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Subject: SITE-SPECIFIC LEACHABILITY STUDY
SUMMARY REPORT
MIDLAND AREA SOILS
MID 000 724 724

Please find the attached Summary Report for the Site-Specific Leachability Study that was conducted for Midland Area Soils. The work was conducted in accordance with the Leachability Study Work Plan, submitted July 1, 2011, and approved on October 7, 2011. Data from this study was originally provided on a disk on February 29, 2012. An updated dataset is included with the attached report.

If you have any comments or questions related to the attached information, please contact me.

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MIDLAND AREA SOILS SITE-SPECIFIC LEACHABILITY STUDY SUMMARY REPORT

Submitted by:

The Dow Chemical Company

Midland, Michigan

Revised: June 1, 2012

Prepared By URS Corporation

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1.0 INTRODUCTION

Pursuant to its Part 111 Hazardous Waste Management Facility Operation License (License), The Dow Chemical Company (Dow), with oversight from the Michigan Department of Environmental Quality (MDEQ), has investigated the City of Midland area soils. Based on the Target Analyte List (TAL) screening effort completed for the Midland Area Soils project, analytical results from previous studies performed in 2005, 2006 (CH2M Hill, 2007), and 2010 (URS, 2011b) were identified above MDEQ Residential Generic Groundwater Drinking Water Protection (DW) and Groundwater Surface Water Interface Protection (GSI) criteria. These generic soil criteria are calculated based on simplified assumptions that can be evaluated on a site-specific basis. A Work Plan was submitted 1 July 2011 detailing a proposed soil sampling study to determine the level at which constituents of interest (COIs) leach from samples representative of the soils in the Midland area (URS, 2011a). The sampling activities took place November 2011. Additionally, in September 2011 hardness and pH data were obtained from select surface water bodies in the surrounding area to provide actual data in lieu of assumed data to verify that calculated cleanup criteria are protective of the GSI pathway.

The Study Area includes the Michigan Operations facility, off-site Dow-owned properties, and select adjacent surface water bodies. The data generated during this study are being used to support further evaluation of the list of constituents of interest (COI) for Midland Area Soils as described in Section 1.1.

1.1 BACKGROUND

Over 858 samples have been submitted from more than 400 locations for dioxin and furan analysis during soil sampling work in 2005, 2006, and 2010. A subset of the dioxin and furan data representing over 200 samples also includes VOCs, SVOCs, metals, pesticides, and PCBs to determine if concentrations are detectable in Midland Area Soils above generic MDEQ criteria. The existing non-dioxin and furan data were compiled and a preliminary screening evaluation was conducted according to the COI screening flow chart in Appendix A. The screening and preliminary results of the TAL were presented in the *2010 Field Pilot Characterization Plan Summary Report* that was submitted 26 August 2011 (URS, 2011b). A summary of the COI screening of analytical results is presented in Table 1. As shown in Table 1, a number of

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analytes were not detected or were detected below generic MDEQ criteria or applicable background levels, and therefore have been eliminated as COIs and excluded from the TAL. Columns D5 and D6 from Table 1 show the results of the initial screening evaluation where one or more detected concentrations exceed one or more of the MDEQ generic criteria for DW and/or GSI. Figure 1 presents the Leachability Study Process Flowchart and summarizes the steps of the leach study, including the identification of COIs, which is Step 1 of the flow chart.

The following list of COIs were identified for the leach study:

- Arsenic
- Boron
- Chromium (Hexavalent)
- Cyanide (Total)
- Fluoranthene
- Hexachlorobenzene
- Hexachlorobutadiene
- Lithium
- Methylene Chloride
- Pentachlorophenol
- Selenium
- Strontium
- Toluene
- Xylene (Total)
- Zinc

This report details the results of the soil samples collected to determine if COIs in Midland Area Soils can be expected to leach at concentrations that exceed MDEQ residential DW and GSI criteria. The process for determining if the COIs listed above should be excluded from the TAL is presented on Figure 1 as Steps 2 and 3.

1.2 CURRENT STATUS OF LEACH TESTING SCREENING EFFORT

The final COI list for the leachability study presented above was agreed upon during discussions with the MDEQ in conference calls conducted May through October 2011. Because the Work Plan and *2010 Field Pilot Characterization Plan Summary Report* were submitted before the final meeting, the final COI list differs from the lists submitted in those reports (URS, 2011b). During the final meeting on 6 October 2011, mercury, silver, benzidine and ethylene dibromide were eliminated from further consideration, as well as the six analytes the MDEQ had placed on hold pending MDEQ review (acrylonitrile, ethyl cyanide propionitrile, octachlorostyrene, 1,2,3-trimethylbenzene, methylene iodide, and thorium). Lithium was the only COI added to the final list during the 6 October 2011 meeting.

2.0 SAMPLING ACTIVITIES

The Work Plan provided the strategy and scope of work to address the key elements required to complete sampling for leach testing in the Study Area. The following section summarizes the activities that were performed in order to successfully complete sampling.

Sample collection and analysis is presented on Figure 1 as Step 2 of the Leachability Study Process Flowchart. A site location map and a site plan and vicinity map are provided as Figures 2 and 3, respectively.

2.1 WORK SUMMARY

Soil samples were collected in November 2011 from select locations and submitted for both totals analysis and leach testing for the COIs listed in Section 1.1. The soil sampling and leach testing activities were conducted in areas on or around the Michigan Operations facility where relevant default cleanup criteria for soil were exceeded in soils and are believed to be representative of the study area as a whole. These areas included:

- 1) The highest results (generally in or near the plant site),
- 2) Areas where limited data are available (generally to the southwest of the plant site), and
- 3) Areas that are representative of the areas predominantly downwind from historic releases from the plant site.

This methodology allows the total results to be correlated with results from leaching analyses. These resulting patterns identify the potential of COIs to leach to groundwater within the study area.

Furthermore, the MDEQ generic GSI protection criteria for soils used in the initial screening process are based on calculated cleanup criteria derived from conservatively assumed surface water hardness and pH data of approximately 100 mg/l and 8.2 units, respectively. In September 2011, four surface water samples were collected from the main water bodies/open drains in the study area to evaluate site-specific hardness and pH data. The surface water hardness and pH

data from representative locations were utilized to calculate facility-specific criteria when applicable.

2.2 FIELD ACTIVITIES

The following sections detail the sampling procedures that were utilized for the Midland Area Soils field activities. Samples were collected in accordance with United States Environmental Protection Agency (U.S. EPA) and MDEQ protocols as outlined in the Work Plan.

2.2.1 Soil Sampling

The biased sampling (as discussed in Section 2.1) included surface and near surface soils at designated locations. The soil sampling locations are presented on Figure 4.

Soil samples were collected in accessible locations as close as possible to the locations where the highest results from 2005, 2006 and 2010 sampling efforts were encountered. These locations correspond with the following on- and off-site sample locations: DOS-1 (i.e. DOS-DUP-1), DOS-2, DOS-3, DOS-6, DOS-8, DOS-11, DOS-23, B1-01, F1-02, O1-01, O1-03, Site1-07, 1582-2, 7734-2, 4995-2, 9672-1, and 9712-1. These locations were chosen based on the highest results from the aggregate data set, except when access was deemed not available (i.e. were blinded locations [706-1-C, 706-2-C, 5538-1, 4528-2] or where development has occurred or is anticipated to occur in the immediate area [DOS-7 and DOS-20]). In those cases, the location with the next highest value that was accessible for sampling was chosen as an alternative. Three sample locations were offset from their original locations due to minor site disturbance or development. Leach study soil samples at two of the onsite locations, P-DOS-1 and P-DOS-2 were offset from the original sampling location due to apparent recent changes to the area. The immediate area of P-DOS-1 and P-DOS-2 had new topsoil and grass cover placed since the time of the previous sampling event, so the leach study soil sample locations were offset approximately 114 ft to the southwest and 125 ft to the southeast, respectively. Leach study soil sample location P-F1-02 was offset 116 ft to the southeast due to significantly disturbed soils from apparent brush clearing or construction activities.

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Other soil sampling locations were located to the southwest (i.e. vicinity of Poseyville Road) of the City of Midland study area. These include locations along the north side of Freeman Road, east side of Poseyville Road adjacent to the No. 6 brine pond, and along north edge of the south Poseyville Road landfill access road. The remaining locations were distributed evenly throughout the area located predominantly downwind from historic waste incinerators at the Michigan Operations facility.

Soil samples were collected via an Enterprise Venture Corporation sampling tool or shovel. The soil samples were extruded, and placed into sample containers. Soil samples were free of plant material and debris before placing into sample containers. Sample locations were surveyed with a global positioning system (GPS) and referenced to NAD83 state plane Michigan North (international feet).

2.2.2 Surface Water Sampling

Four surface water samples were collected to provide site-specific data to verify calculated cleanup criteria is protective of the GSI pathway. These surface water samples were obtained from four locations (PSW-1 through PSW-4) as shown on Figure 4. Samples were obtained via grab samples directly from surface water bodies selected for sampling. Surface water samples were obtained 1 foot below water surface and further than five feet from any shoreline to ensure they were free of any sediment or vegetation. Surface water sample locations were surveyed with a global positioning system (GPS) and referenced to NAD83 state plane Michigan North (international feet).

2.2.3 Sample Collection and Analyses

Each sample was assigned a unique sample identification number consistent with the previous 2010 Dow sampling effort and current project needs. Grab was the only sample type collected. Each sample location had a unique identification that relates to the location of the sample. Each sample was uniquely identified by location designation. Sample labels were affixed to each sample at the time of collection. The label included the following information at a minimum:

- sample location designation;

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- date and time sampled;
- preservatives added (as required);
- sampler's initials; and
- required analysis.

Environmental samples were shipped using standard chain-of-custody procedures.

Environmental soil samples were analyzed for the analytes listed in Section 1.1. These analyses included select metals using United States Environmental Protection Agency ("U.S. EPA") Series 6000 and 7000 approved methods; select pesticides using U.S. EPA Method 8081A; cyanide using U.S. EPA Method 9014 or 9012A; select volatile organic compounds using U.S. EPA Method 8260B; and select semi-volatile organic compounds using U.S. EPA Method 8270. Soil samples collected for total VOC analysis were preserved in accordance with U.S. EPA Method 5035.

In order to approximate infiltration of precipitation (acidic rainwater) through potentially impacted soils, separate environmental soil samples collected were leached by the Synthetic Precipitation Leaching Procedure ("SPLP"), using U.S. EPA method 1312, and the leachate was analyzed for the appropriate constituents using the corresponding methods. These soil leach testing protocols are in accordance with the MDEQ Operational Memorandum Number 2, Attachment 2, Sampling and Analysis, Soil Leaching Methods, October 22, 2004.

To verify soil samples are representative of Midland Area Soils, samples were tested to determine physical properties. These analyses included: total organic carbon (TOC) via U.S. EPA method 9060 and grain size determination (% sand, % silt, and % clay) per American Society of Testing Methods (ASTM) D422.

Data required for calculation of GSI cleanup criteria was tested on surface water samples. The analytes included: pH utilizing field instrumentation and harness as CaCO₃ per U.S. EPA Method 130.2. Field instrumentation utilized a calibrated In-Situ[®] TROLL[®] 9500 or equivalent monitoring device.

2.3 QUALITY ASSURANCE/QUALITY CONTROL

The sampling activities included implementation of quality assurance/quality control (QA/QC) protocols such as trip blanks and matrix spike/matrix spike duplicate (MS/MSD) analyses for environmental samples. The QA/QC measures are summarized below:

- Trip Blanks
- MS/MSD (designated MS/MSD)
- Temperature blanks
- Method blanks
- Lab Control Samples
- Evaluation of Sample Surrogate Recoveries

Due to a shipping problem that caused to the original seven samples to exceed hold time for volatiles, the following leach samples were recollected on January 4, 2012: P-B-001, P-B1-01, P-Site1-07, P-M-002, P-DOS-8, P-DOS-6, and P-DOS-11. Methylene chloride, toluene, and total xylenes were analyzed in the seven replacement samples using U.S. EPA Method 8260B.

The data package is provided in Appendix B.

3.0 RESULTS AND DISCUSSION

Total soil concentration and soil leachate concentration results were used to evaluate the potential of the selected COIs (listed in Section 1.1) in Midland Area Soils to leach to groundwater at levels greater than the generic residential DW and GSI criteria. As presented in Figure 1, Step 3 of the Leachability Study Process Flowchart summarizes the procedure for evaluating the results of each COI and determining if the COI should be excluded from the TAL.

The Work Plan detailed two objectives required to be satisfied by the data:

- (1) Laboratory testing for the leachate concentrations of COIs identified for study during this investigation must achieve a reliable level of detection equivalent to or less than the relevant groundwater criteria.
- (2) Concentrations of total COIs in the soil samples should be within the range of those concentrations detected at the Midland Area Soils site.

In regards to the first objective, hexachlorobutadiene is the only COI that has SPLP non-detect reporting limits that exceed criteria. As further discussed below on a constituent-specific basis, 100% of the reporting limits for hexachlorobutadiene leachate results (0.12 ug/L) exceed the GSI criteria (0.053 ug/L).

In order to meet the second objective, the results of soil totals analysis were compared to the range of detected concentrations from previous Midland Area Soils investigations to determine if the soil leachate results were within the observed values. The previous Midland Area Soils investigations include the data sets used in the TAL screening effort documented in the 2010 Field Pilot Characterization Summary Report (URS, 2011b). Table 2 and Figure 5 show a comparison of the soil ranges. The results of this comparison are discussed below on a constituent-specific basis. Physical characteristics of the soils sampled (e.g. sand, silt and clay fractions) were measured and compared to the range of observed soil types in the Midland Area. All leach study samples are within the range of observed soil types with the exception of sample P-AA-1. This sample had roughly 7% less sand than typically observed, with a correspondingly higher silt content of 9%. This is unlikely to significantly affect results of the study.

A summary of the results of the leachate study sampling effort and comparison to criteria are shown on Table 3. Leach testing results were compared to generic residential MDEQ DW and GSI criteria to estimate the potential for soils to leach at concentrations that may cause impact to groundwater. For metals, if a background level was higher than the generic criteria, the background level was used in place of the criteria (as indicated on Table 3 for arsenic, cyanide, lithium and selenium). For zinc, the GSI facility-specific criteria used were derived using the MDEQ GSI and GSI protection criteria spreadsheet (MDEQ, 2011). The facility-specific criteria were calculated using site-specific pH and hardness data collected from nearby receiving waters and the most conservative criteria were selected. The surface water results and MDEQ calculation worksheets are provided in Appendix C).

3.1 COI Evaluations

As summarized on Figure 1, COIs are eliminated from the TAL if all total soil results are below criteria, or if the COI has total soil results greater than criteria, all of the leachate results for that COI are below criteria. COIs are considered to have the potential to leach to groundwater if co-located soil and leachate results are identified above relevant criteria. For those COIs, further evaluation is conducted to determine if the COI warrants inclusion in the TAL for the site.

For discussion purposes, the results are presented below by category (i.e., why the analyte was retained for the leach study).

Category D5: Detected $\leq 5\%$, one or more detected concentration > Generic MDEQ Part 201 GSI Criterion

Hexachlorobutadiene

The hexachlorobutadiene data set from the previous Midland Area Soils investigations includes 2005/2006 Dow On-site sampling, 2006 blinded soil sampling of properties in the community near the plant site, as well as the 2010 Dow and MDEQ sampling efforts. Soil sampling locations were distributed throughout Michigan Operations facility, along the boundary of the facility, and on properties in the adjacent community. Hexachlorobutadiene was detected in two of 227 (1%) samples. Neither detection exceeded the DW criteria; however, both exceeded the

GSI criteria (91 ug/kg). Both locations were on-site: DOS-5 (250 ug/kg) and DOS-8 (640 ug/kg). All reporting limits were suitable for evaluation against the DW criterion. Sixty percent of the soil samples had reporting limits that did not meet the GSI criterion and these samples were located both on- and off-site. With the exception of the northeast corner near the facility boundary, many of the samples with reporting limits above the GSI criterion were near other samples with acceptable reporting limits. This analyte was retained because of the high percentage of reporting limits and two detections above the GSI criterion.

The range of hexachlorobutadiene results in soil from the leachate study fall within the range of results from previous Midland Area Soils investigations, as shown in Figure 5 (and listed in Table 2). Hexachlorobutadiene is detected in a single (4%) leachate study soil sample and not detected in the leachate samples. All of the soil and leachate reporting limits are below the DW criterion and all of the soil reporting limits are below the GSI criterion. All of the non-detect reporting limits for the leachate samples exceed the GSI criteria due to the limitations of the analytical method. The location of the single detected soil result for hexachlorobutadiene (P-DOS-1) is on the plant site. Soil sample locations in the northeast corner near the facility boundary with reporting limits above the GSI criterion were re-occupied and acceptable reporting limits are achieved in this study. Based on the Leachability Study Process outlined in Figure 1, hexachlorobutadiene cannot be excluded as a COI solely on the results of the leach testing, so additional evaluation is required to determine if it warrants inclusion in the TAL. The following lines of evidence are considered for hexachlorobutadiene:

1. No detected results or reporting limits exceed the DW criterion.
2. Two historical soil samples and a single leach study sample detected hexachlorobutadiene out of over two hundred sampling locations;
3. Many of the samples with reporting limits above the GSI criterion were near other samples with acceptable reporting limits; and
4. Where paired samples with acceptable reporting limits were not available, the leach study collected additional samples (located in the northeast corner of the facility) and acceptable reporting limits are achieved in this study.

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Based on these lines of evidence, hexachlorobutadiene does not warrant being included in the TAL, as it does not exceed GSI criteria off-site. No further consideration of hexachlorobutadiene is necessary.

Category D6: Detected >5%, one or more detected concentration > Generic MDEQ Part 201 DW Criterion

Arsenic

Two hundred twenty-seven soil samples made up the previous Midland Area Soils investigations arsenic dataset. These samples were tested in the 2005/2006 Dow On-site sampling, 2006 blinded soil sampling of properties in the community near the plant site, as well as the 2010 Dow and MDEQ sampling efforts. Soil sampling locations were distributed throughout the Michigan Operations facility, along the boundary of the facility, and on properties in the adjacent community. Arsenic was detected in 99% of the 227 samples. Roughly one third (approx 75 samples) of the soil samples exceeded both DW and GSI criteria. The Michigan State Background (5,800 ug/kg) and the regional background screening level (11,200 ug/kg) are higher than the DW and GSI generic screening criteria. Pursuant to R 299.5750(B), background may be substituted if it is higher than the calculated cleanup criteria. Therefore, the criteria used for comparison for Arsenic is 11,200 ug/kg. Arsenic was detected above the regional background screening level in 16 samples (7%). Arsenic was retained for this study because of the 7% of samples exceeding the regional background screening level for DW and GSI criteria.

The range of arsenic results from the leachate study are within the range of results from previous Midland Area Soils investigations. Arsenic is detected in 100% of the soil and leachate samples, as shown on Figure 6. Two of 28 (7%) soil results exceed the regional background screening level. Figures 7 and 8 present the association between the concentration of arsenic in soil and SPLP leachate). Both locations (P-DOS-1 and P-DOS-8) have exceedances of criteria in both media, indicating a leaching potential for arsenic. However, these two locations are on-site.

Site-specific Kd values range from roughly 158 to over 2,000. The generic Kd value used to calculate Cleanup Criteria is 29, indicating soils in the Midland Area leach roughly 80 to 99 percent less than the generic assumption.

