7.0	889.30	61.78	2495	-23
MMW-12S	11/2/2009	-	6.9	948.21	65.35	1885	116
MMW-14D	11/2/2009	14.90	7.1	782.66	60.79	1820	1
MMW-P-01	11/3/2009	19.07	6.7	1824.15	63.48	1774	-48
MMW-P-02	11/3/2009	20.19	7.0	1006.19	61.88	2066	98
MMW-P-03S	11/3/2009	20.05	6.9	1162.90	63.95	1783	-81
MMW-P-03D	11/3/2009	20.06	6.8	1406.29	62.99	1791	-48
MMW-P-05	11/3/2009	19.44	7.0	1036.88	62.55	1842	-70
MMW-P-06	11/3/2009	20.05	6.9	1276.43	62.46	1631	-105
MMW-P-07	11/3/2009	18.19	6.6	2224.11	63.28	1745	-72
MMW-P-08	11/3/2009	17.80	6.5	1547.62	64.58	1676	-74
MMW-P-09S	11/3/2009	19.90	6.9	810.17	60.02	2892	174
MMW-P-09D	11/3/2009	19.82	7.1	897.83	56.97	1717	-59
MMW-P-10S	11/3/2009	17.76	6.8	705.52	65.19	1566	-112
MMW-P-10D	11/3/2009	18.00	6.8	1104.13	62.40	1699	-98
MMW-C-01	11/3/2009	19.85	6.9	983.51	63.80	1765	-100
MMW-C-02	11/3/2009	19.25	6.8	784.90	58.07	1811	24
MMW-168D	11/4/2009	18.00	6.8	1070.78	61.97	7162	-107

BTOC - Below Top of Casing

ug/L - micrograms per liter

mV - millivolts

**Attachment A
Low Flow Data
Quarter 1 2010
Michigan Plaza
3801-3823 West Michigan Street
Indianapolis, Indiana
MUNDELL Project No. M01046**

Well ID	Date	Water Level Depth (Feet BTOC)	pH	Conductivity	Temperature (°F)	Dissolved Oxygen (ug/L)	Oxygen Reduction Potential (mV)
MMW-1S	2/3/2010	16.13	6.7	1163.71	60.87	5359	-47
MMW-8S	2/3/2010	17.15	7.0	840.91	57.80	46.38	-49
MMW-9S	2/3/2010	17.33	6.6	1372.18	61.81	5596	11
MMW-10S	2/3/2010	16.29	6.6	1547.07	60.44	5474	-43
MMW-11S	2/3/2010	16.12	6.9	1043.16	56.74	4936	-24
MMW-11D	2/3/2010	16.29	6.9	939.19	59.82	4812	-1
MMW-12S	2/3/2010	15.41	6.8	1038.47	60.30	5624	251
MMW-13D	2/3/2010	16.10	7.2	700.22	58.89	5090	-75
MMW-14D	2/3/2010	15.20	7.0	779.17	59.40	5793	303
MMW-P-01	2/4/2010	19.29	6.9	1530.40	62.01	697	-132
MMW-P-02	2/4/2010	20.29	6.8	1324.05	60.42	693	272
MMW-P-03S	2/4/2010	20.20	6.9	1303.45	62.38	751	-63
MMW-P-03D	2/4/2010	20.20	6.7	1360.53	61.96	661	64
MMW-P-04	2/2/2010	-	6.9	827.41	58.95	1005	199
MMW-P-05	2/4/2010	19.64	7.0	787.24	59.62	724	-83
MMW-P-06	2/4/2010	20.24	7.0	927.09	61.92	725	-86
MMW-P-07	2/4/2010	18.46	6.7	1800.27	61.71	721	-92
MMW-P-08	2/4/2010	18.09	6.6	1629.37	61.63	631	-86
MMW-P-09S	2/3/2010	19.94	6.9	701.41	56.41	3997	-51
MMW-P-09D	2/3/2010	19.92	7.1	862.01	55.67	4243	-78
MMW-P-10S	2/4/2010	18.28	6.7	1663.47	60.85	614	-93
MMW-P-10D	2/4/2010	18.06	6.8	992.55	60.70	619	-101
MMW-C-01	2/3/2010	19.98	6.9	758.54	61.77	3818	-59
MMW-C-02	2/3/2010	19.33	6.8	778.88	57.33	3782	76
MMW-168D	2/4/2010	18.03	6.9	941.82	60.88	469	-74