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Based on the Leachability Study Process outlined in Figure 1, arsenic cannot be eliminated solely on the results of the leach testing, so additional evaluation is needed to determine if it warrants inclusion in the TAL. The following lines of evidence are considered for arsenic:

1. Groundwater to the southwest of the Michigan Operations Facility can currently be utilized for drinking water. Between 1984 and 1989, MDEQ obtained samples from residential wells and tested them for Arsenic. None of the wells detected Arsenic, with a reporting limit of 5 ug/L, which is suitably low to evaluate against both DW and GSI criteria. More recently, The Dow Chemical obtained groundwater samples from former residential wells along Freeman Drive (2004). Four residential wells were sampled, and one well detected arsenic at a concentration of 3.1 ug/L. The residential well data for both the MDEQ (1984 and 1989) and Dow (2004) sampling efforts are presented in Appendix D. All of the reporting limits for Arsenic were suitable for comparison to the DW and GSI criteria.
2. Using one hundred and ninety-one available soil samples that were tested for both dioxins and furans as well as arsenic, a linear relationship has been established, consistent with Section 5.4 of the Interim Response Activity Plan Designed to Meet Criteria (URS, 2012). Dioxins and furans in the Midland Resolution Area will be removed on residential property where the dioxin and furan concentration is greater than 250 ppt TEQ.
3. Arsenic in soils in the Midland Area leach roughly 80 to 99 percent less than the generic assumption used to calculate the Generic Cleanup Criteria.

Based on these lines of evidence, arsenic does not warrant being included in the TAL and no further consideration of arsenic for these pathways is necessary.

Lithium

The previous Midland Area Soils investigations lithium dataset includes the 2005/2006 Dow On-site sampling and 2010 Dow/MDEQ sampling effort. Lithium was detected in 100% (155) of the soil samples. 121 sample results exceeded the DW criterion and 37 exceeded GSI. The Michigan State Background (9,800 ug/kg) and the regional background screening levels (12,500

ug/kg) are higher than the DW and GSI generic screening criteria. Pursuant to R 299.5750(B), background may be substituted if it is higher than the calculated cleanup criteria. Therefore, the criteria used for comparison for lithium is 12,500 ug/kg. During the 6 October 2011 discussion with MDEQ, lithium was retained because eight samples exceeded the regional background screening level of 12,500 ug/kg.

The range of lithium results in soil from the leachate study fall within the range of results from previous Midland Area Soils investigations, as shown in Figure 5 (and listed in Table 2). Lithium is detected in 100% (28) of leachate study soil samples and in 43% (12/28) of the leachate samples, as shown on Figure 9. Only two of the total soil samples exceed the regional background screening level. These two locations are on-site to the west side of the facility at P-AA-1 (14,000 ug/kg) and P-BB-1 (16,000 ug/kg). There are no detected concentrations in leachate that exceed the GSI or DW criteria. Furthermore, Figures 10 and 11 present the positive association between the concentration of lithium in soil and SPLP leachate (i.e., as soil concentrations increase, leachate concentrations increase). The relationship between these results indicates that the range of lithium in Midland area soils will not produce sufficient levels of lithium in groundwater that exceed the DW or GSI criteria. Site-specific Kd values range from roughly 120 to over 2,000. The generic Kd value used to calculate Cleanup Criteria is not specified for lithium. If soil Cleanup Criteria are calculated from groundwater Cleanup Criteria (using site-specific Kd values), the Generic Cleanup Criteria are roughly 80 to 99 percent lower than site-specific calculated values. Based on the Leachability Study Process outlined in Figure 1, no SPLP leachate was detected above the DW or GSI criteria, and lithium is eliminated as a COI.

Category D6: Detected > 5%, one or more detected concentration > Generic MDEQ Part 201 GSI Criterion

Lithium was also screened into this subcategory; however, it was discussed in the subcategory above.

Fluoranthene

Two hundred twenty-seven soil samples made up the previous Midland Area Soils investigations fluoranthene dataset. These samples were tested in the 2005/2006 Dow On-site sampling, 2006 blinded soil sampling of properties in the community near the plant site, as well as the 2010 Dow and MDEQ sampling efforts. These soil samples are broadly distributed on and directly outside the Michigan Operations facility as well as within the surrounding community. Fluoranthene was detected in 82% (186 samples) of 227 total samples. No detected concentrations exceeded the DW criterion. Two samples exceeded the GSI criterion of 5,500 ug/kg. The 2 sample locations were off-site at O1_01_6-1'_12/18/2012_TDF (8,816 ug/kg) and blinded sample location 706-1-C (16,100 ug/kg). The sample from Site O is located in an area of known impacts from PAHs that are from another source. A work plan to further evaluate this area was submitted under the H-2 Compliance Schedule on 30 September 2010. Sample 706-1-C is a blinded sample location that yielded detections of a number of organic compounds suggesting impacts from a source other than aerial deposition.

Fluoranthene is detected in 79% (22 samples) of the leachate study soil samples and is detected in the range of fluoranthene soil results from previous Midland Area Soils investigations. None of the detected soil concentrations exceeded either the DW or GSI criteria. The reporting limits were sufficiently low to evaluate non-detected results against the groundwater residential criteria. Based on these results, the DW and GSI criteria are not exceeded for fluoranthene as a result of an aerial release from Dow. Based on the Leachability Study Process outlined in Figure 1, no SPLP leachate is detected above the DW or GSI criteria and fluoranthene is eliminated as a COI.

Zinc

The previous Midland Area Soils investigation zinc data set includes the 2005/2006 Dow On-site sampling, 2006 blinded soil sampling of properties in the community near the plant site, as well as the 2010 MDEQ sampling efforts. Soil sampling locations were distributed throughout the Michigan Operations facility, along the boundary of the facility, and on properties in the adjacent community. Zinc was detected in 100% of 227 total samples. Of those, the detected concentration in 17 samples exceeded the GSI criterion (120,000 ug/kg). These samples were located both on-site (11 on-site samples) and off-site (4 blinded samples from one area and 2

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samples from 1 off-site location). There were no detected concentrations that exceeded the DW criterion (2,400,000 ug/kg). The reporting limits were suitable for evaluation against both the DW and GSI criteria. Zinc has a statewide background level of 47,000 ug/kg and a regional background screening level of 139,500 ug/kg. Based on a comparison to background levels, the detected concentrations in approximately 51 samples (40%) exceed the statewide background level and 15 samples (11%) exceed the regional background screening level. Zinc was retained based on the detected concentrations in 15 samples that exceed the regional background screening level.

The range of zinc results in soil from the leachate study fell within the range of results from previous Midland Area Soils investigations, as shown in Figure 5 (and listed in Table 2). Zinc was detected in 100% of both the soil and leachate samples, as shown on Figure 12. There are no detections in soil or leachate that exceed the DW criterion. Pursuant to R 299.5750(G), a facility-specific criterion may be calculated based on facility-specific information and used if it is higher than the calculated cleanup criteria. Based on this reference, facility-specific GSI criterion for both soil (220,000 ug/kg) and leachate (220 ug/L) were calculated and utilized to evaluate the zinc results for the GSI pathway. There is a single on-site soil sample with a detected concentration that exceeds the facility-specific GSI criterion (P-DOS-8, 350,000 ug/kg) and one on-site leachate sample that exceeds the facility-specific GSI criterion (P-DOS-2, 2,300 ug/L). In the previous Midland Area Soils investigations data set, only six sample locations had detected concentrations that exceeded 220,000 ug/kg and all of these samples were located on-site.

Furthermore, Figure 13 presents the association between the concentration of zinc in soil and SPLP leachate. No direct correlation is apparent from these data. Site-specific Kd values range from roughly 150 to over 7,000 (with one extreme low outlier at P-DOS-2). The generic Kd value used to calculate Cleanup Criteria is 62, indicating soils in the Midland Area leach roughly 58 to 99 percent less than the generic assumption.

The following lines of evidence are considered for zinc:

1. 89% of historic soil data are below regional background.

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2. 96% of leachate results and 96% of soil leachate study results and 100% of non-detect reporting limits are below the GSI criteria.
3. Site-specific Kd values are higher than the generic assumptions for the calculated cleanup criteria.
4. Sample locations that exceed the regional background screening level are located within Michigan Operations, and not in the community.

Based on these lines of evidence, zinc does not warrant being included in the TAL and no further consideration is necessary.

Category D6: Detected > 5%, one or more detected concentration > Generic MDEQ Part 201 DW Criterion and no regional background values are available.

Boron

The previous Midland Area Soils investigations Boron dataset includes both Dow and MDEQ sampling in 2010. Soil sampling locations were distributed along the boundary of the Michigan Operations facility. Boron was detected 99% of 132 total samples. Of those, roughly 50 (38%) samples of detected concentrations exceeded the DW criterion (10,000 ug/kg) but there were no detected concentrations greater than GSI (100,000 ug/kg). The samples with detected concentrations that exceed the DW criterion were distributed evenly around the east and north of the facility boundary. All of the reporting limits were suitable for evaluation against both the DW and GSI criteria. Background values for boron are not currently available. Boron was retained based on the lack of a background value and the samples with detections that exceed the DW criterion.

The range of boron results in soil from the leachate study fall within the range of results from previous Midland Area Soils investigations, as shown in Figure 5 (and listed in Table 2). Boron is detected in 100% of the soil and leachate samples, as shown on Figure 14. Only two of 28 (7%) soil results exceed the DW criterion (both results are 11,000 ug/Kg). These two samples are located on-site at P-AA-1 and P-BB-4 to the west side of the facility. All remaining sample results for soil are below their respective criteria. While detected in all of the leachate samples, none of the detected concentrations exceed the DW or GSI criteria.

Figure 15 presents the positive association between the concentration of boron in soil and SPLP leachate (i.e., as soil concentrations increase, leachate concentrations increase). The relationship between these results indicates that the range of boron in Midland area soils will not produce sufficient levels of boron in groundwater that exceed the DW or GSI criteria. Site-specific K_d values range from roughly 29 to Over 200. The generic K_d value used to calculate Cleanup Criteria is not specified for boron. If soil Cleanup Criteria are calculated from groundwater Cleanup Criteria (using site-specific K_d values), the Generic Cleanup Criteria are roughly 30 to 91 percent lower than site-specific calculated values.

Based on these results, the DW and GSI criteria are not exceeded for boron as a result of an aerial release from Dow. Based on the Leachability Study Process outlined in Figure 1, while two on-site leachate study soil concentrations exceed the DW criterion, no SPLP leachate concentrations exceeded the residential DW or GSI criteria, and boron is eliminated as a COI.

Strontium

The previous Midland Area Soils investigations strontium data set includes the 2005/2006 Dow On-site sampling and the 2010 Dow and MDEQ sampling efforts. Soil sampling locations were distributed throughout the Michigan Operations facility and along the boundary of the facility. Strontium was detected in 100% of 155 total samples. Of those, the detected concentration in 12 samples (eight on-site and four off-site) exceeded the DW criterion (92,000 ug/kg). The four off-site sample locations with detected concentrations greater than the DW criterion are located at G1-02-6-1', F1-01-6-1', B1-01 6-12'', and B1-01 6-1'. There were no detected concentrations of strontium that exceeded the GSI criterion (420,000 ug/kg). The reporting limits were suitable for evaluation against both the DW and GSI criteria. Background values for strontium are currently not available. Strontium was retained based on the lack of a background value and the off-site detections that exceeded the DW criterion.

The range of strontium results in soil from the leachate study fell within the range of results from previous Midland Area Soils investigations, with a single result in the leachate study that was higher than the Midland Area Soils maximum detection, as shown in Figure 5 (and listed in Table 2). Strontium was detected in 100% of the soil and leachate samples (28 total). As shown

on Figure 16, only three (11%) of the soil samples exceeded the DW criterion. These three samples are located on-site at P-DOS-1 (110,000 ug/kg), P-DOS-6 (220,000 ug/kg), and P-DOS-8 (100,000 ug/kg). Site-specific Kd values range from roughly 116 to 10,500. Figure 17 presents the association between the concentration of strontium in soil and SPLP leachate. The relationship between these results indicates that the range of strontium in Midland area soils will not produce sufficient levels of strontium in groundwater that exceed the DW criterion. The generic Kd value used to calculate Cleanup Criteria is not specified for strontium. If soil Cleanup Criteria are calculated from groundwater Cleanup Criteria (using site-specific Kd values), the Generic Cleanup Criteria are roughly 83 to 99 percent lower than site-specific calculated values.

Based on these results, the DW and GSI criteria are not exceeded for strontium as a result of an aerial release from Dow. Based on the Leachability Study Process outlined in Figure 1, while three on-site leachate study soil concentration exceeds the GSI criterion, no SPLP leachate concentrations exceed the residential DW or GSI criteria, and strontium is eliminated as a COI.

Category D6: Detected >5%, one or more detected concentration and detection limit >

Generic MDEQ Part 201 DW Criterion

Hexachlorobenzene

The hexachlorobenzene data set from the previous Midland Area Soils investigations includes the 2005/2006 Dow On-site sampling, 2006 blinded soil sampling of properties in the community near the plant site, as well as the 2010 Dow and MDEQ sampling efforts. Soil sampling locations were distributed throughout the Michigan Operations facility, along the boundary of the facility, and on properties in the adjacent community. Hexachlorobenzene was detected in 15% (34 samples) of 227 total samples. Two sample results exceeded DW criterion (1,800 ug/kg) and four sample results exceeded the GSI criterion (350 ug/kg). All of the exceedances were on-site: DOS-3 (1,800 ug/kg); DOS-6 (720 ug/kg); DOS-5 (5,900 ug/kg); DOS-8 (32,000 ug/kg). Approximately 46% of reporting limits exceeded the GSI criterion. The majority of reporting limit exceedances occurred on- and off-site and were relatively close to other samples with acceptable reporting limits. However, approximately one-third of these sample locations (samples along the western property boundary, the furthest sample to the south,

and samples in the northeast corner) were not located close to another sample with acceptable limits. Therefore, hexachlorobenzene was retained for the leach study.

The range of hexachlorobenzene results in soil from the leachate study fall within the range of results from previous Midland Area Soils investigations, as shown in Figure 5 (and listed in Table 2). Hexachlorobenzene is detected in 7% of the leachate study soil samples and is not detected in any of the leachate samples, as shown on Figure 18. A single (4%) soil result on-site exceeds the DW criteria (P-DOS-8) and two of 28 (7%) soil results on-site exceed the GSI criteria (P-DOS-1 and P-DOS-8). All of the non-detect reporting limits for soil and leachate are below their respective criteria. Based on the Leachability Study Process outlined in Figure 1, since there are no detected leachate concentrations or reporting limits above criteria, hexachlorobenzene is eliminated as a COI.

Methylene Chloride

The methylene chloride data set from the previous Midland Area Soils investigations includes the 2005/2006 Dow On-site sampling, 2006 blinded soil sampling of properties in the community near the plant site, as well as the 2010 Dow and MDEQ sampling efforts. Soil sampling locations were distributed throughout the Michigan Operations facility, along the boundary of the facility, and on properties in the adjacent community. Methylene chloride was detected in 69% (153 samples) of 222 total samples. The detected soil concentrations in 129 samples (58%) exceeded the DW criterion (100 ug/kg). There were no exceedances of GSI criterion. The reporting limits in 47 samples (21%) exceeded the DW criterion. These locations were primarily off-site and many were not located near a sample with acceptable reporting limits. Therefore, methylene chloride was retained for the leach study.

As discussed above, methylene chloride was detected in 69% of the previous Midland Area Soils investigation samples; however, it is not detected in any of the leachate study soil samples, as shown on Table 2. Methylene chloride is detected in nine of 28 (32%) leachate samples and five (18%) of the detected leachate results exceed the DW criterion, as shown on Figure 19. However, with no corresponding detection in the associated soil samples, there is no case for leachability from Midland soils. Furthermore, all of the detected leachate results were below the

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GSI criteria and all of the non-detect reporting limits in soil and leachate were also below their respective criteria. Based on the Leachability Study Process outlined in Figure 1, since there were no detected total soil concentrations or reporting limits above criteria, methylene chloride is eliminated as a COI.

Pentachlorophenol

The pentachlorophenol data set from the previous Midland Area Soils investigations includes the 2005/2006 Dow On-site sampling, 2006 blinded soil sampling of properties in the community near the plant site, as well as the 2010 Dow and MDEQ sampling efforts. Soil sampling locations were distributed throughout the Michigan Operations facility, along the boundary of the facility, and on properties in the adjacent community. Pentachlorophenol was detected in 15% (34 samples) of 227 total samples. Eight samples had detected results that exceeded the DW criteria (22 ug/kg). Fifty-eight percent (132 samples) of samples had reporting limits that exceeded the DW criteria. No detected concentrations exceeded GSI criterion (one reporting limit exceeded the GSI criteria). The samples with reporting limit exceedances were located both on- and off-site. The off-site locations were generally not located near samples with acceptable reporting limits. Therefore, pentachlorophenol was retained for the leach study.

The range of pentachlorophenol results in soil from the leachate study fall within the range of results from previous Midland Area Soils investigations, as shown in Figure 5 (and listed in Table 2). Pentachlorophenol is detected in 14% (4 samples) of the leachate study soil samples and in a single (4%) leachate sample, as shown on Figure 20. Four of 28 (14%) soil results exceed the DW criteria and all four sample locations are on-site (P-DOS-1, P-DOS-3, P-DOS-8, and P-DOS-11). The single on-site leachate detect at P-DOS-1 exceeds both the DW and GSI criteria, indicating a leaching potential for pentachlorophenol since the total soil result at this location also exceeds the DW criteria. All of the remaining non-detect reporting limits in soil and leachate are below the GSI and DW criteria. Based on the Leachability Study Process outlined in Figure 1, pentachlorophenol cannot be excluded as a COI solely on the results of the leach testing, so additional evaluation is required to determine if it warrants inclusion in the TAL. The following lines of evidence are considered for pentachlorophenol:

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1. 96% of leachate results, 100% of soil leachate study results and 100% of non-detect reporting limits are below the GSI criteria.
2. 86% of soil leachate study results, 96% of leachate results and 100% of non-detect reporting limits are below the DW criteria.
3. The four sample locations with exceedances are on-site. All off-site sample locations are non-detect and 100% of the non-detect reporting limits are below criteria.

Based on these lines of evidence, pentachlorophenol does not warrant being included in the TAL is eliminated from additional consideration.

Category D6: Detected >5%, one or more detected concentration and detection limit > Generic MDEQ Part 201 GSI Criterion

Hexachlorobenzene was also screened into this subcategory; however, it was discussed in the subcategory above.

Total Cyanide

Two hundred and four soil samples made up the previous Midland Area Soils investigations' total cyanide dataset. These samples were tested in the 2006 blinded soil sampling of properties in the community near the plant site, as well as the 2010 Dow and MDEQ sampling efforts. Soil sampling locations were distributed along the boundary of the facility and on properties in the adjacent community. Total cyanide was detected in 86% (approx 175 samples) of 204 total samples. Of these detections, none exceeded the DW criteria but 46% (approx 94 samples) of detected concentrations (and 7% reporting limits) exceed GSI criteria (100 ug/kg). The Michigan Statewide Default Background Level for total cyanide is 380 ug/kg. Pursuant to R 299.5750(B), background may be substituted if it is higher than the calculated cleanup criteria. Therefore, the GSI criterion used for comparison for total cyanide is 380 ug/kg. Distribution of the off-site detections that exceed GSI is fairly even to the north and east of the facility boundary, therefore total cyanide was retained as a COI.

The range of cyanide results in soil from the leachate study fall within the range of results from previous Midland Area Soils investigations. Cyanide is detected in 93% of the leachate study

soil samples and in 46% of the leachate samples, as shown on Figure 21. None of the detected soil concentrations exceeded DW criterion or the Statewide Default Background Levels. The detected soil concentrations in 7 leachate samples (25%) exceeded GSI criterion (5.2 ug/L). However, with no corresponding detection in the associated soil samples, there is no case for leachability from Midland soils. Site-specific K_d values range from roughly 3 to 46. The generic K_d value used to calculate Cleanup Criteria is not specified for total cyanide. If soil Cleanup Criteria are calculated from groundwater Cleanup Criteria (using site-specific K_d values), the Generic Cleanup Criteria are in the same order of magnitude site-specific calculated values. Based on the Leachability Study Process outlined in Figure 1, because there were no detected total soil concentrations or reporting limits above criteria, total cyanide is eliminated as a COI.

Selenium

The previous Midland Area Soils investigations selenium data set includes the 2005/2006 Dow On-site sampling, 2006 blinded soil sampling of properties in the community near the plant site, as well as the 2010 Dow and MDEQ sampling efforts. Soil sampling locations were distributed throughout the Michigan Operations facility, along the boundary of the facility, and on properties in the adjacent community. Selenium was detected in approximately 75 (33%) of 227 total samples. Of those, the detected concentration in three samples exceeded the DW criterion. These three samples were all located off-site at sample location 876-1 and two blinded samples 706-1 and 706-2. The detected concentrations in 57 (25%) samples exceed the GSI criterion. The reporting limits were suitable for evaluation against the DW criterion but there are approximately 73 samples (32%) with reporting limits that exceed the GSI criterion. A comparison to the regional background screening level of 770 ug/kg demonstrated that 25 samples (11%) exceeded background but only 3% of the reporting limits exceeded. Selenium was retained based on its presence in the blinded sample data set, detected concentrations that exceeded both the DW criterion and regional specific background levels, and the high level of reporting limits that exceeded the GSI criterion.

The range of selenium results in soil from the leachate study fall within the range of results from previous Midland Area Soils investigations, as shown in Figure 5 (and listed in Table 2).

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Selenium is detected in 100% of the soil and in 7 samples (25%) of leachate samples, as shown on Figure 22. There are no detected concentrations in soil or leachate that exceed the DW criterion. Pursuant to R 299.5750(B), background may be substituted if it is higher than the calculated cleanup criteria. The regional background screening level of 770 ug/kg is higher than the GSI criterion of 400 ug/kg. Therefore, the criteria used for comparison for the GSI pathway is 770 ug/kg. When evaluated against this criterion, the detected concentration in only 1 sample (4%) is greater than exceeds the 770 ug/kg. This one exceedance is located on-site to the west side of the facility at P-AA-1. There are no exceedances of the GSI criterion for the leachate detections. Site-specific Kd values range from roughly 250 to 560. The generic Kd value used to calculate Cleanup Criteria is not specified for strontium. If soil Cleanup Criteria are calculated from groundwater Cleanup Criteria (using site-specific Kd values), the Generic Cleanup Criteria are roughly 68 to 86 percent lower than site-specific calculated values.

Based on these results, the DW and GSI criteria are not exceeded for selenium as a result of an aerial release from Dow. Based on the Leachability Study Process outlined in Figure 1, while one on-site leachate study soil concentration exceeds the GSI criterion, no leachate concentrations exceeded the residential DW or GSI criteria, and selenium is eliminated as a COI.

Toluene

The previous Midland Area Soils investigations toluene data set includes the 2005/2006 Dow On-site sampling, 2006 blinded soil sampling of properties in the community near the plant site, as well as the 2010 Dow and MDEQ sampling efforts. Soil sampling locations were distributed throughout the Michigan Operations facility, along the boundary of the facility, and on properties in the adjacent community. Toluene was detected in approximately 167 of 222 (75%) samples. Detected concentrations in only five samples exceeded the GSI criterion (5,400 ug/Kg) and no detected concentrations exceeded the DW criterion. All of the reporting limits were suitable for evaluation against both the DW and GSI criteria. The five sample locations fell both on- and off-site, including three blinded sample locations. Toluene was retained based on the exceedance of the GSI criterion in five samples, with three of those locations being blinded samples.

The range of toluene results in soil from the leachate study fall within the range of results from previous Midland Area Soils investigations, as shown in Figure 5 (and listed in Table 2). As

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shown on Figure 23, toluene is detected in two (7%) leachate study soil samples which do not exceed criteria, and detected in 21 of 28 (75%) leachate samples which do not exceed the DW criterion. Only two of the leachate samples exceeded the GSI criterion of (270 ug/L). All of the reporting limits were below the DW and GSI criteria for both soil and leachate. The two leachate results for toluene that exceed the GSI criterion are located off-site at P-B1-01 (420 ug/L) and P-M-002 (9672-1) (420 ug/L), but do not have corresponding elevated soil concentrations.

Based on these results, the DW and GSI criteria are not exceeded for toluene as a result of an aerial release from Dow. Based on the Leachability Study Process outlined in Figure 1, no leachate study soil concentrations exceed the residential DW or GSI criteria, and toluene is eliminated as a COI.

Total Xylenes

The previous Midland Area Soils investigations total xylenes data set includes the 2005/2006 Dow On-site sampling, 2006 blinded soil sampling of properties in the community near the plant site, as well as the 2010 Dow and MDEQ sampling efforts. Soil sampling locations were distributed throughout the Michigan Operations facility, along the boundary of the facility, and on properties in the adjacent community. Total xylenes was detected in approximately 53 of 222 (24%) samples. Detected concentrations in only two samples exceeded the GSI criterion (820 ug/Kg) and no detected concentrations exceeded the DW criterion. All of the reporting limits were suitable for evaluation against both the DW and GSI criteria with one exception (1 sample out of 222 total samples) that exceeded the GSI criterion. The three sample locations include one sample on-site (DOS-2) and two off-site sample locations (9672-1 and B1-01). Total xylenes was retained based on the two off-site exceedances of the GSI criterion.

The range of total xylenes results in soil from the leachate study fall within the range of results from previous Midland Area Soils investigations, as shown in Figure 5 (and listed in Table 2). Total xylenes is detected in one (4%) leachate study soil samples and detected in 6 of 28 (21%) leachate samples. The detections in the leachate study soil and leachate samples do not exceed either the DW or GSI criteria. All of the reporting limits were below the DW and GSI criteria for both soil and leachate.

Based on these results, the DW and GSI criteria are not exceeded for total xylenes as a result of an aerial release from Dow. Based on the Leachability Study Process outlined in Figure 1, no leachate study soil or leachate concentrations exceed the residential DW or GSI criteria, and total xylenes are eliminated as a COI.

Category D6: Detected > 5%, one or more detected concentration > Generic MDEQ Part 201 Criteria, and limited off-site data available for assessment against criteria.

Hexavalent Chromium

The previous Midland Area Soils investigation hexavalent chromium data set is comprised of the 2005/2006 Dow On-site sampling effort. Soil sampling locations were distributed throughout the Michigan Operations facility. Hexavalent chromium was detected three (13%) of 23 total samples. Of those, only one on-site sample result (DOS-2) exceeded the GSI criterion (3,300 ug/kg). There were no detected concentrations that exceeded the DW criterion of 33,000 ug/kg. Background values for hexavalent chromium are not currently available. Hexavalent chromium was retained based on the lack of a background value and the limited data set.

Hexavalent chromium was not detected in any of the leachate study soil samples and was detected in only one of the leachate samples. The single leachate result of 21 ug/L was detected on-site at P-DOS-8 and exceeds the GSI criterion of 11 ug/L, as shown on Figure 24. All of the other leachate results are below the DW and GSI criteria. The reporting limits for both soil and leachate samples were below their respective criteria.

Based on these results, the DW and GSI criteria are not exceeded for hexavalent chromium as a result of an aerial release from Dow. Based on the Leachability Study Process outlined in Figure 1, the leachate study soil samples were all non-detect with reporting limits that were below the DW and GSI criteria, and hexavalent chromium is eliminated as a COI.

4.0 CONCLUSION

The results of this Leachability Study have been reviewed for the constituents listed in Section 1.1. Pursuant to the Leachability Study Process outlined in Figure 1, 11 compounds were excluded from further consideration because they were not detected in either soil or SPLP leachate above the DW or GSI criteria. These include:

- Boron
- Hexavalent Chromium
- Total Cyanide
- Fluoranthene
- Hexachlorobenzene
- Lithium
- Methylene Chloride
- Selenium
- Strontium
- Toluene, and
- Total Xylenes

Additional evaluation was conducted for the remaining four (4) compounds (arsenic, hexachlorobutadiene, pentachlorophenol and zinc) to determine if the compound should be retained for the TAL. The lines of evidence presented in Section 3.0 for each of these compounds successfully demonstrate that detected concentrations of the COIs included in this study in Midland Area Soil are not leaching into area groundwater above the DW and/or GSI pathway and all of the COIs included in this study should be eliminated from additional consideration and excluded from the TAL.

5.0 REFERENCES

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MDEQ, 2011. Michigan Department of Environmental Quality Calculation of Generic Facility-Specific Part 201 Groundwater Surface Water Interface (GSI) Criteria for (G) Footnoted Hazardous Substances. Spreadsheet available on the MDEQ internet website.

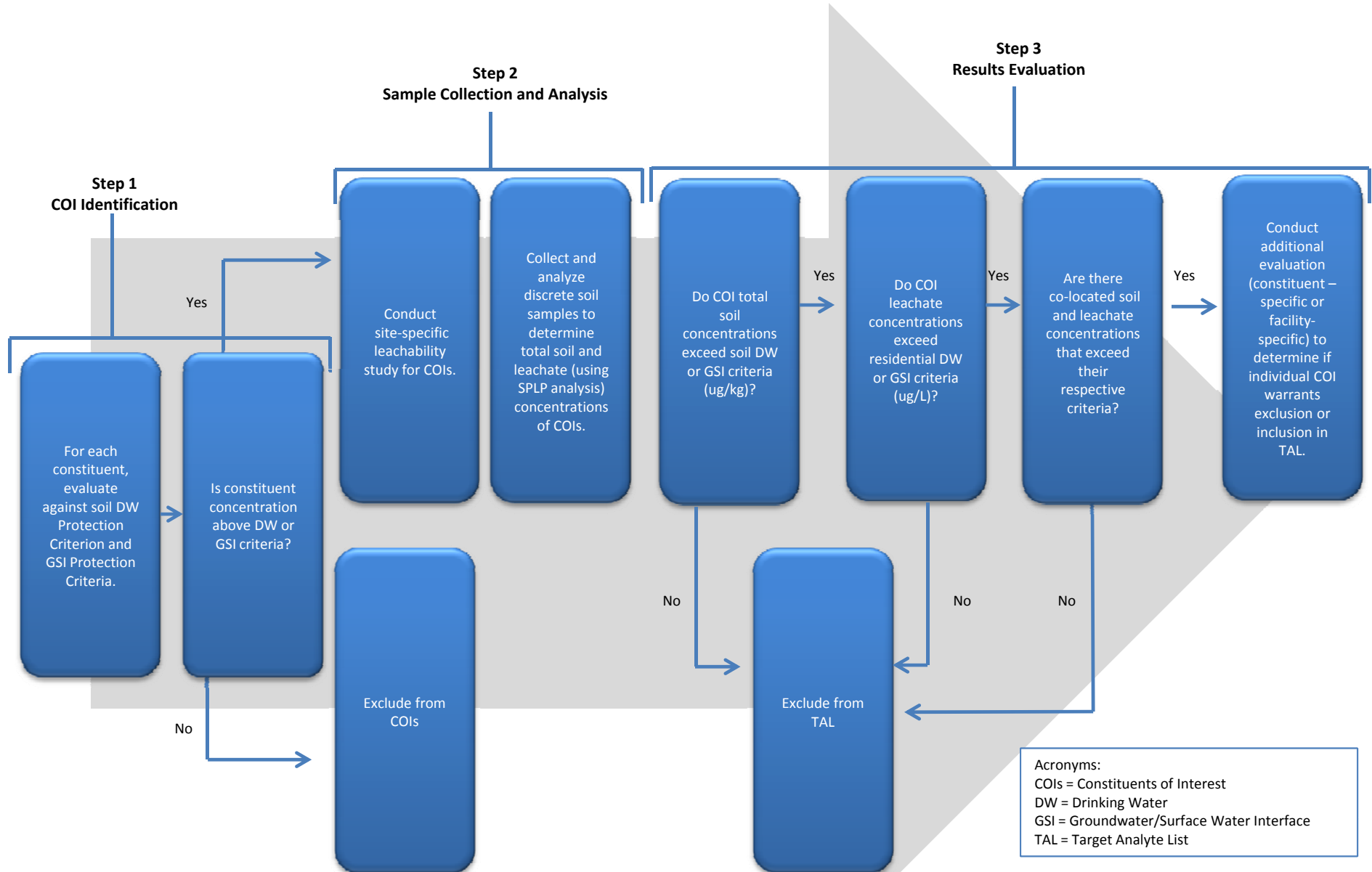
URS, 2011a. Midland Area Soils Leachability Testing Study. July 1, 2011.

URS, 2011b. 2010 Field Pilot Characterization Summary Report. August 29, 2011.

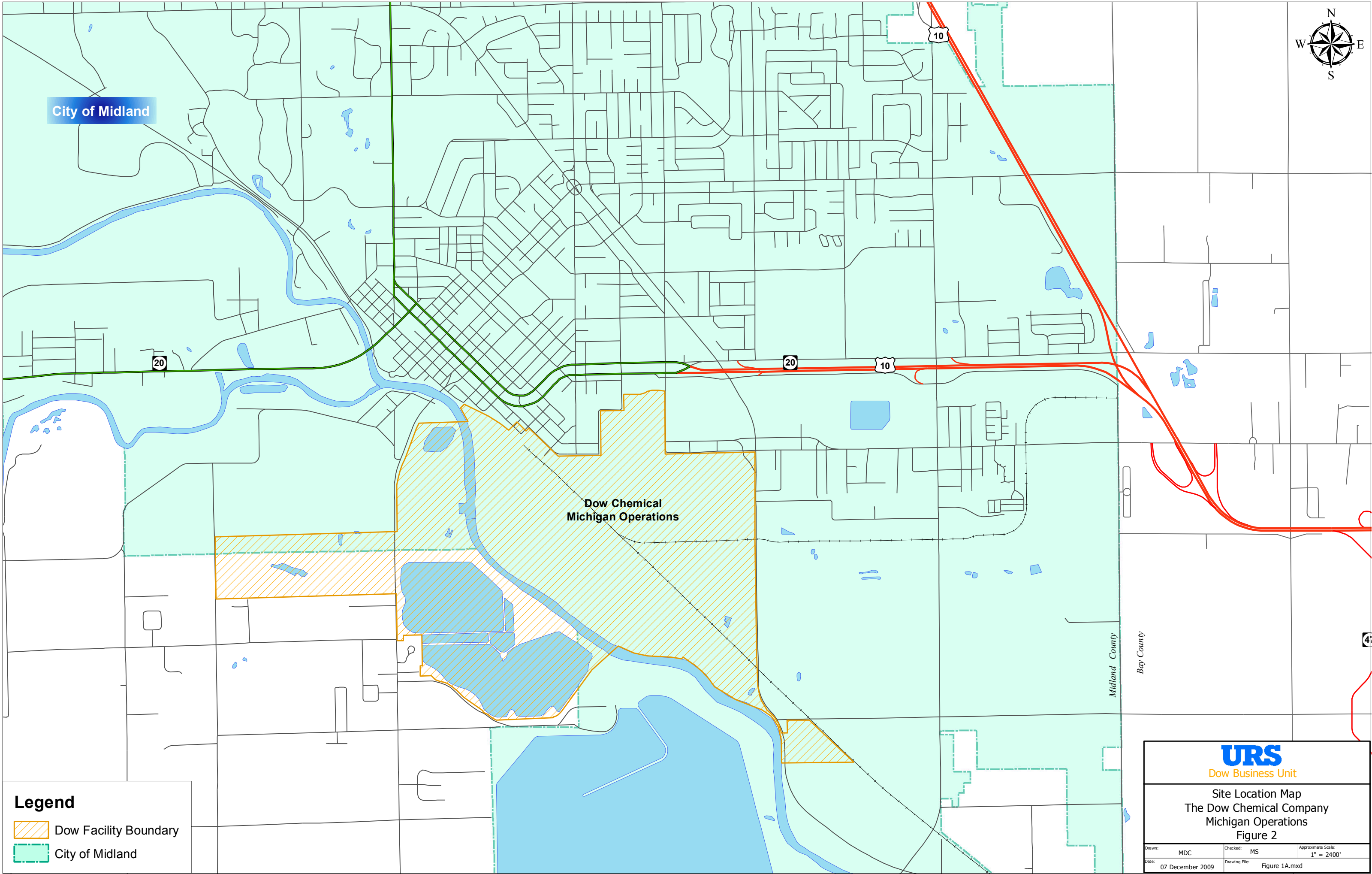
URS, 2012. Interim Response Activity Plan Designed to Meet Criteria. March 2012. Revised May 2012.

FIGURES

Figure 1. Flowchart of Leachability Study Process, The Dow Chemical Company, Michigan Operations
Midland Area Soils



Note: Leach testing results were compared to generic residential MDEQ DW and GSI criteria to estimate the potential for soils to leach at concentrations that may cause impact to groundwater. For metals, if a background level was higher than generic criteria, the background level was used in place of the criteria (as indicated on Table 3 for arsenic, cyanide, lithium and selenium). For zinc, the GSI facility-specific criteria used were derived using the MDEQ GSI and GSI protection criteria spreadsheet (MDEQ, 2011).