BTOC - Below Top of Casing

ug/L - micrograms per liter

mV - millivolts

Attachment A
Low Flow Data
Quarter 2 2010
Michigan Plaza
3801-3823 West Michigan Street
Indianapolis, Indiana
MUNDELL Project No. M01046

Well ID	Date	Water Level Depth (Feet BTOC)	pH	Conductivity	Temperature (°F)	Dissolved Oxygen (ug/L)	Oxygen Reduction Potential (mV)
MMW-1S	4/22/2010	15.91	6.8	1309.12	61.99	2753	-43
MMW-2S	4/22/2010	-	7.2	786.37	63.60	7865	107
MMW-3S	4/20/2010	12.70	7.2	932.59	49.62	454	75
MMW-4D	4/20/2010	13.69	7.1	1209.81	54.87	379	0
MMW-5D	4/20/2010	13.48	7.1	1063.96	48.50	304	126
MMW-6D	4/20/2010	14.51	7.4	1060.86	46.91	362	51
MMW-7S	4/20/2010	14.10	6.8	1013.16	63.54	637	200
MMW-8S	4/22/2010	16.88	7.1	891.80	60.32	1303	-47
MMW-9S	4/22/2010	17.16	6.6	2012.35	63.68	1456	-61
MMW-10S	4/22/2010	16.06	6.6	1835.07	64.68	1396	-91
MMW-11S	4/22/2010	15.86	7.0	959.55	59.09	1807	103
MMW-11D	4/22/2010	16.03	7.0	945.64	60.39	1325	96
MMW-12S	4/20/2010	15.25	7.0	1046.17	58.76	234	170
MMW-13D	4/22/2010	15.81	7.1	828.29	61.59	1743	-55
MMW-14D	4/20/2010	15.02	7.1	750.80	61.27	231	111
MMW-P-01	4/22/2010	18.80	7.1	1493.75	61.95	1376	-255
MMW-P-02	4/22/2010	19.72	7.0	1346.32	60.07	148	256
MMW-P-03S	4/22/2010	19.65	6.9	970.51	62.33	170	-63
MMW-P-03D	4/22/2010	19.63	6.9	1143.79	62.02	143	-16
MMW-P-04	4/21/2010	19.65	7.0	808.10	65.49	237	-47
MMW-P-05	4/22/2010	19.16	7.0	1003.09	60.21	1663	-26
MMW-P-06	4/22/2010	19.72	6.9	1129.17	60.95	1405	-106
MMW-P-07	4/22/2010	18.07	6.7	1924.80	61.08	1400	-154
MMW-P-08	4/22/2010	17.74	6.7	1804.33	60.11	1408	-202
MMW-P-9S	4/22/2010	19.47	7.1	640.05	57.71	2699	69
MMW-P-9D	4/22/2010	19.44	7.1	884.73	57.54	1360	-65
MMW-P-10S	4/22/2010	17.69	7.0	971.25	60.76	1564	-200
MMW-P-10D	4/22/2010	17.95	7.1	856.97	61.77	1371	-192
MMW-C-01	4/21/2010	19.40	7.1	723.37	6050.00	174	57
MMW-C-02	4/21/2010	18.80	6.9	786.28	56.92	177	202
MMW-168D	4/21/2010	17.81	6.9	1128.46	61.80	190	53
MMW-169S	4/21/2010	19.70	7.1	848.37	58.42	228	-49
MMW-169D	4/21/2010	19.78	7.1	783.49	59.50	207	-53
MMW-170S	4/21/2010	20.41	7.0	1489.91	59.08	162	90
MMW-170D	4/21/2010	20.34	7.1	1148.57	59.67	190	87
MMW-171D	4/21/2010	15.95	7.1	688.13	54.68	205	53
MMW-167S	4/21/2010	19.43	6.9	1212.34	58.04	173	102
MMW-167D	4/21/2010	18.61	8.3	803.34	60.16	163	64