City of Midland

Dow Chemical
Michigan Operations

Midland County

Bay County

Legend

-  Dow Facility Boundary
-  City of Midland

URS
Dow Business Unit

Site Location Map
The Dow Chemical Company
Michigan Operations
Figure 2

| | | |
|------------------------|-----------------------------|-------------------------------|
| Drawn: MDC | Checked: MS | Approximate Scale: 1" = 2400' |
| Date: 07 December 2009 | Drawing File: Figure 1A.mxd | |



Dow Business Unit

Figure 3

| | | |
|-------------------|--------------------------------------|---------------------------------|
| Drawn: JH | Checked: PT | Approximate Scale: 1" = 950' |
| Date: 31 May 2011 | Drawing File: Site Plan Map-Vicinity | |

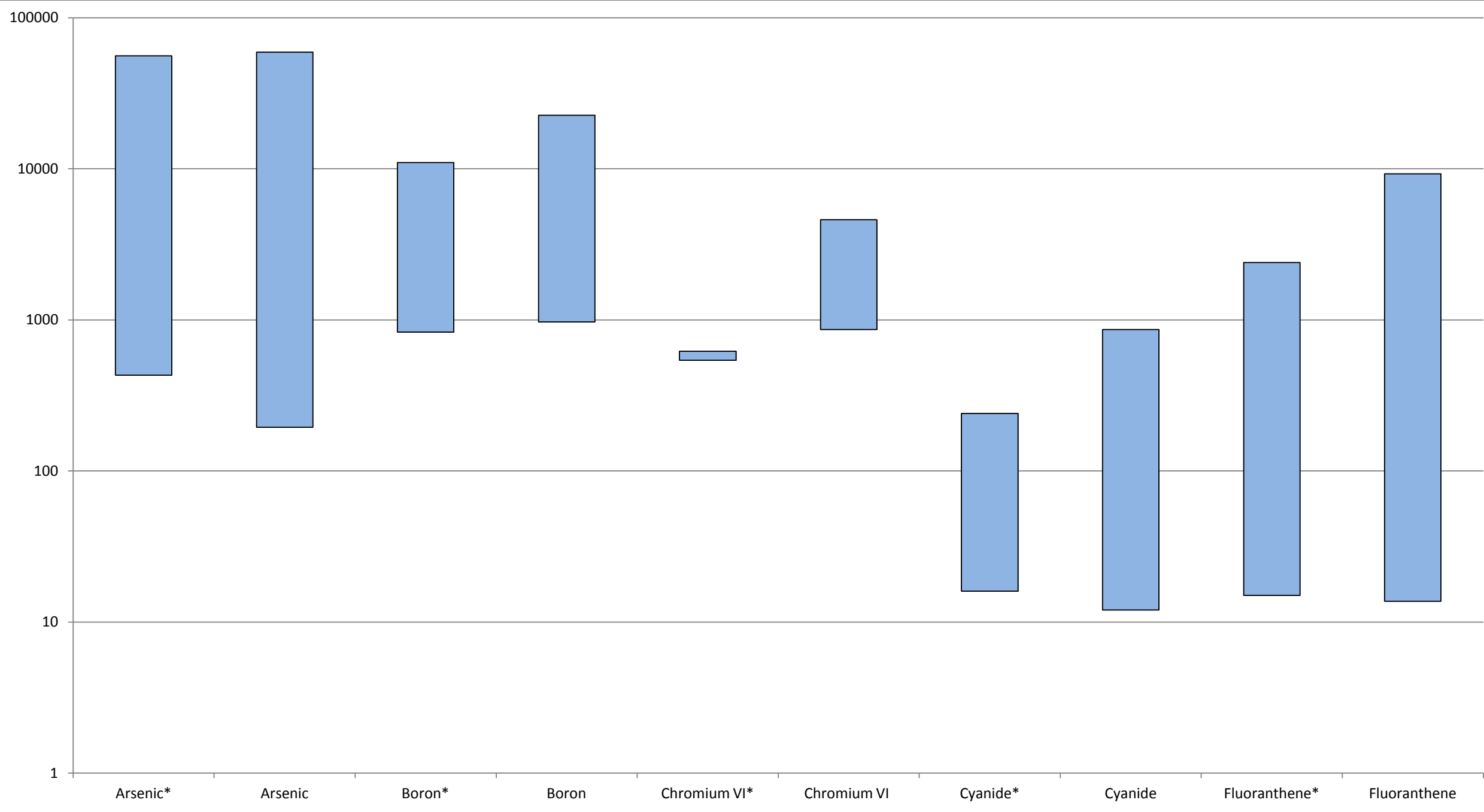


URS
Dow Business Unit

Midland Area Soils Leachability Testing Study
Sample Location Map
The Dow Chemical Company
Michigan Operations
Figure 4

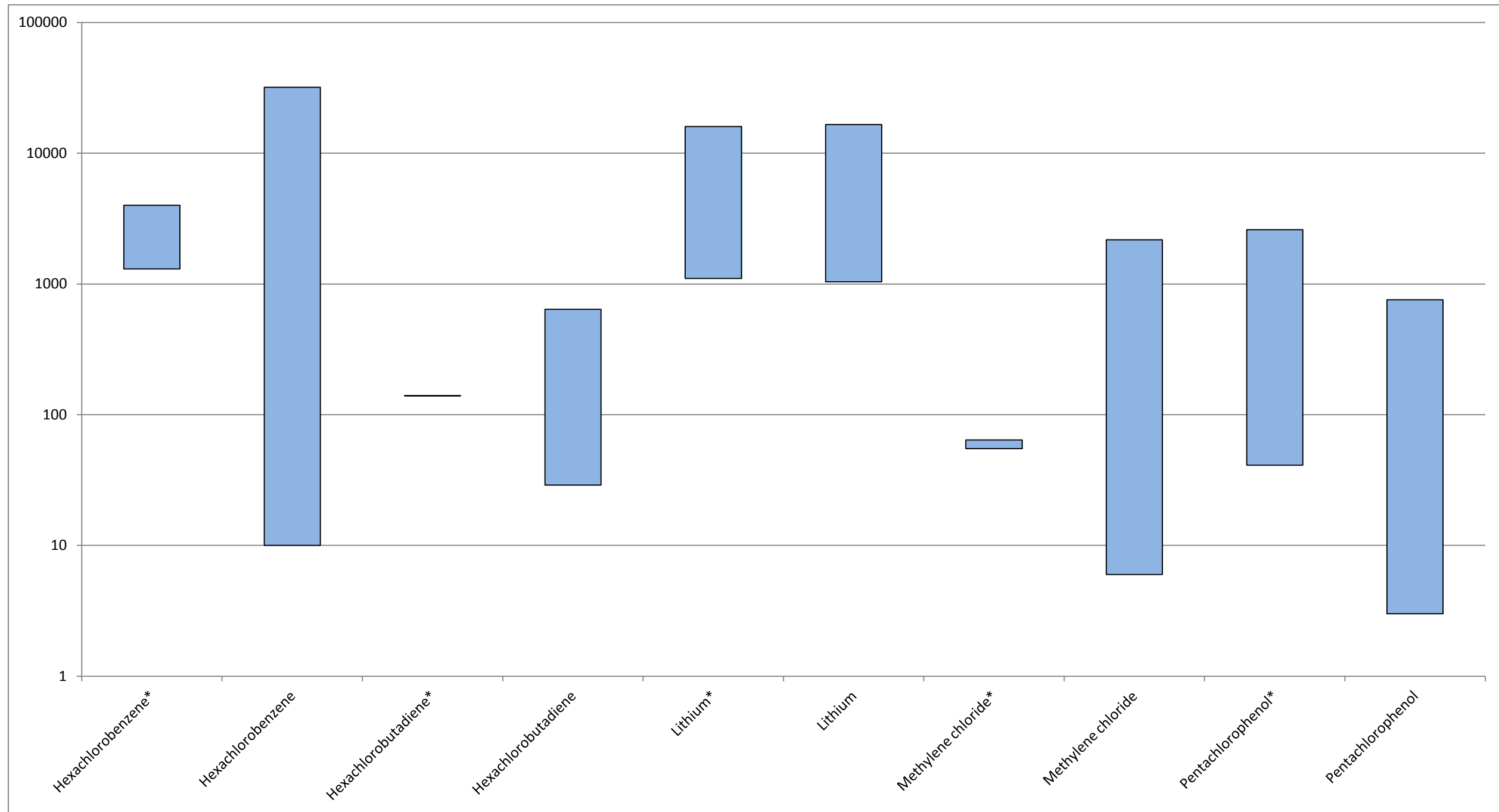
| | | |
|-------------------|--|-------------------------------|
| Drawn: JH | Checked: MC | Approximate Scale: 1" = 1215' |
| Date: 28 Feb 2012 | Drawing File: Proposed_Sample_Locations_PT | |

Figure 5
Range Comparison of Leachate Study and Midland Area Soil Results



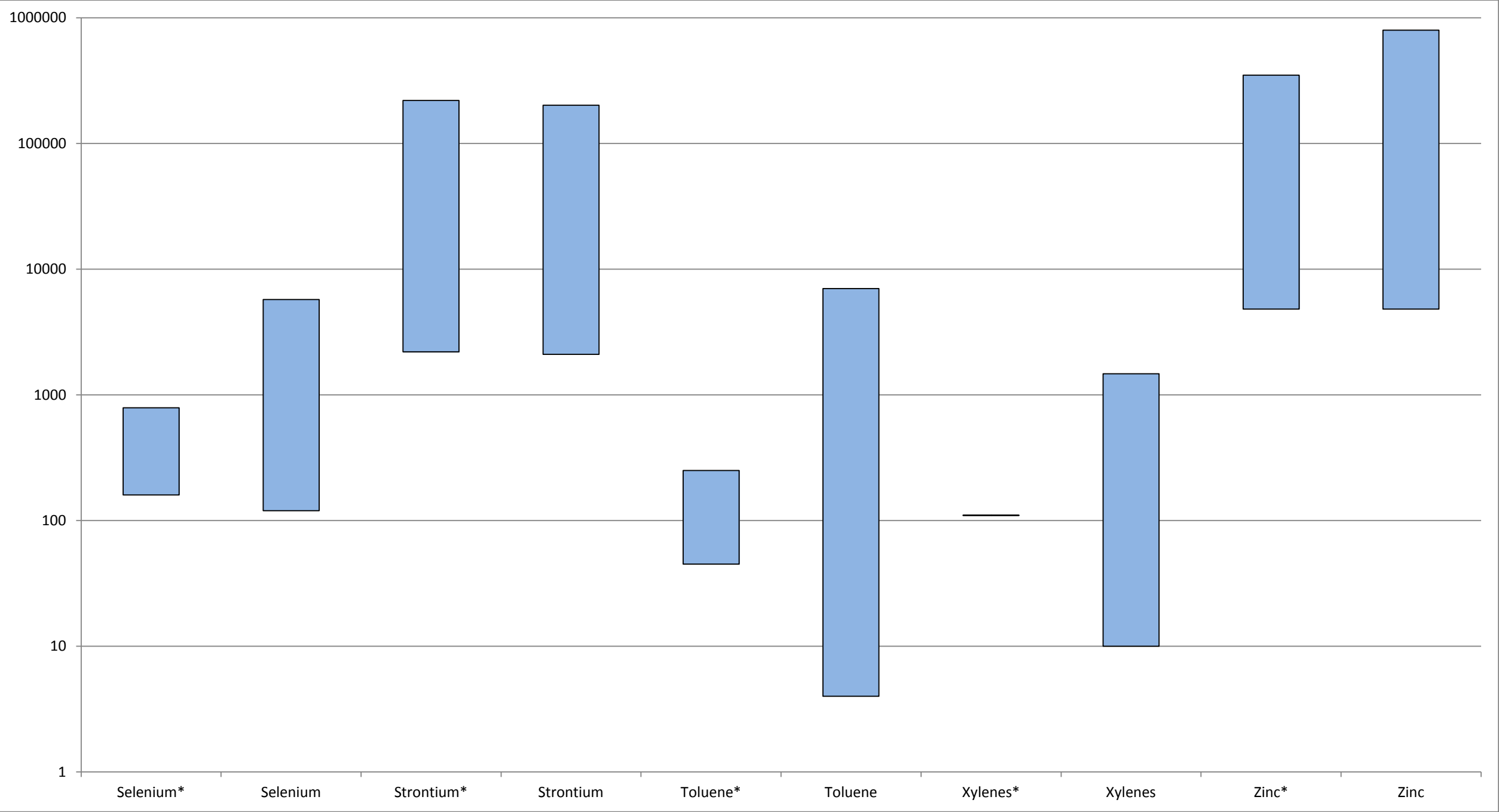
* Indicates Leachate Study Soil Data

Figure 5
Range Comparison of Leachate Study and Midland Area Soil Results



* Indicates Leachate Study Soil Data

Figure 5
Range Comparison of Leachate Study and Midland Area Soil Results



* Indicates Leachate Study Soil Data

| Location | Blinded Results in ug/kg |
|----------|--------------------------|
| 1139-1 | 3430 |
| 1139-2 | 3030 |
| 1251-1 | 5670 |
| 1251-2 | 6070 |
| 1438-1 | 3390 |
| 1438-2 | 3050 |
| 2808-1 | 1210 |
| 2808-2 | 1640 |
| 2823-1 | 4110 |
| 2823-2 | 4530 |
| 3672-1 | 5570 |
| 3672-2 | 5910 |
| 4460-1 | 7930 |
| 4460-2 | <u>11900</u> |
| 4528-1 | 2940 |
| 4528-2 | 1970 |
| 5338-1 | 4800 |
| 5338-2 | 5670 |
| 5583-1 | 3510 |
| 5583-2 | 5330 |
| 5620-1 | <u>12100</u> |
| 5620-1-C | <u>10600</u> |
| 5620-2 | <u>12600</u> |
| 5620-2-C | <u>13100</u> |
| 6676-1 | 1540 |
| 6676-2-D | 3750 |
| 706-1 | 3820 |
| 706-1-C | 2240 |
| 706-2 | 3390 |
| 706-2-C | 2930 |
| 8314-1 | 4010 |
| 8314-2 | 4450 |
| 9645-1 | 2190 |
| 9645-1-C | 1980 |
| 9645-2 | 2580 |
| 9645-2-C | 2540 |

Arsenic Soil and Leachate Results

Midland Area Soil Results (previous investigations) are presented in black font
Soil leachate results (total soil (ug/kg) and leachate (ug/L)) are presented in blue font.

Bolded Leachate Results Exceed the Generic Groundwater/Surface Water Interface (GSI) Criteria (greater than 10 ug/L)

Italicized Leachate Results Exceed the Generic Residential Drinking Water Protection Criteria (greater than 10 ug/L)

Bolded Soil Results Exceed the Regional Background Screening Level (which replaces the Generic GSI and Residential Drinking Water Protection Criteria for Soil) (greater than 11,290 ug/kg)

Underlined results are greater than Statewide Background Criteria (greater than 5,800)

Diagonal hatched results are greater than the Generic Residential Direct Contact Criterion (greater than 7,600)

Gray highlighted results are greater than the Generic Non-residential Direct Contact Criterion (greater than 37000)

- Arsenic Units in ug/kg (Over one or more criteria in this area)
- Arsenic Units in ug/kg
- Blinded Areas
- Dow Facility Boundary

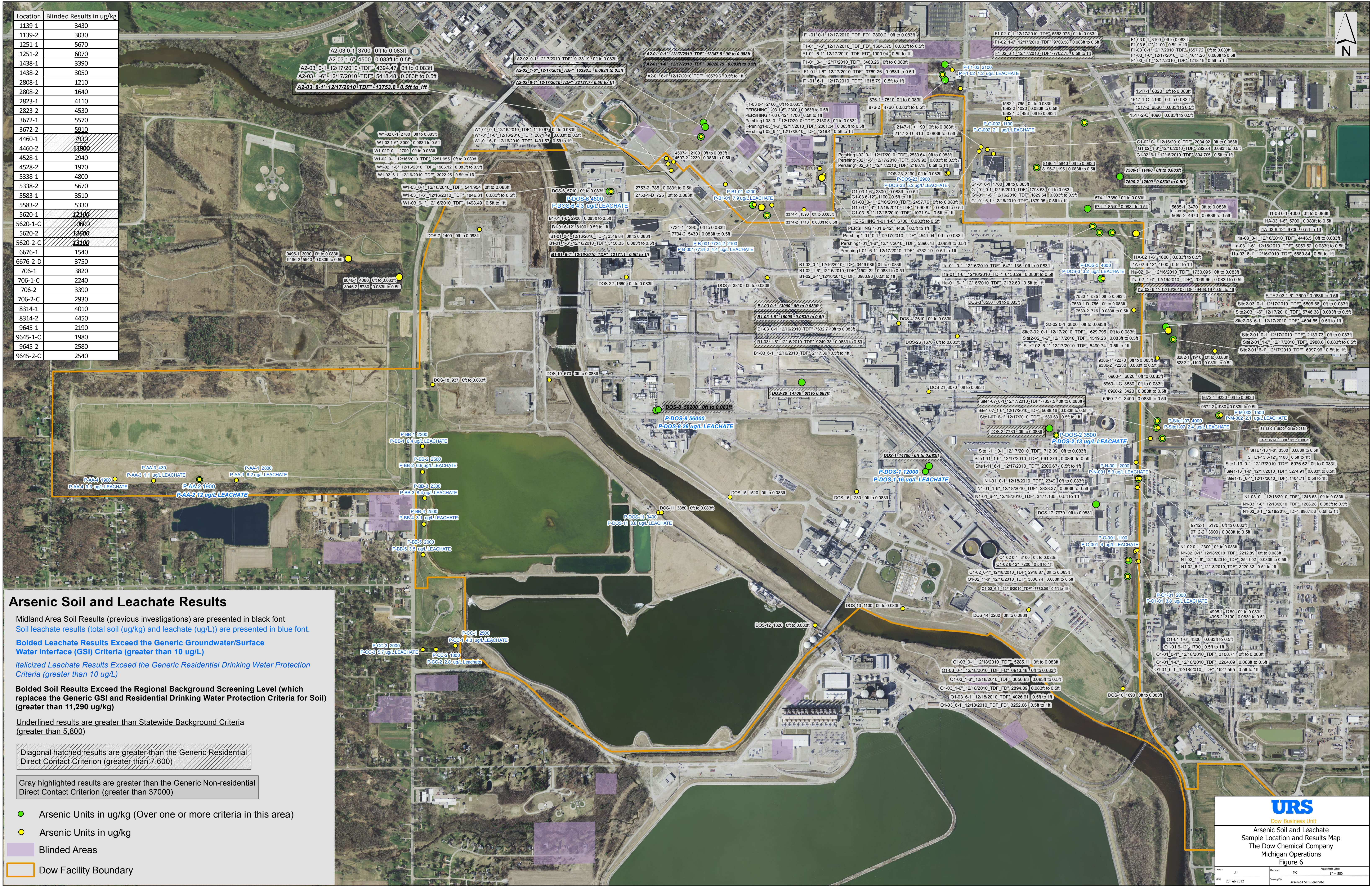


Figure 7
Arsenic Leachability Correlation Plot for Drinking Water Criteria

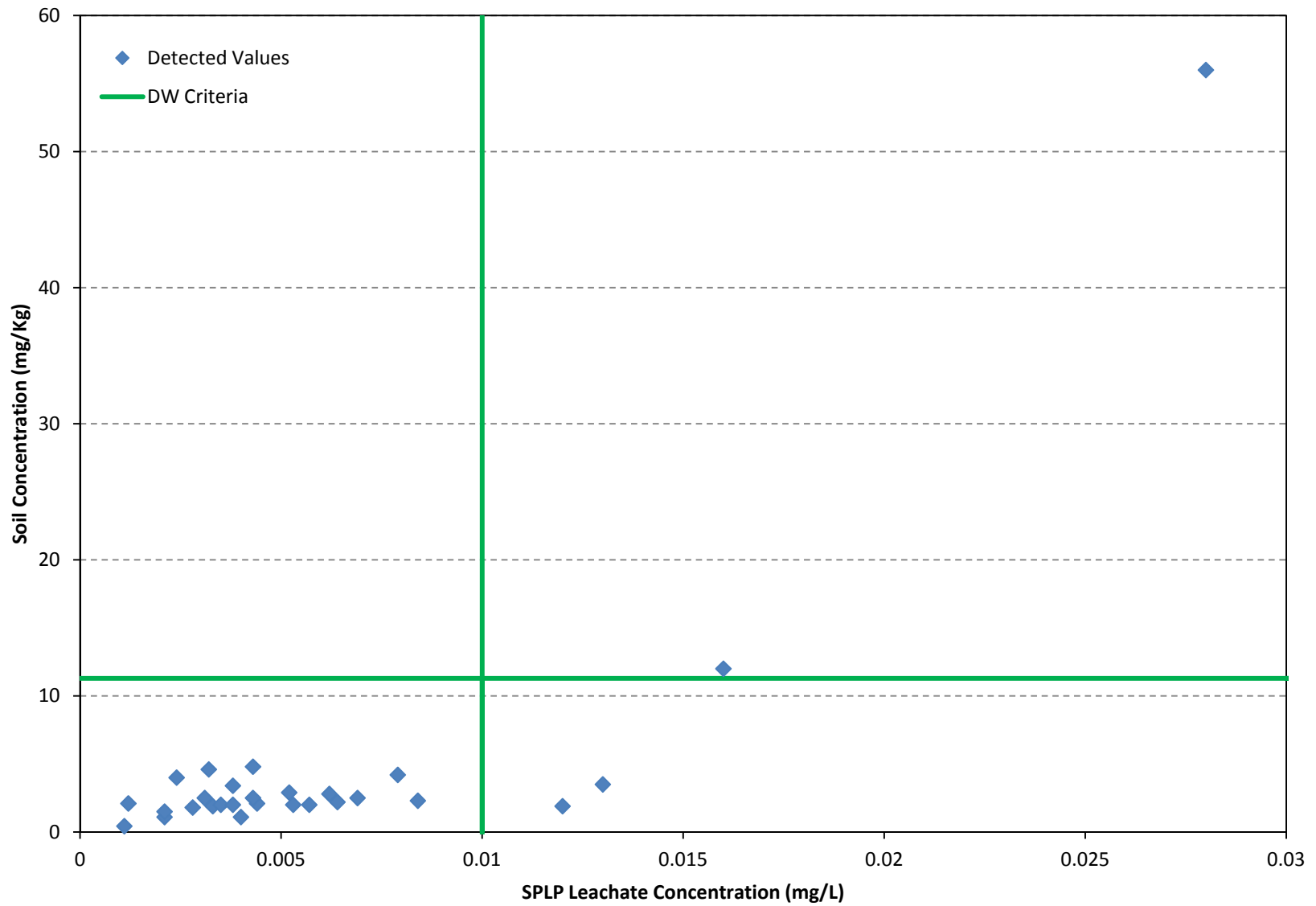
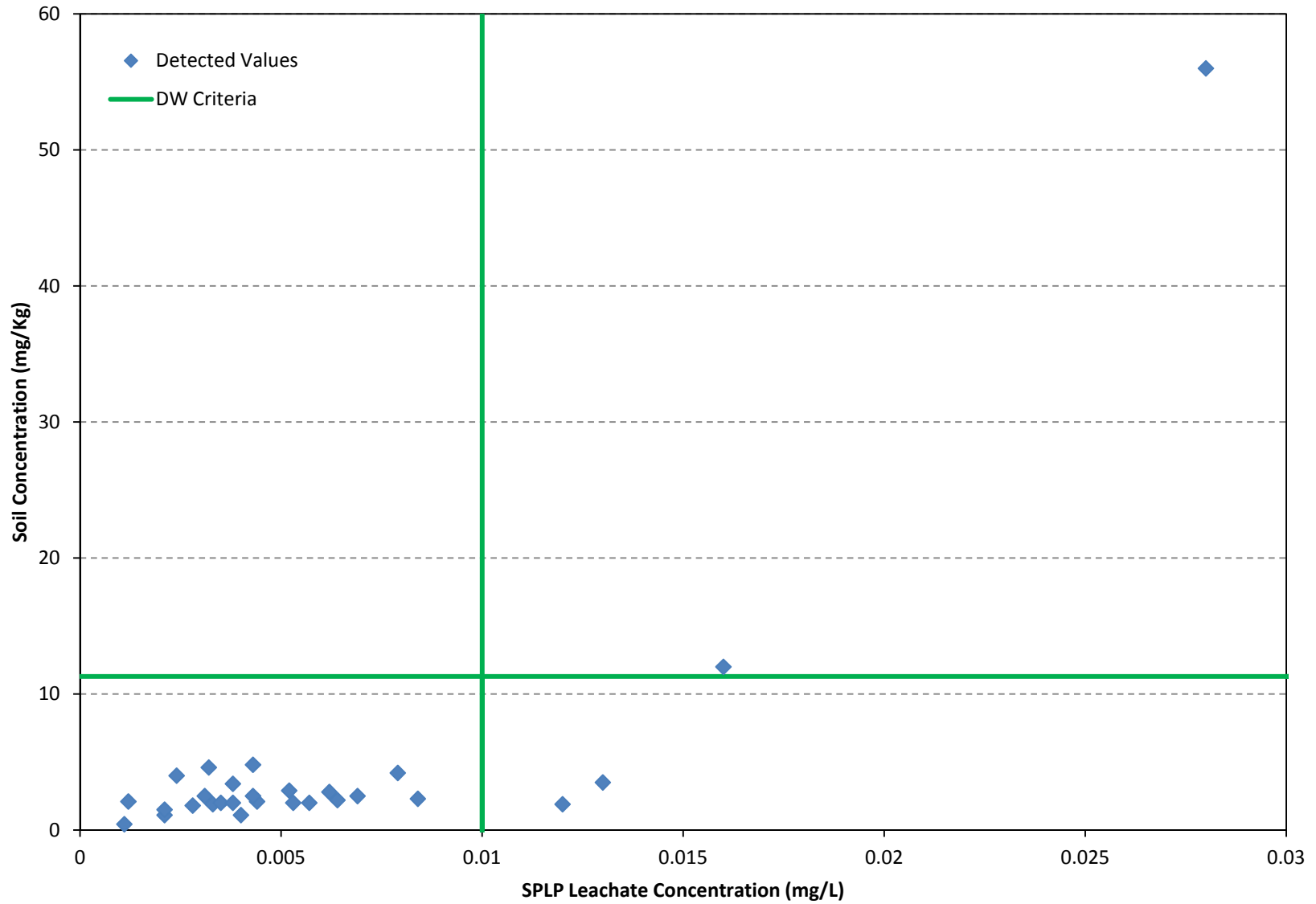


Figure 8

Arsenic Leachability Correlation Plot for Groundwater Surface Interface Criteria



No Blinded Data for Lithium

Lithium Soil and Leachate Results

Midland Area Soil Results (previous investigations) are presented in black font

Soil leachate results (total soil (ug/kg) and leachate (ug/L)) are presented in blue font.

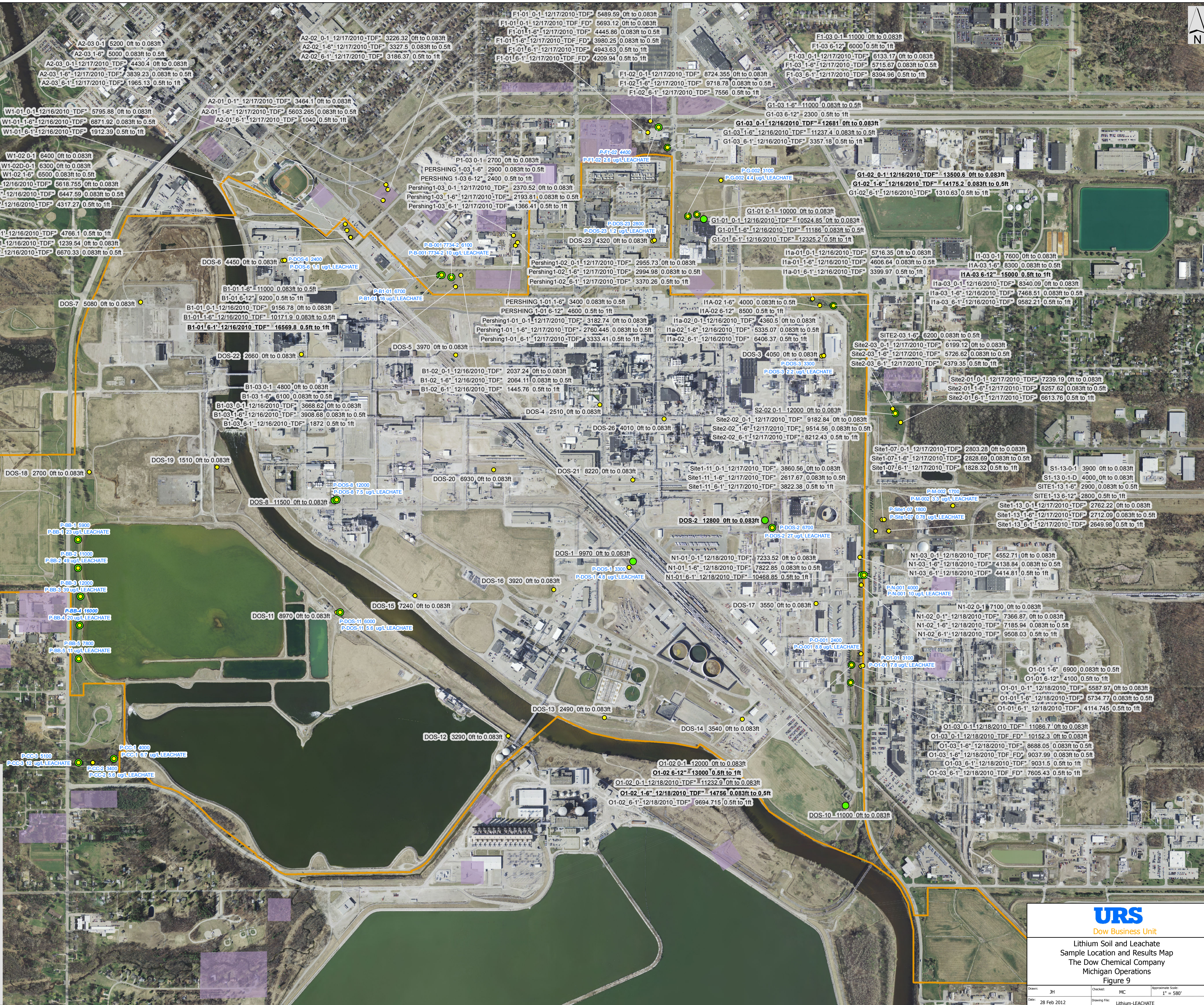
Bolded Leachate Results Exceed the Generic Groundwater/Surface Water Interface (GSI) Criteria (greater than 440 ug/L)

Italicized Leachate Results Exceed the Generic Residential Drinking Water Protection Criteria (greater than 170 ug/L)

Bolded Soil Results Exceed the Regional Background Screening (which replaces the Generic GSI and Residential Drinking Water Protection Criteria for Soil) Level (greater than 12,500 ug/kg)

Underlined results are greater than Statewide Background Criteria (greater than 9,800)

- Lithium Units in ug/kg
- Lithium Units in ug/kg (Over one or more criteria in this area)
- Blinded Areas
- Dow Facility Boundary



URS
Dow Business Unit

Lithium Soil and Leachate
Sample Location and Results Map
The Dow Chemical Company
Michigan Operations
Figure 9

| | | |
|-------------------|--------------------------------|------------------------------|
| Drawn: JH | Checked: MC | Approximate Scale: 1" = 500' |
| Date: 28 Feb 2012 | Drawing File: Lithium-LEACHATE | |

Figure 10
Lithium Leachability Correlation Plot for Drinking Water Criteria

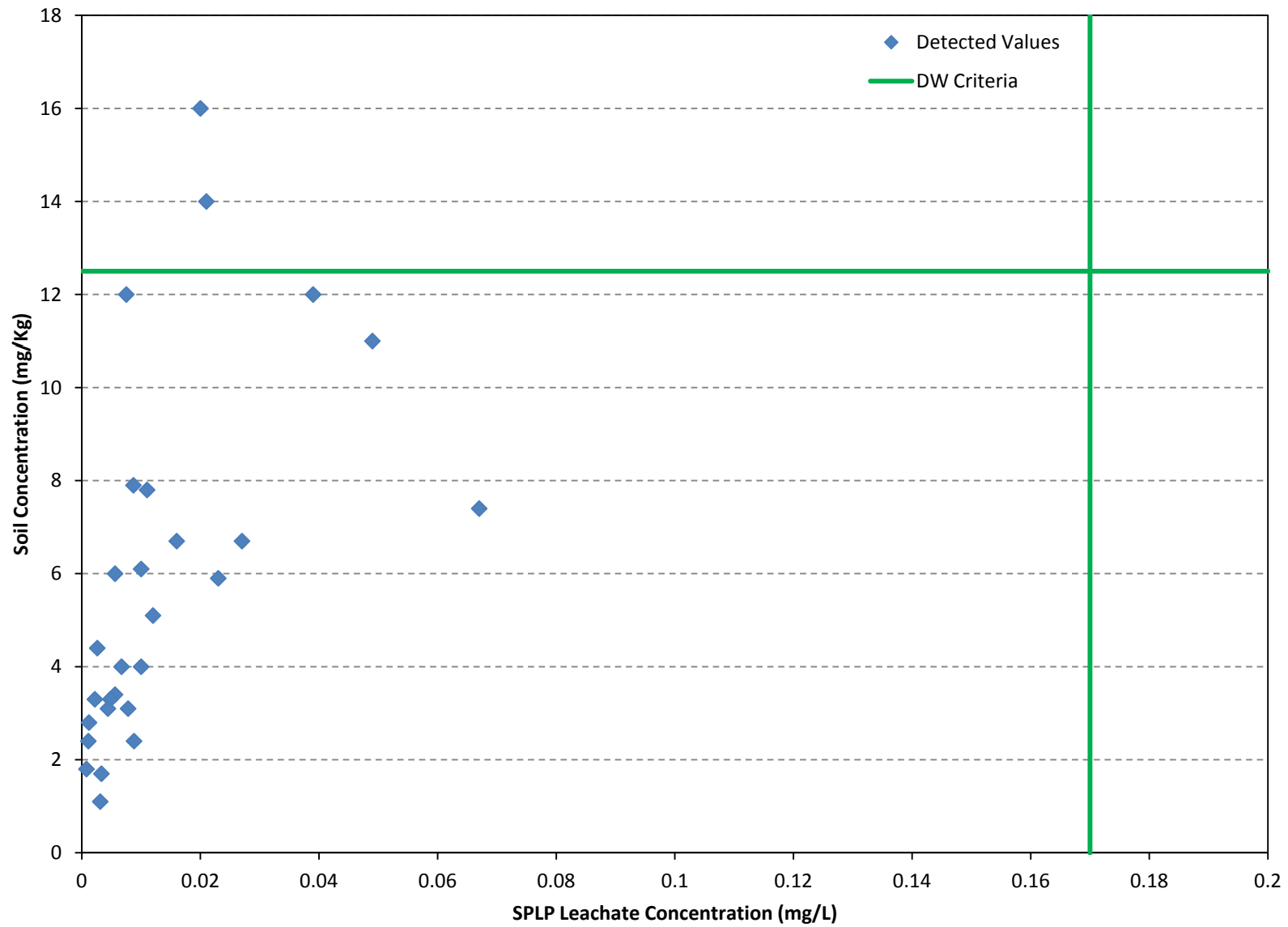
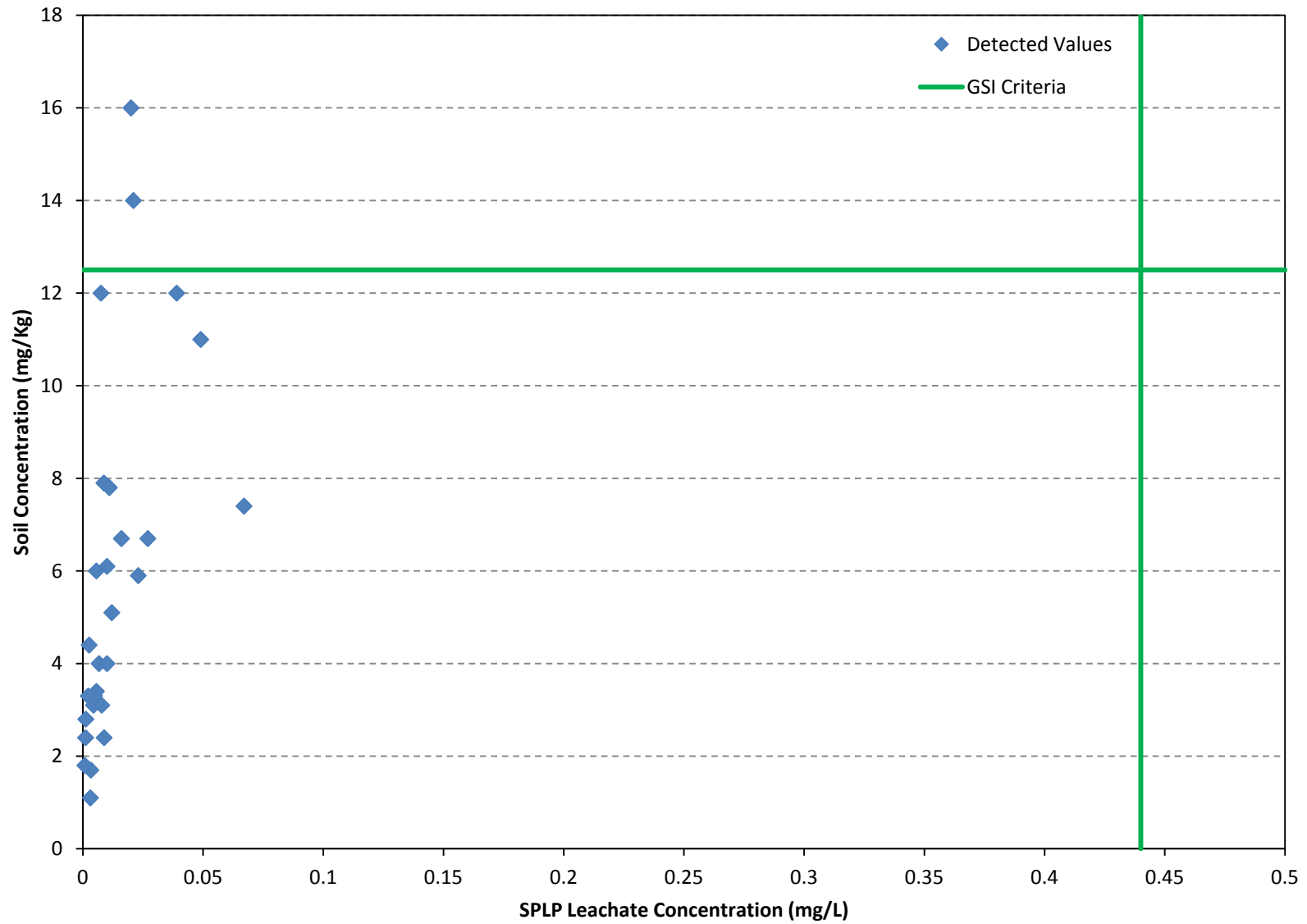


Figure 11

Lithium Leachability Correlation Plot for Groundwater Surface Water Interface Criteria



| Location | Blinded Results in ug/kg |
|----------|--------------------------|
| 1139-1 | 39300 |
| 1139-2 | 34100 |
| 1251-1 | 46000 |
| 1251-2 | 32500 |
| 1438-1 | 38600 |
| 1438-2 | 34800 |
| 2808-1 | 19500 |
| 2808-2 | 36600 |
| 2823-1 | 118000 |
| 2823-2 | 96700 |
| 3672-1 | 30800 |
| 3672-2 | 31900 |
| 4460-1 | 49100 |
| 4460-2 | 40000 |
| 4528-1 | 12800 |
| 4528-2 | 7430 |
| 5338-1 | 66700 |
| 5338-2 | 55400 |
| 5583-1 | 40600 |
| 5583-2 | 36300 |
| 5620-1 | 182000 |
| 5620-1-C | 142000 |
| 5620-2 | 162000 |
| 5620-2-C | 147000 |
| 6676-1 | 34800 |
| 6676-2-D | 34900 |
| 706-1 | 57000 |
| 706-1-C | 66900 |
| 706-2 | 58000 |
| 706-2-C | 54000 |
| 8314-1 | 43200 |
| 8314-2 | 36800 |
| 9645-1 | 21900 |
| 9645-1-C | 21100 |
| 9645-2 | 22400 |
| 9645-2-C | 22000 |

Zinc Soil and Leachate Results

Midland Area Soil Results (previous investigations) are presented in black font
Soil leachate results (total soil (ug/kg) and leachate (ug/L)) are presented in blue font.