BTOC - Below Top of Casing

ug/L - micrograms per liter

mV - millivolts

**Attachment A
Low Flow Data
Quarter 3 2010
Michigan Plaza
3801-3823 West Michigan Street
Indianapolis, Indiana
MUNDELL Project No. M01046**

Well ID	Date	Water Level Depth (Feet BTOC)	pH	Conductivity	Temperature (°F)	Dissolved Oxygen (ug/L)	Oxygen Reduction Potential (mV)
MMW-1S	7/21/2010	15.36	6.6	1543.32	67.00	2413	18
MMW-8S	7/21/2010	16.27	7.0	995.05	61.99	1709	-32
MMW-9S	7/21/2010	16.51	6.6	1485.92	63.56	3403	-60
MMW-10S	7/20/2010	15.46	6.6	1806.61	66.06	2423	-56
MMW-11S	7/21/2010	15.25	7.0	1037.29	60.95	1751	50
MMW-11D	7/21/2010	15.41	7.0	960.85	61.68	1820	36
MMW-12S	7/20/2010	14.67	7.0	932.53	64.21	10359	160
MMW-13D	7/20/2010	15.21	7.2	823.77	63.91	1906	-38
MMW-14D	7/20/2010	14.45	7.1	803.56	61.89	4430	-55
MMW-P-01	7/21/2010	18.06	6.8	1421.25	64.54	2113	-130
MMW-P-02	7/21/2010	18.92	6.9	1121.84	62.11	1806	-10
MMW-P-03S	7/21/2010	18.85	6.8	1300.24	65.37	2016	-72
MMW-P-03D	7/21/2010	18.84	6.8	1084.75	64.30	2235	-125
MMW-P-04	7/22/2010	18.75	6.7	964.16	74.50	3591	-40
MMW-P-05	7/21/2010	18.40	6.9	1101.45	61.90	2067	-80
MMW-P-06	7/21/2010	18.95	7.0	1448.34	63.11	2001	-112
MMW-P-07	7/22/2010	17.35	6.6	1605.51	66.85	3369	-55
MMW-P-08	7/22/2010	17.01	6.8	939.29	65.43	3994	-70
MMW-P-09S	7/22/2010	18.87	7.0	1077.88	61.78	5477	27
MMW-P-09D	7/22/2010	18.85	7.2	929.01	57.92	3702	-59
MMW-P-10S	7/21/2010	16.86	6.9	900.75	63.63	1868	-105
MMW-P-10D	7/22/2010	17.21	6.8	913.11	61.12	2694	-27
MMW-C-01	7/22/2010	18.61	7.0	792.01	62.07	5588	47
MMW-C-02	7/22/2010	18.12	6.9	755.80	57.65	2670	30
MMW-168D	7/22/2010	17.22	6.9	1194.59	63.03	4678	-53
MMW-171D	7/22/2010	15.35	7.1	1001.94	60.97	4607	-47

BTOC - Below Top of Casing

ug/L - micrograms per liter

mV - millivolts

**Attachment A
Low Flow Data
Quarter 4 2010
Michigan Plaza
3801-3823 West Michigan Street
Indianapolis, Indiana
MUNDELL Project No. M01046**