Bolded Leachate Results Exceed the Facility - Specific Groundwater/Surface Water Interface (GSI) Criteria (greater than 220 ug/L)

Italicized Leachate Results Exceed the Generic Residential Drinking Water Protection Criteria (greater than 2,400 ug/L)

Bolded Soil Results Exceed the Facility - Specific GSI Criteria for Soil (greater than 220,000 ug/kg)

Italicized Soil Results Exceed the Generic Residential Drinking Water Protection Criteria (greater than 2,400,000 ug/kg)

Underlined results are greater than Statewide Background Criteria (greater than 47,000)

- Zinc Units in ug/kg (Over one or more criteria in this area)
- Zinc Units in ug/kg
- Blinded Areas
- Dow Facility Boundary

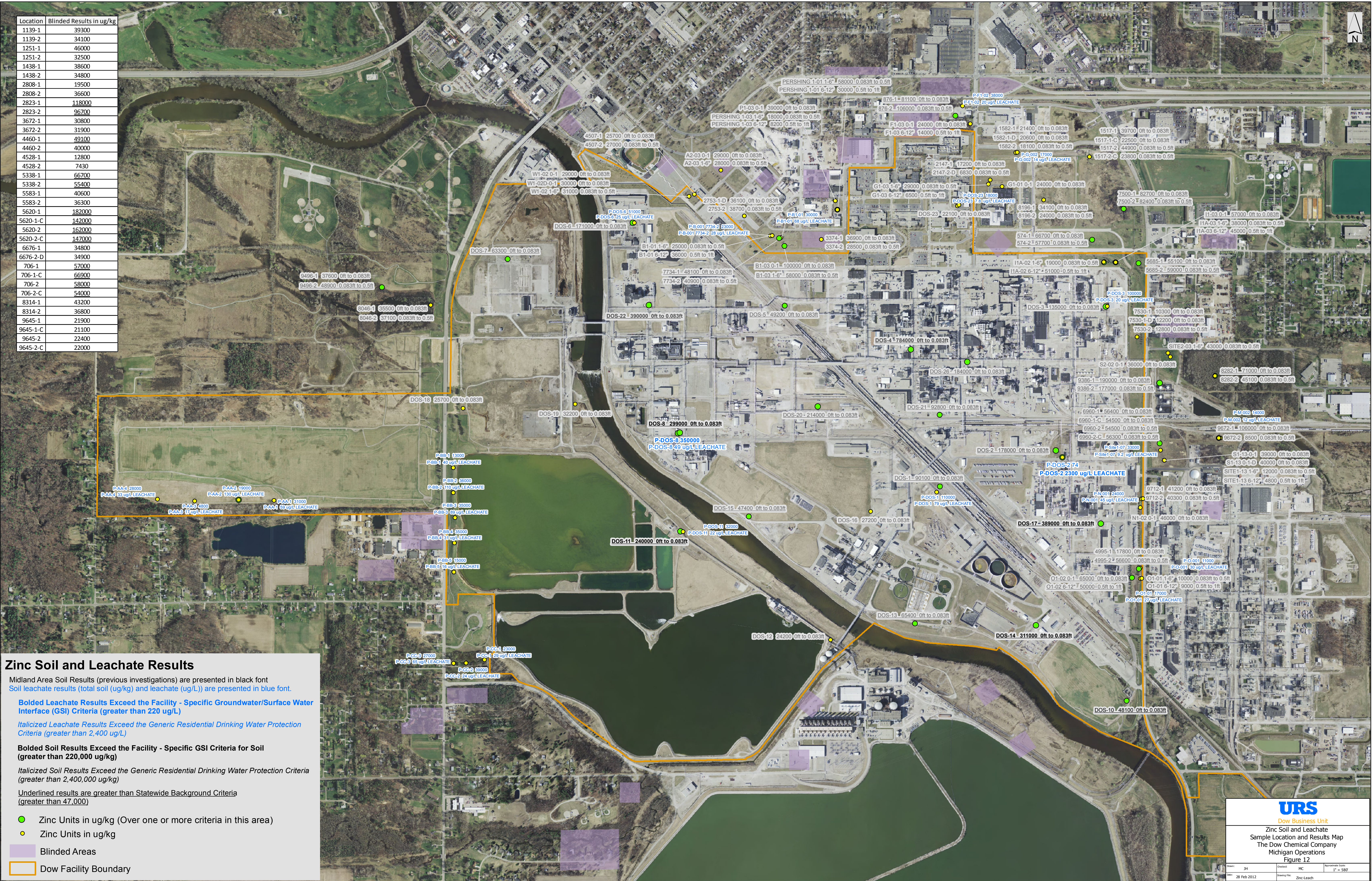
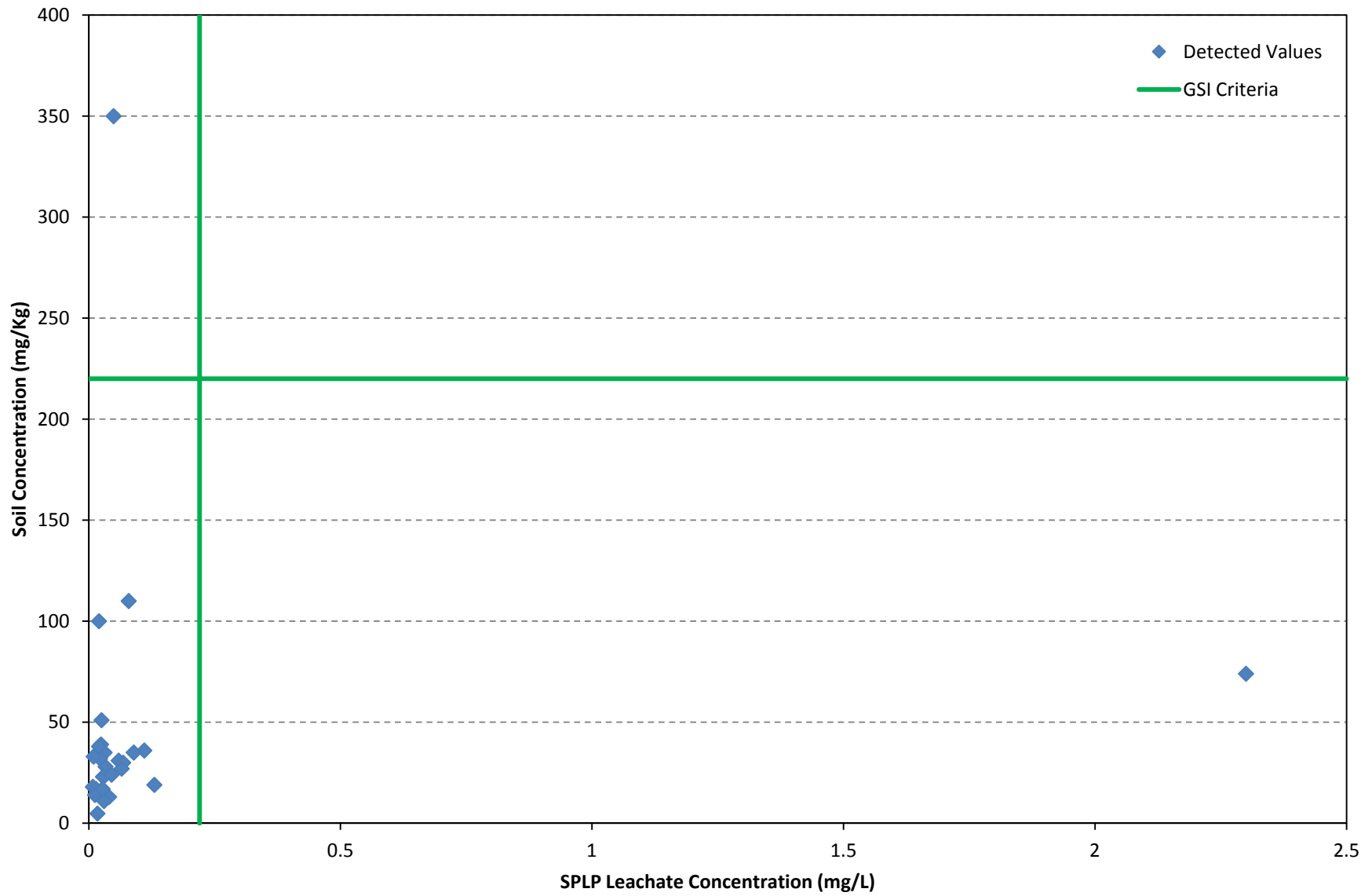


Figure 13

Zinc Leachability Correlation Plot for Groundwater Surface Water Interface Criteria



No Blinded Data for Boron

Boron Soil and Leachate Results

Midland Area Soil Results (previous investigations) are presented in black font
Soil leachate results (total soil (ug/kg) and leachate (ug/L)) are presented in blue font.

Bolded Leachate Results Exceed the Generic Groundwater/Surface Water Interface (GSI) Criteria (greater than 5,000 ug/L)

Italicized Leachate Results Exceed the Generic Residential Drinking Water Protection Criteria (greater than 500 ug/L)

Bolded Soil Results Exceed GSI Criteria for Soil (greater than 100,000 ug/kg)

Italicized Soil Results Exceed the Generic Residential Drinking Water Protection Criteria (greater than 10,000 ug/kg)

Italicized results are greater than the Generic Residential Drinking Water Protection Criterion (greater than 10,000)

- Boron Units in ug/kg (Over one or more criteria in this area)
- Boron Units in ug/kg
- Blinded Areas
- Dow Facility Boundary

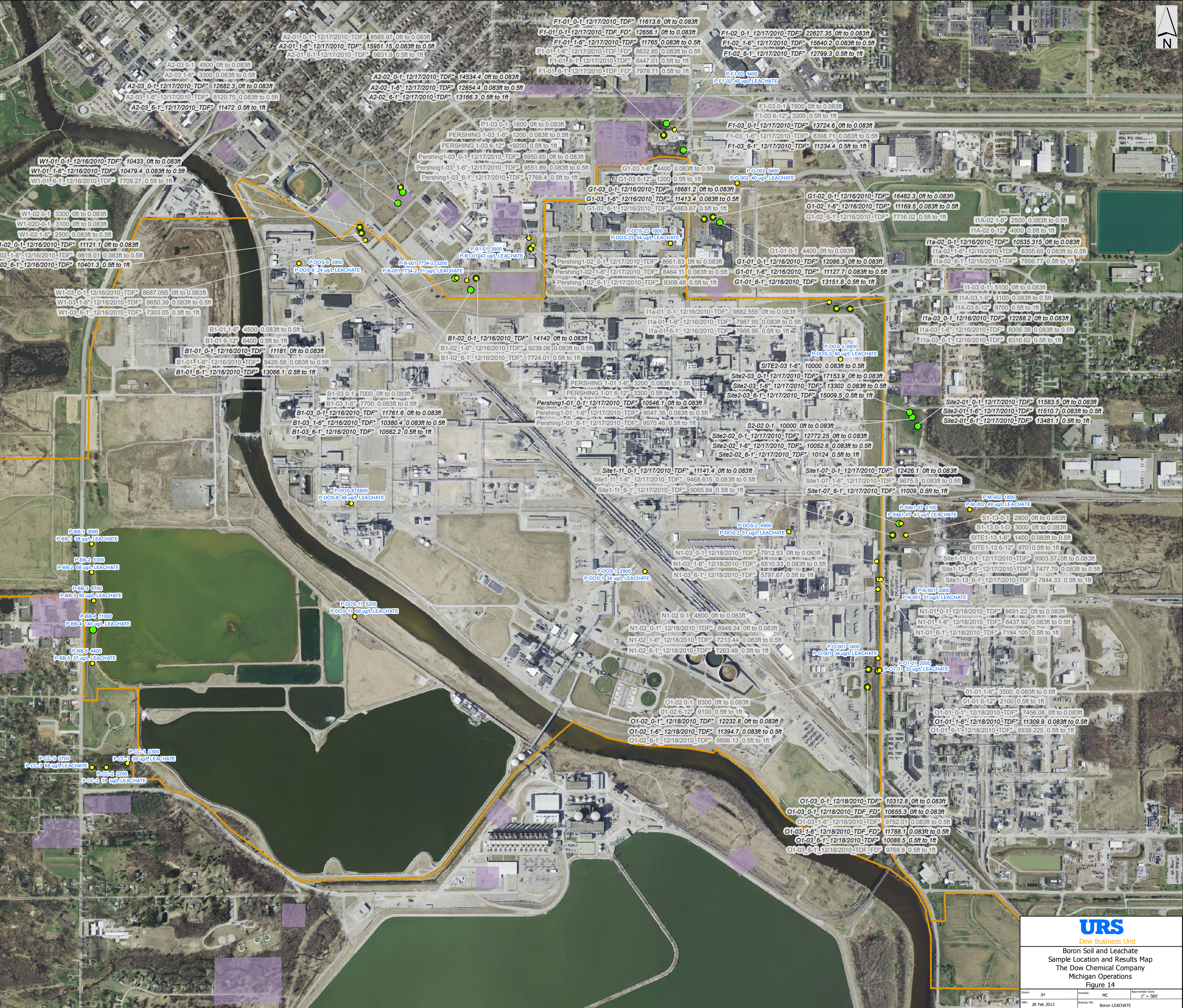
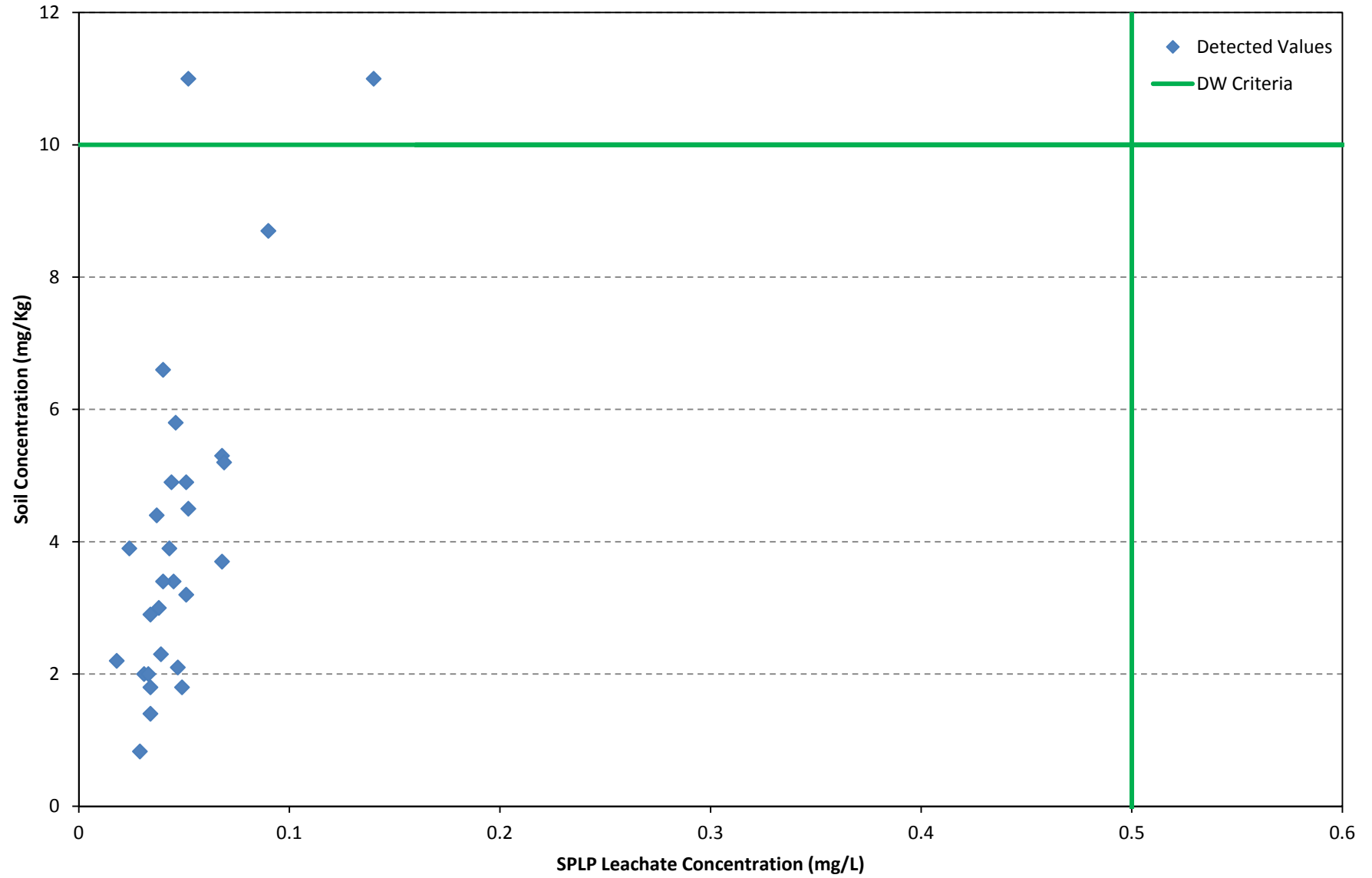


Figure 15
Boron Leachability Correlation Plot for Drinking Water Criteria



No Blinded data for Strontium

Strontium Soil and Leachate Results

Midland Area Soil Results (previous investigations) are presented in black font
Soil leachate results (total soil (ug/kg) and leachate (ug/L)) are presented in blue font.

Bolded Leachate Results Exceed the Generic Groundwater/Surface Water Interface (GSI) Criteria (greater than 21,000 ug/L)

Italicized Leachate Results Exceed the Generic Residential Drinking Water Protection Criteria (greater than 4,600 ug/L)

Bolded Soil Results Exceed GSI Criteria for Soil (greater than 420,000 ug/kg)

Italicized Soil Results Exceed the Generic Residential Drinking Water Protection Criteria (greater than 92,000 ug/kg)

● Strontium Units in ug/kg (Over one or more criteria in this area)

○ Strontium Units in ug/kg

Blinded Areas

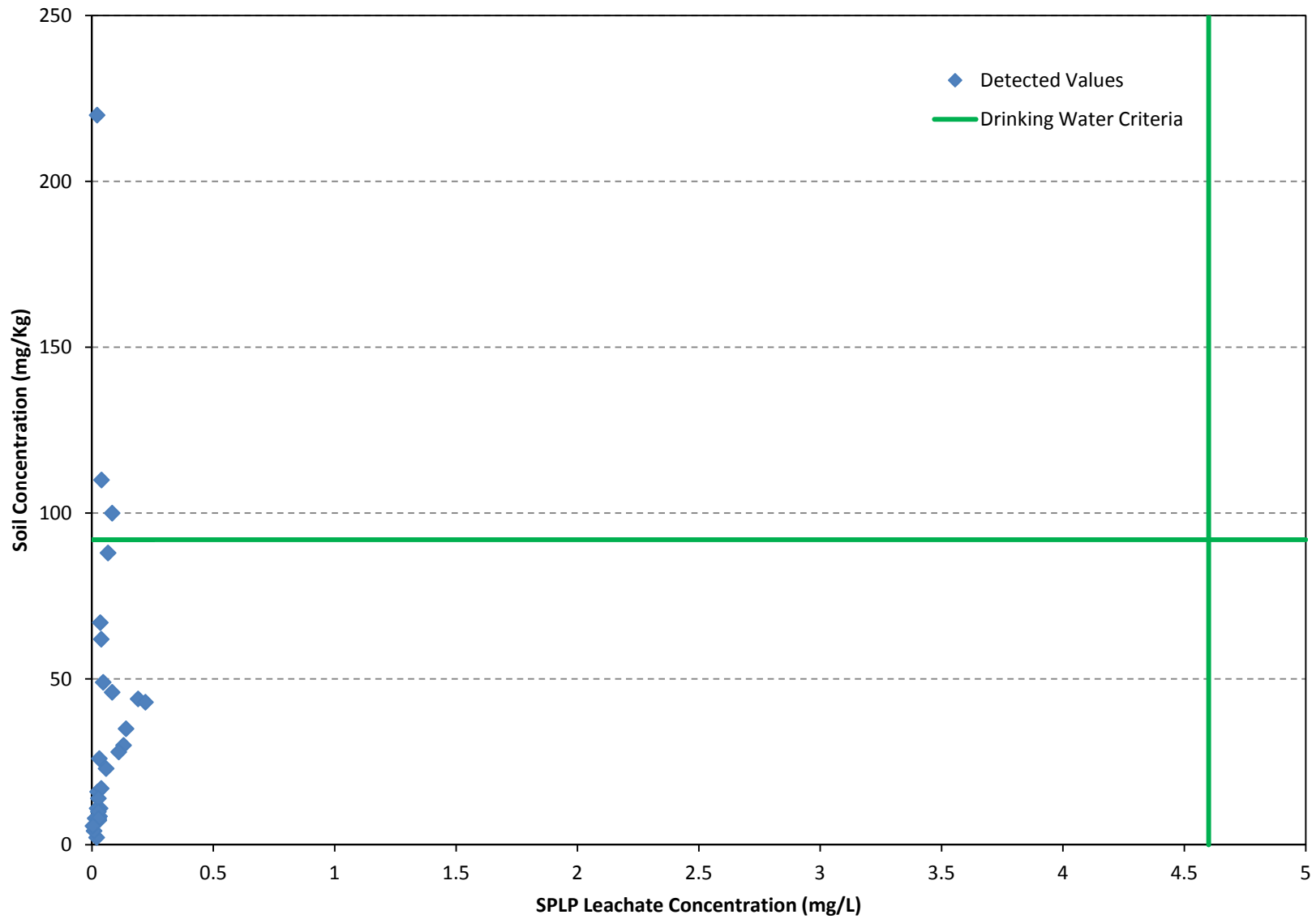
Dow Facility Boundary

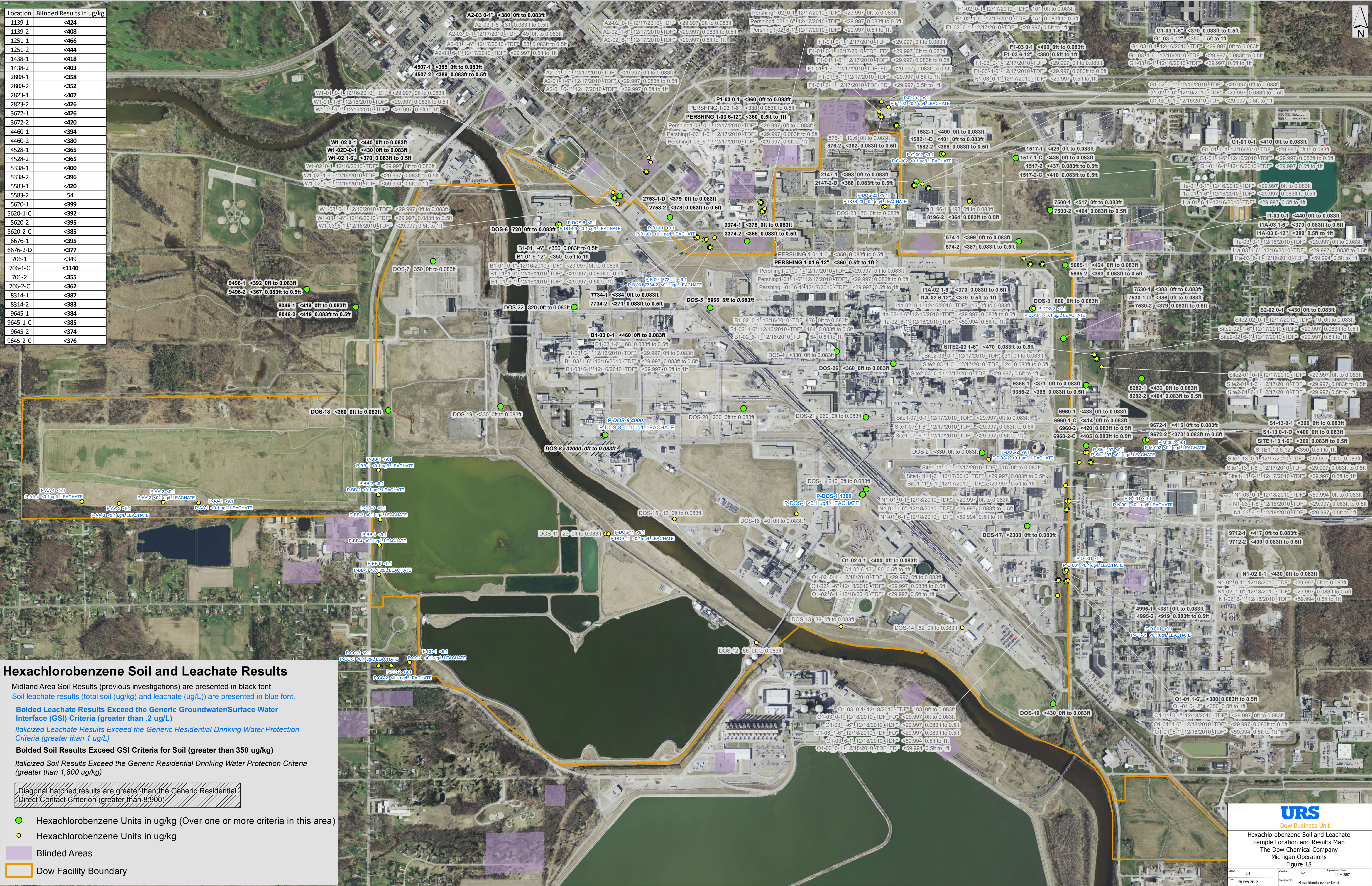
URS
Dow Business Unit

Strontium Soil and Leachate
Sample Location and Results Map
The Dow Chemical Company
Michigan Operations
Figure 16

Date: 3H
Checked: MC
Drawing File: Strontium-LEACHATE
28 Feb 2012
Approximate Scale: 1" = 580'

Strontium Leachability Correlation Plot for Drinking Water Criteria





| Location | Blinded Results in ug/kg |
|----------|--------------------------|
| 1139-1 | <288 |
| 1139-2 | <287 |
| 1251-1 | 675 |
| 1251-2 | 1540 |
| 1438-1 | 283 |
| 1438-2 | 260 |
| 2808-1 | <284 |
| 2808-2 | <255 |
| 2823-1 | 256 |
| 2823-2 | 281 |
| 3672-1 | 566 |
| 3672-2 | 268 |
| 4460-1 | <314 |
| 4460-2 | <307 |
| 4528-1 | <237 |
| 4528-2 | 248 |
| 5338-1 | <312 |
| 5338-2 | <239 |
| 5583-1 | 278 |
| 5583-2 | 224 |
| 5620-1 | 256 |
| 5620-1-C | 282 |
| 5620-2 | 304 |
| 5620-2-C | 427 |
| 6676-1 | <291 |
| 6676-2-D | <294 |
| 706-1 | 268 |
| 706-1-C | 248 |
| 706-2 | 277 |
| 706-2-C | 307 |
| 8314-1 | 410 |
| 8314-2 | 272 |
| 9645-1 | 249 |
| 9645-1-C | 277 |
| 9645-2 | 229 |
| 9645-2-C | 235 |

Methylene Chloride Soil and Leachate Results

Midland Area Soil Results (previous investigations) are presented in black font
Soil leachate results (total soil (ug/kg) and leachate (ug/L)) are presented in blue font.

Bolded Leachate Results Exceed the Generic Groundwater/Surface Water Interface (GSI) Criteria (greater than 1,500 ug/L)

Italicized Leachate Results Exceed the Generic Residential Drinking Water Protection Criteria (greater than 5 ug/L)

Bolded Soil Results Exceed GSI Criteria for Soil (greater than 30,000 ug/kg)

Italicized Soil Results Exceed the Generic Residential Drinking Water Protection Criteria (greater than 100 ug/kg)

- Methylene Chloride Units in ug/kg (Over one or more criteria in this area)
- Methylene Chloride Units in ug/kg
- Blinded Areas
- Dow Facility Boundary



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Methylene Chloride Soil and Leachate
Sample Location and Results Map
The Dow Chemical Company
Michigan Operations

Figure 19

| | | | | | |
|--------|-------------|---------------|-----------------------------|--------------------|-----------|
| Drawn: | JH | Checked: | MC | Approximate Scale: | 1" = 580' |
| Date: | 28 Feb 2012 | Drawing File: | Methylene_Chloride-LEACHATE | | |

| Location | Blinded Results in ug/kg |
|----------|--------------------------|
| 1139-1 | <1030 |
| 1139-2 | <990 |
| 1251-1 | <1130 |
| 1251-2 | <1080 |
| 1438-1 | <1010 |
| 1438-2 | <978 |
| 2808-1 | <869 |
| 2808-2 | <853 |
| 2823-1 | <986 |
| 2823-2 | <1030 |
| 3672-1 | <1030 |
| 3672-2 | <1020 |
| 4460-1 | <954 |
| 4460-2 | <921 |
| 4528-1 | <885 |
| 4528-2 | <884 |
| 5338-1 | <970 |
| 5338-2 | <961 |
| 5583-1 | <1020 |
| 5583-2 | <964 |
| 5620-1 | <968 |
| 5620-1-C | <950 |
| 5620-2 | <958 |
| 5620-2-C | <933 |
| 6676-1 | <959 |
| 6676-2-D | <914 |
| 706-1 | <846 |
| 706-1-C | 117 |
| 706-2 | <862 |
| 706-2-C | 55.1 |
| 8314-1 | <937 |
| 8314-2 | <928 |
| 9645-1 | <932 |
| 9645-1-C | <933 |
| 9645-2 | <908 |
| 9645-2-C | <912 |

Pentachlorophenol Soil and Leachate Results

Midland Area Soil Results (previous investigations) are presented in black font
Soil leachate results (total soil (ug/kg) and leachate (ug/L)) are presented in blue font.

Bolded Leachate Results Exceed the Generic Groundwater/Surface Water Interface (GSI) Criteria (greater than 1.8 ug/L)

Italicized Leachate Results Exceed the Generic Residential Drinking Water Protection Criteria (greater than 1 ug/L)

Bolded Soil Results Exceed GSI Criteria for Soil (greater than 17,000 ug/kg)

Italicized Soil Results Exceed the Generic Residential Drinking Water Protection Criteria (greater than 22 ug/kg)

- Pentachlorophenol Units in ug/kg (Over one or more criteria in this area)
- Pentachlorophenol Units in ug/kg
- Blinded Areas
- Dow Facility Boundary

| Location | Blinded Results in ug/kg |
|----------|--------------------------|
| 1139-1 | 182.1 |
| 1139-2 | 218 |
| 1251-1 | 106.2 |
| 1251-2 | <134.6 |
| 1438-1 | <127.2 |
| 1438-2 | <122.2 |
| 2808-1 | 43.9 |
| 2808-2 | 27 |
| 2823-1 | 37.2 |
| 2823-2 | 65.1 |
| 3374-1 | 173.5 |
| 3374-2 | 173.1 |
| 3672-1 | 64.9 |
| 3672-2 | 38.4 |
| 4460-1 | 95.8 |
| 4460-2 | 46.6 |
| 4528-1 | <110.6 |
| 4528-2 | <110.5 |
| 5338-1 | 98.3 |
| 5338-2 | 132.6 |
| 5583-1 | 312.9 |
| 5583-2 | 144.6 |
| 5620-1 | 91.4 |
| 5620-1-C | 78.5 |
| 5620-2 | 264.2 |
| 5620-2-C | 76.8 |
| 6676-1 | 134 |
| 6676-2-D | 75.5 |
| 706-1 | 246.6 |
| 706-1-C | 173.5 |
| 706-2 | 270.2 |
| 706-2-C | 1350 |
| 8314-1 | 70.3 |
| 8314-2 | 336.3 |
| 9645-1 | <117.7 |
| 9645-1-C | 17.7 |
| 9645-2 | <115 |
| 9645-2-C | <114.7 |

Total Cyanide Soil and Leachate Results

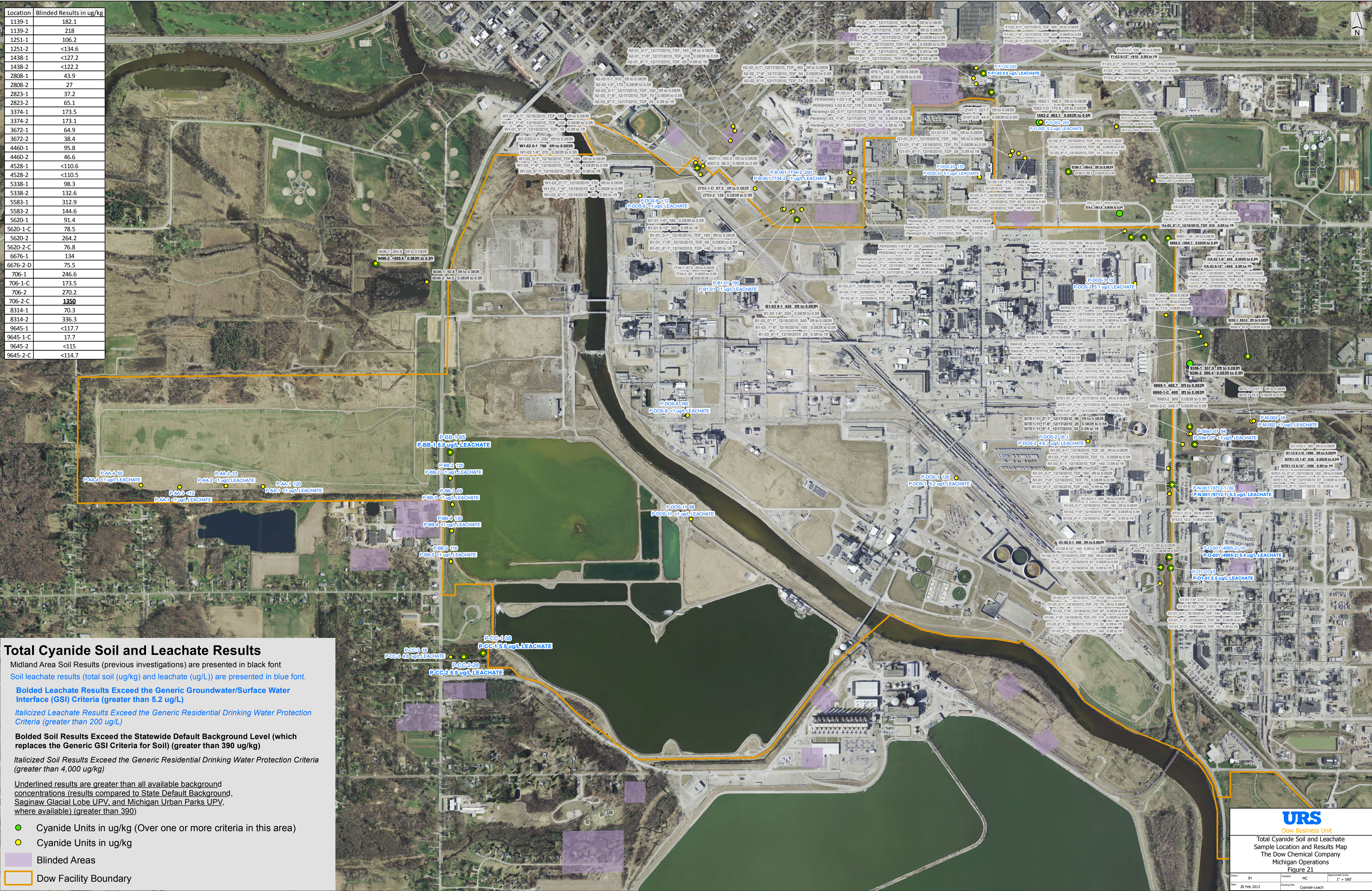
Midland Area Soil Results (previous investigations) are presented in black font
Soil leachate results (total soil (ug/kg) and leachate (ug/L)) are presented in blue font.

Bolded Leachate Results Exceed the Generic Groundwater/Surface Water Interface (GSI) Criteria (greater than 5.2 ug/L)
Italicized Leachate Results Exceed the Generic Residential Drinking Water Protection Criteria (greater than 200 ug/L)

Bolded Soil Results Exceed the Statewide Default Background Level (which replaces the Generic GSI Criteria for Soil) (greater than 390 ug/kg)
Italicized Soil Results Exceed the Generic Residential Drinking Water Protection Criteria (greater than 4,000 ug/kg)

Underlined results are greater than all available background concentrations (results compared to State Default Background, Saginaw Glacial Lobe UPV, and Michigan Urban Parks UPV, where available) (greater than 390)

- Cyanide Units in ug/kg (Over one or more criteria in this area)
- Cyanide Units in ug/kg
- Blinded Areas
- Dow Facility Boundary



| Location | Blinded Results in ug/kg |
|----------|--------------------------|
| 1139-1 | <650 |
| 1139-2 | <618 |
| 1251-1 | <702 |
| 1251-2 | <673 |
| 1438-1 | <631 |
| 1438-2 | <606 |
| 2808-1 | <544 |
| 2808-2 | <540 |
| 2823-1 | <620 |
| 2823-2 | <646 |
| 3672-1 | <649 |
| 3672-2 | 1230 |
| 4460-1 | <598 |
| 4460-2 | <578 |
| 4528-1 | <553 |
| 4528-2 | <553 |
| 5338-1 | <614 |
| 5338-2 | <598 |
| 5583-1 | <633 |
| 5583-2 | <602 |
| 5620-1 | <604 |
| 5620-1-C | <604 |
| 5620-2 | <600 |
| 5620-2-C | <586 |
| 6676-1 | <604 |
| 6676-2-D | 543 |
| 706-1 | 4960 |
| 706-1-C | <574 |
| 706-2 | 6850 |
| 706-2-C | <547 |
| 8314-1 | <586 |
| 8314-2 | <575 |
| 9645-1 | <584 |
| 9645-1-C | <584 |
| 9645-2 | <575 |
| 9645-2-C | <574 |

Selenium Soil and Leachate Results

Midland Area Soil Results (previous investigations) are presented in black font
Soil leachate results (total soil (ug/kg) and leachate (ug/L)) are presented in blue font.

Bolded Leachate Results Exceed the Generic Groundwater/Surface Water Interface (GSI) Criteria (greater than 5 ug/L)

Italicized Leachate Results Exceed the Generic Residential Drinking Water Protection Criteria (greater than 50 ug/L)

Bolded Soil Results Exceed the Regional Background Screening Level (which replaces the Generic GSI Criteria for Soil) (greater than 770 ug/kg)

Italicized Soil Results Exceed the Generic Residential Drinking Water Protection Criteria (greater than 4,000 ug/kg)

- Selenium Units in ug/kg (Over one or more criteria in this area)
- Selenium Units in ug/kg
- Blinded Areas
- Dow Facility Boundary



URS
Dow Business Unit

Selenium Soil and Leachate
Sample Location and Results Map
The Dow Chemical Company
Michigan Operations
Figure 22

| | | |
|-----------|-------------|----------------------------|
| Drawn: JH | Checked: MC | Approved Date: 28 Feb 2012 |
| Drawn: JH | Checked: MC | Approved Date: 28 Feb 2012 |
| Drawn: JH | Checked: MC | Approved Date: 28 Feb 2012 |

| Location | Blinded Results in ug/kg |
|----------|--------------------------|
| 1139-1 | <57.6 |
| 1139-2 | <57.4 |
| 1251-1 | 5920 |
| 1251-2 | 5640 |
| 1438-1 | <56.6 |
| 1438-2 | <52 |
| 2808-1 | 1000 |
| 2808-2 | <51.1 |
| 2823-1 | <51.2 |
| 2823-2 | 1590 |
| 3672-1 | 1520 |
| 3672-2 | 716 |
| 4460-1 | <62.7 |
| 4460-2 | <61.4 |
| 4528-1 | 156 |
| 4528-2 | 7010 |
| 5338-1 | 81.7 |
| 5338-2 | <47.9 |
| 5583-1 | <55.6 |
| 5583-2 | 72.1 |
| 5620-1 | <51.2 |
| 5620-1-C | <56.4 |
| 5620-2 | 1440 |
| 5620-2-C | 3120 |
| 6676-1 | <58.2 |
| 6676-2-D | 1020 |
| 706-1 | 502 |
| 706-1-C | 828 |
| 706-2 | 2680 |
| 706-2-C | 4390 |
| 8314-1 | 771 |
| 8314-2 | 3420 |
| 9645-1 | <49.9 |
| 9645-1-C | 61.6 |
| 9645-2 | <45.7 |
| 9645-2-C | <46.9 |

Toluene Soil and Leachate Results

Midland Area Soil Results (previous investigations) are presented in black font
Soil leachate results (total soil (ug/kg) and leachate (ug/L)) are presented in blue font.