Well ID	Date	Water Level Depth (Feet BTOC)	pH	Conductivity	Temperature (°F)	Dissolved Oxygen (ug/L)	Oxygen Reduction Potential (mV)
MMW-1S	10/12/2010	16.55	6.6	1518.29	68.14	5576	-229
MMW-8S	10/12/2010	17.60	7.1	879.84	64.88	124	-274
MMW-9S	10/12/2010	17.79	6.6	1540.05	65.73	564	-308
MMW-10S	10/12/2010	16.82	6.6	1852.22	68.31	951	-261
MMW-11S	10/12/2010	16.73	7.0	954.24	62.83	301	-217
MMW-11D	10/12/2010	16.61	7.0	953.96	61.59	209	-221
MMW-12S	10/12/2010	15.83	6.9	1026.00	66.50	349	-155
MMW-13D	10/12/2010	16.55	7.3	759.80	62.51	116	-255
MMW-14D	10/12/2010	15.62	7.1	820.21	61.62	221	-224
MMW-P-01	10/14/2010	19.82	6.8	1382.53	64.53	203	-164
MMW-P-02	10/13/2010	20.88	6.9	1089.71	64.13	281	-209
MMW-P-03S	10/13/2010	20.75	6.9	1333.00	65.29	270	-274
MMW-P-03D	10/13/2010	20.75	6.7	1358.04	63.84	269	-246
MMW-P-04	10/13/2010	20.65	6.7	1025.25	68.69	869	-203
MMW-P-05	10/13/2010	20.19	6.9	917.79	63.87	250	-240
MMW-P-06	10/14/2010	20.77	6.9	1194.85	62.94	162	-121
MMW-P-07	10/14/2010	19.16	6.6	2187.63	64.54	359	-148
MMW-P-08	10/14/2010	18.60	6.7	1923.74	65.39	395	-175
MMW-P-09S	10/13/2010	20.47	6.9	725.62	60.76	1026	-105
MMW-P-09D	10/13/2010	20.42	7.1	903.03	57.58	694	-282
MMW-P-10S	10/14/2010	18.58	6.6	1681.66	64.62	404	-154
MMW-P-10D	10/14/2010	18.74	6.7	1341.39	62.52	351	-165
MMW-C-01	10/13/2010	20.53	6.9	834.61	68.27	3883	-29
MMW-C-02	10/13/2010	19.86	6.8	717.42	58.64	212	-175
MMW-168D	10/13/2010	18.45	6.8	1184.43	63.67	350	-230

BTOC - Below Top of Casing

ug/L - micrograms per liter

mV - millivolts

**Attachment A
Low Flow Data
Quarter 3 2011
Michigan Plaza
3801-3823 West Michigan Street
Indianapolis, Indiana
MUNDELL Project No. M01046**

Well ID	Date	Water Level Depth (Feet BTOC)	pH	Conductivity	Temperature (°F)	Dissolved Oxygen (ug/L)	Oxygen Reduction Potential (mV)
MMW-1S	7/28/2011	15.70	6.56	1473.98	65.99	730	-179
MMW-8S	7/26/2011	16.82	6.58	2259.31	81.79	2202	-47
MMW-9S	7/27/2011	16.91	6.52	1835.33	62.55	434	-187
MMW-10S	7/27/2011	15.92	6.58	1734.55	66.62	513	-158
MMW-11S	7/26/2011	15.76	6.87	764.47	61.66	250	-169
MMW-11D	7/26/2011	15.93	6.82	989.47	64.76	394	-156
MMW-12S	7/26/2011	15.02	6.76	1006.61	63.05	400	-114
MMW-13D	7/26/2011	15.76	7.03	913.7	63.75	1428	-204
MMW-14D	7/26/2011	14.80	6.96	827.15	61.22	262	-183
MMW-P-01	7/28/2011	19.06	6.7	1508.75	64.16	628	-161
MMW-P-02	7/27/2011	20.25	6.86	1083.82	65.02	322	-225
MMW-P-03S	7/27/2011	20.05	6.75	1290.23	66.31	412	-175
MMW-P-03D	7/27/2011	20.07	6.81	1284.67	65.32	367	-192
MMW-P-04	7/28/2011	19.90	6.67	1363.11	71.04	1011	-174
MMW-P-05	7/27/2011	19.42	6.8	1436.68	64.29	607	-184
MMW-P-06	7/28/2011	20.05	6.85	1302.64	64.65	812	-198
MMW-P-07	7/28/2011	18.25	8.33	2098.5	64.30	765	-161
MMW-P-08	7/27/2011	17.79	6.544	2323.74	64.47	597	-146
MMW-P-09S	7/26/2011	19.99	6.78	882.4	58.32	1473	-85
MMW-P-09D	7/26/2011	19.93	6.98	919.04	60.33	567	-198
MMW-P-10S	7/27/2011	17.41	6.69	1538.33	64.52	543	-170
MMW-P-10D	7/27/2011	17.91	6.82	1073.2	65.70	539	-162
MMW-C-01	7/27/2011	19.81	6.8	1156.65	62.38	707	-190
MMW-C-02	7/27/2011	19.34	6.72	811.88	59.32	694	-146
MMW-168D	7/28/2011	17.56	6.75	1476.13	65.24	528	-163

BTOC - Below Top of Casing

ug/L - micrograms per liter

mV - millivolts

**Attachment A
Low Flow Data
Quarter 4 2011
Michigan Plaza
3801-3823 West Michigan Street
Indianapolis, Indiana
MUNDELL Project No. M01046**

Well ID	Date	Water Level Depth (Feet BTOC)	pH	Conductivity	Temperature (°F)	Dissolved Oxygen (ug/L)	Oxygen Reduction Potential (mV)
MMW-1S	10/19/2011	16.41	6.76	1172.0	64.67	170	-60
MMW-8S	10/24/2011	17.46	7.01	1016.0	63.37	190	-90
MMW-9S	10/24/2011	17.67	6.62	2035.0	65.46	180	-40
MMW-10S	10/19/2011	16.70	6.73	1646.0	65.11	200	-70
MMW-11S	10/21/2011	16.40	7.0	1108.0	62.02	260	140
MMW-11D	10/21/2011	16.43	7.10	917.0	61.0	200	0
MMW-12S	10/18/2011	15.70	6.52	1063.0	64.58	180	220
MMW-13D	10/18/2011	16.43	7.28	789.9	61.37	180	-100
MMW-14D	10/19/2011	15.48	6.78	844.7	60.54	240	-50
MMW-P-01	10/24/2011	19.71	6.76	1694.0	65.01	120	-90
MMW-P-02	10/19/2011	19.78	6.93	1174.0	62.44	210	-50
MMW-P-03S	10/19/2011	20.65	6.84	1416.0	64.11	190	-90
MMW-P-03D	10/18/2011	20.70	6.87	1377.0	63.27	150	-150
MMW-P-04	10/24/2011	20.58	6.87	874.2	66.05	520	-150
MMW-P-05	10/19/2011	20.11	7.11	559.7	64.48	230	-120
MMW-P-06	10/24/2011	20.69	6.92	1169.0	63.67	160	-90
MMW-P-07	10/24/2011	19.02	6.66	1492.0	63.93	110	-60
MMW-P-08	10/24/2011	18.45	6.68	1308.0	65.30	110	-90
MMW-P-09S	10/18/2011	20.43	6.90	850.9	59.42	760	160
MMW-P-09D	10/21/2011	20.39	7.17	855.0	58.16	200	-90
MMW-P-10S	10/21/2011	18.39	6.90	592.0	67.11	110	-90
MMW-P-10D	10/17/2011	18.62	6.86	1039.0	63.42	160	-80
MMW-C-01	10/21/2011	20.48	6.92	756.5	63.52	340	-30
MMW-C-02	10/18/2011	19.86	6.82	779.9	58.42	180	80
MMW-168D	10/24/2011	18.33	6.87	1209.0	64.46	200	-100

BTOC - Below Top of Casing

ug/L - micrograms per liter

mV - millivolts