Bolded Leachate Results Exceed the Generic Groundwater/Surface Water Interface (GSI) Criteria (greater than 270 ug/L)

Italicized Leachate Results Exceed the Generic Residential Drinking Water Protection Criteria (greater than 790 ug/L)

Bolded Soil Results Exceed GSI Criteria for Soil (greater than 5,400 ug/kg)

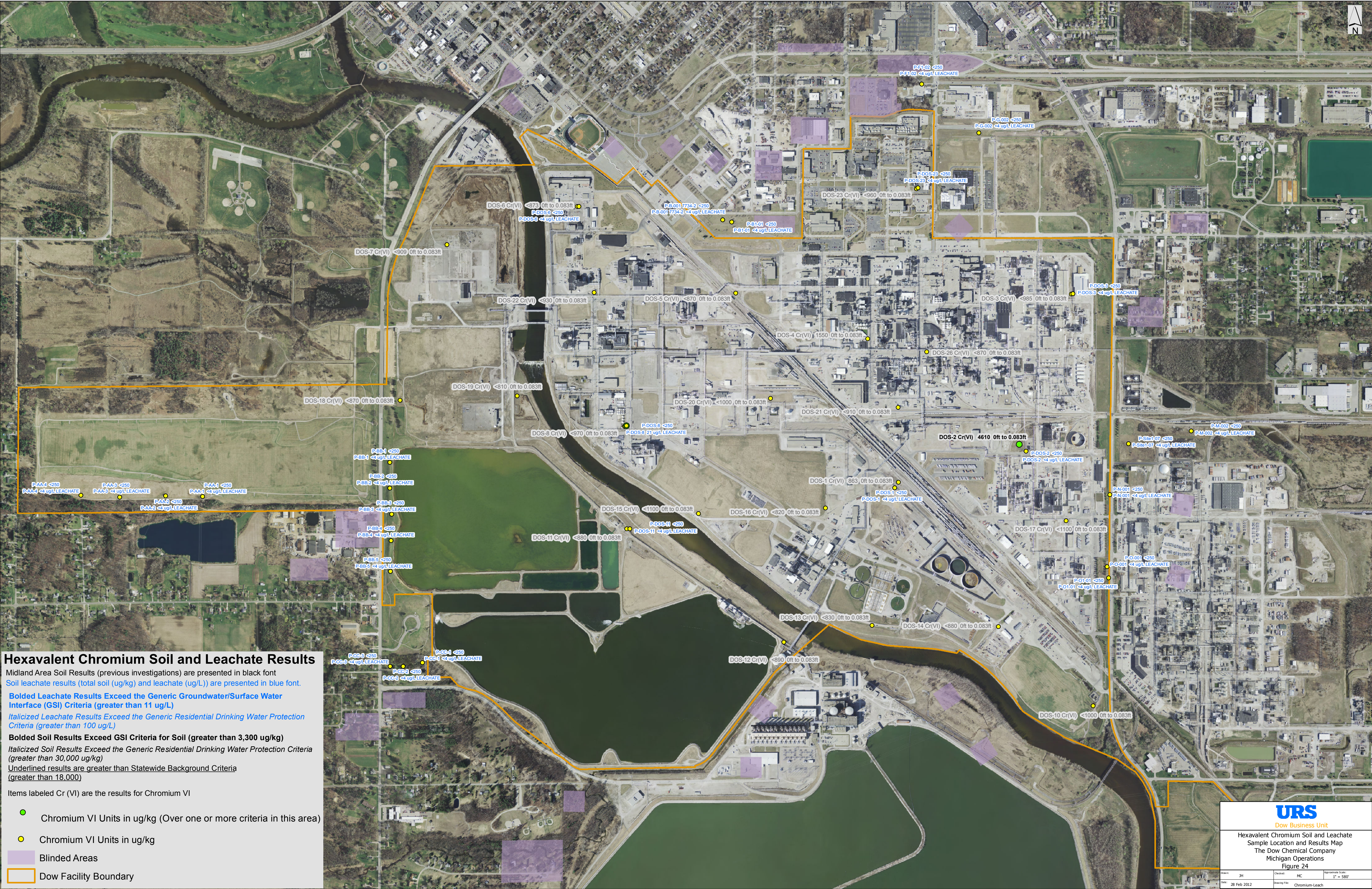
Italicized Soil Results Exceed the Generic Residential Drinking Water Protection Criteria (greater than 16,000 ug/kg)

● Toluene Units in ug/kg (Over one or more criteria in this area)

● Toluene Units in ug/kg

Blinded Areas

Dow Facility Boundary



TABLES

Table 1
Summary of Non-dioxin Data Screening Results, The Dow Chemical Company, Michigan Operations

| A1 ¹ Metals Screen-out by Statewide Default Background | A2 ¹ Metals Screen-out by Regional Background Screening Levels | B1 ¹ Screen-out by all NDs; RLs met MDEQ target detection levels | B2 ¹ Screen-out by off-site NDs; RLs met MDEQ target detection levels | B3 ¹ Screen-out by all NDs; all RLs ≤ all Part 201/EPA criteria | C1 ² No criteria; detected ≤ 5% | C2 ² No criteria; detected > 5% | D1 ¹ Screen-out by other reasons | D2 ¹ Detected ≤ 5%; screen-out by Part 201/EPA criteria | D3 ¹ Detected > 5%; screen-out by Part 201/EPA criteria | D4 ² Not detected above Part 201/EPA criteria; but have elevated RLs for NDs | D5 ² Detected ≤ 5%; one or more detected concentrations > Part 201/EPA criteria | D6 ² Detected > 5%; one or more detected concentrations > Part 201/EPA criteria | E1 ³ Eliminate through a review of spacial distribution | E2 Eliminate based on leach testing results | E3 Eliminate - analyte not sourced by Dow |
|--|--|--|---|---|---|---|--|--|--|--|---|---|--|---|---|
| | | | | Pentachloronitrobenzene | | | | | | Diphenylamine | | | 4-Chloroaniline | | |
| | | | | p-Phenylenediamine | | | | | | Disulfoton | | | 4-Nitroaniline | | |
| | | | | Pronamide | | | | | | Hexachloroethane | | | 5-Nitro-o-toluidine | | |
| | | | | Ronnel | | | | | | Kepone | | | 7,12-Dimethylbenz(a)anthracene | | |
| | | | | Sym-Trinitrobenzene | | | | | | Methyl methanesulfonate | | | Aniline | | |
| | | | | trans-Nonachlor | | | | | | Nitrobenzene | | | Aramite (Total) | | |
| | | | | 1,1,1,2-Tetrachloroethane | | | | | | n-Nitrosodiethylamine | | | Benzidine | | |
| | | | | 1,1,1-Trichloroethane | | | | | | n-Nitrosodimethylamine | | | Bis(2-Chloroethoxy)methane | | |
| | | | | 1,1-Dichloroethane | | | | | | N-Nitroso-di-n-butylamine | | | Bis(2-Chloroethyl) ether | | |
| | | | | 1,2,3-Trichloropropane | | | | | | n-Nitrosodi-n-propylamine | | | Chlorobenzilate | | |
| | | | | 2,2-Dichloropropane | | | | | | n-Nitrosomethylethylamine | | | Chlorpyrifos | | |
| | | | | 4-Chlorotoluene | | | | | | n-Nitrosomorpholine | | | Cresol, Total | | |
| | | | | Bromobenzene | | | | | | n-Nitrosopiperidine | | | Diallate (total of cis and trans isomers) | | |
| | | | | Bromodichloromethane | | | | | | n-Nitrosopyrrolidine | | | Dibenz(a,h)anthracene | | |
| | | | | Bromoform | | | | | | Parathion, Methyl | | | Diethyl phthalate | | |
| | | | | Carbon disulfide | | | | | | p-Dimethylaminoazobenzene | | | Dimethoate | | |
| | | | | Chlorobromomethane | | | | | | Pentachlorethane | | | Dinoseb | | |
| | | | | Chloroethane | | | | | | Phenacetin | | | Diphenylamine | | |
| | | | | cis-1,2-Dichloroethene | | | | | | Phorate | | | Disulfoton | | |
| | | | | cis-1,3-Dichloropropene | | | | | | Pyridine | | | Hexachloroethane | | |
| | | | | Cyclohexanone | | | | | | Safrole | | | Kepone | | |
| | | | | Dibromochloromethane | | | | | | Tetraethyl Dithiopyrophosphate (Sulfotepp) | | | Methyl methanesulfonate | | |
| | | | | Dibromomethane | | | | | | 1,1,2,2-Tetrachloroethane | | | Nitrobenzene | | |
| | | | | Ethyl methacrylate | | | | | | 1,1,2-Trichloroethane | | | n-Nitrosodiethylamine | | |
| | | | | Isobutanol | | | | | | 1,1,2-Trichlorotrifluoroethane | | | n-Nitrosodimethylamine | | |
| | | | | n-Butanol | | | | | | 1,1-Dichloroethene | | | N-Nitroso-di-n-butylamine | | |
| | | | | trans-1,2-Dichloroethene | | | | | | 1,2-Dibromo-3-chloropropane | | | n-Nitrosodi-n-propylamine | | |
| | | | | trans-1,3-Dichloropropene | | | | | | 1,2-Dibromoethane (EDB) | | | n-Nitrosomethylethylamine | | |
| | | | | Trichlorofluoromethane | | | | | | 1,2-Dichloroethane | | | n-Nitrosomorpholine | | |
| | | | | Trihalomethanes, Total | | | | | | 1,2-Dichloropropane | | | n-Nitrosopiperidine | | |
| | | | | | | | | | | 1,3-Dichloropropane | | | n-Nitrosopyrrolidine | | |
| | | | | | | | | | | 1,3-Dichloropropene, Total | | | Parathion, Methyl | | |
| | | | | | | | | | | 1,4-Dioxane | | | p-Dimethylaminoazobenzene | | |
| | | | | | | | | | | 2-Propanol | | | Pentachlorethane | | |
| | | | | | | | | | | Acetonitrile | | | Phenacetin | | |
| | | | | | | | | | | Acrolein | | | Phorate | | |
| | | | | | | | | | | Allyl Chloride (3-Chloropropene) | | | Pyridine | | |
| | | | | | | | | | | Carbon tetrachloride | | | Safrole | | |
| | | | | | | | | | | Chloroprene (2-Chloro-1,3-Butadiene) | | | Tetraethyl Dithiopyrophosphate (Sulfotepp) | | |
| | | | | | | | | | | Ethyl Benzene | | | 1,1,2,2-Tetrachloroethane | | |
| | | | | | | | | | | Ethyl ether | | | 1,1,2-Trichloroethane | | |
| | | | | | | | | | | Ethylene oxide | | | 1,1,2-Trichlorotrifluoroethane | | |
| | | | | | | | | | | Methyl methacrylate | | | 1,1-Dichloroethene | | |
| | | | | | | | | | | Methylacrylonitrile | | | 1,2-Dibromo-3-chloropropane | | |
| | | | | | | | | | | trans-1,4-Dichloro-2-butene | | | 1,2-Dibromoethane (EDB) | | |
| | | | | | | | | | | Trichloroethene (TCE) | | | 1,2-Dichloroethane | | |
| | | | | | | | | | | Vinyl chloride | | | 1,2-Dichloropropane | | |

Table 1
Summary of Non-dioxin Data Screening Results, The Dow Chemical Company, Michigan Operations

| A1 ¹ Metals Screen-out by Statewide Default Background | A2 ¹ Metals Screen-out by Regional Background Screening Levels | B1 ¹ Screen-out by all NDs; RLs met MDEQ target detection levels | B2 ¹ Screen-out by off-site NDs; RLs met MDEQ target detection levels | B3 ¹ Screen-out by all NDs; all RLs ≤ all Part 201/EPA criteria | C1 ² No criteria; detected ≤ 5% | C2 ² No criteria; detected > 5% | D1 ¹ Screen-out by other reasons | D2 ¹ Detected ≤ 5%; screen-out by Part 201/EPA criteria | D3 ¹ Detected > 5%; screen-out by Part 201/EPA criteria | D4 ² Not detected above Part 201/EPA criteria; but have elevated RLs for NDs | D5 ² Detected ≤ 5%; one or more detected concentrations > Part 201/EPA criteria | D6 ² Detected > 5%; one or more detected concentrations > Part 201/EPA criteria | E1 ³ Eliminate through a review of spacial distribution | E2 Eliminate based on leach testing results | E3 Eliminate - analyte not sourced by Dow |
|--|--|--|---|---|---|---|--|--|--|--|---|---|--|---|---|
| | | | | | | | | | | | | | 1,3-Dichloropropane | | |
| | | | | | | | | | | | | | 1,3-Dichloropropene, Total | | |
| | | | | | | | | | | | | | 1,4-Dioxane | | |
| | | | | | | | | | | | | | 2-Propanol | | |
| | | | | | | | | | | | | | Acetonitrile | | |
| | | | | | | | | | | | | | Acrolein | | |
| | | | | | | | | | | | | | Allyl Chloride (3- Chloropropene) | | |
| | | | | | | | | | | | | | Carbon tetrachloride | | |
| | | | | | | | | | | | | | Chloroprene (2-Chloro- 1,3-Butadiene) | | |
| | | | | | | | | | | | | | Ethyl Benzene | | |
| | | | | | | | | | | | | | Ethyl ether | | |
| | | | | | | | | | | | | | Ethylene oxide | | |
| | | | | | | | | | | | | | Methyl methacrylate | | |
| | | | | | | | | | | | | | Methylacrylonitrile | | |
| | | | | | | | | | | | | | trans-1,4-Dichloro-2- butene | | |
| | | | | | | | | | | | | | Trichloroethene (TCE) | | |
| | | | | | | | | | | | | | Vinyl chloride | | |
| | | | | | | | | | | | | | alpha-BHC | | |
| | | | | | | | | | | | | | Gamma BHC (Lindane) | | |
| | | | | | | | | | | | | | 1,2-Dichlorobenzene | | |
| | | | | | | | | | | | | | Acrylonitrile | | |
| | | | | | | | | | | | | | Chlorobenzene | | |
| | | | | | | | | | | | | | Tetrachloroethene | | |
| | | | | | | | | | | | | | Mercury | | |
| | | | | | | | | | | | | | Aluminum | | |
| | | | | | | | | | | | | | Antimony | | |
| | | | | | | | | | | | | | Chromium | | |
| | | | | | | | | | | | | | Cobalt | | |
| | | | | | | | | | | | | | Copper | | |
| | | | | | | | | | | | | | Iron | | |
| | | | | | | | | | | | | | Lead | | |
| | | | | | | | | | | | | | Molybdenum | | |
| | | | | | | | | | | | | | Nickel | | |
| | | | | | | | | | | | | | Silver | | |
| | | | | | | | | | | | | | Vanadium | | |
| | | | | | | | | | | | | | Benzo[a]pyrene | | |
| | | | | | | | | | | | | | Dibenzofuran | | |
| | | | | | | | | | | | | | Phenanthrene | | |
| | | | | | | | | | | | | | 1,3-Dichlorobenzene | | |
| | | | | | | | | | | | | | 1,4-Dichlorobenzene | | |
| | | | | | | | | | | | | | Benzene | | |
| | | | | | | | | | | | | | Bromomethane | | |
| | | | | | | | | | | | | | Naphthalene | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |

Notes:
Figure 5-4 serves as a companion figure to this table.
Screen-out
Eliminate
May require additional evaluation
Requires additional evaluation

¹ Analytes in categories A1, A2, B1, B2, B3, D1, D2, and D3 screened-out from further evaluation based on the screening category they were placed.
² Analytes in categories C1, C2, D4, D5, and D6 were initially retained and were each evaluated in a series of meetings and conference calls (held in May through July 2011) attended by MDEQ, EPA, and Dow staff.
³ Analytes from categories C1, C2, D4, D5, and D6 (shaded in gray) were placed in category E1 when the analyte was determined to be eliminated from further evaluation based on the results of the meetings and conference calls.

Table 2
Comparison of Leachate Study and Midland Area Soil Results,
The Dow Chemical Company, Michigan Operations

| Analyte | CAS Number | Units | Detection Rate | Min Detected Value | Max Detected Value |
|----------------------|------------|-------|----------------|--------------------|--------------------|
| Arsenic | 7440-38-2 | ug/Kg | 100% | 430 | 56,000 |
| Arsenic | 7440-38-2 | ug/Kg | 99% | 195 | 59,200 |
| Boron | 7440-42-8 | ug/Kg | 100% | 830 | 11,000 |
| Boron | 7440-42-8 | ug/Kg | 99% | 970 | 22,627 |
| Chromium, Hexavalent | 18540-29-9 | ug/Kg | 0% | <540 | <620 |
| Chromium, Hexavalent | 18540-29-9 | ug/Kg | 13% | 863 | 4,610 |
| Cyanide, Total | 57-12-5 | ug/Kg | 93% | 16 | 240 |
| Cyanide, Total | 57-12-5 | ug/Kg | 86% | 12 | 863 |
| Fluoranthene | 206-44-0 | ug/Kg | 79% | 15 | 2,400 |
| Fluoranthene | 206-44-0 | ug/Kg | 82% | 13.7 | 9,270 |
| Hexachlorobenzene | 118-74-1 | ug/Kg | 7% | 1,300 | 4,000 |
| Hexachlorobenzene | 118-74-1 | ug/Kg | 15% | 10 | 32,000 |
| Hexachlorobutadiene | 87-68-3 | ug/Kg | 4% | 140 | 140 |
| Hexachlorobutadiene | 87-68-3 | ug/Kg | 1% | 29 | 640 |
| Lithium | 7439-93-2 | ug/Kg | 100% | 1,100 | 16,000 |
| Lithium | 7439-93-2 | ug/Kg | 100% | 1,040 | 16,570 |
| Methylene chloride | 75-09-2 | ug/Kg | 0% | <55 | <64 |
| Methylene chloride | 75-09-2 | ug/Kg | 69% | 6 | 2,175 |
| Pentachlorophenol | 87-86-5 | ug/Kg | 14% | 41 | 2,600 |
| Pentachlorophenol | 87-86-5 | ug/Kg | 15% | 3 | 755 |
| Selenium | 7782-49-2 | ug/Kg | 100% | 160 | 790 |
| Selenium | 7782-49-2 | ug/Kg | 33% | 120 | 5,720 |
| Strontium | 7440-24-6 | ug/Kg | 100% | 2,200 | 220,000 |
| Strontium | 7440-24-6 | ug/Kg | 100% | 2,100 | 201,919 |
| Toluene | 108-88-3 | ug/Kg | 7% | 45 | 250 |
| Toluene | 108-88-3 | ug/Kg | 75% | 4 | 7,010 |
| Xylenes, Total | 1330-20-7 | ug/Kg | 4% | 110 | 110 |
| Xylenes, Total | 1330-20-7 | ug/Kg | 24% | 10 | 1,470 |
| Zinc | 7440-66-6 | ug/Kg | 100% | 4,800 | 350,000 |
| Zinc | 7440-66-6 | ug/Kg | 100% | 4,800 | 798,500 |

Notes:

Leachate study (totals) soil analytical results are shown with no shading.

Previous Midland Area Soil investigation soil analytical results are shown with grey shading.

Table 3
Leachate Study Summary Statistics and Comparison with Screening Criteria, The Dow Chemical Company, Michigan Operations

| Analyte | CAS Number | Unit | Matrix | Summary Statistics | | | | | | | | Comparison to Screening Criteria | | | | | |
|----------------------|------------|-------|--------|--------------------|----------------|--------|---------|--------------------|--------------------|---------------|---------------|----------------------------------|-------------------------|-----------------------------|----------------|-------------------------|-----------------------------|
| | | | | No. of Samples | Detection Rate | Mean | Std Dev | Min Detected Value | Max Detected Value | Min RL of NDs | Max RL of NDs | Residential DW Protection | Percent Exceed (Detect) | Percent Exceed (Non-detect) | GSI Protection | Percent Exceed (Detect) | Percent Exceed (Non-detect) |
| Arsenic | 7440-38-2 | ug/Kg | Soil | 28 | 100% | 4,719 | 10,262 | 430 | 56,000 | - | - | 11,290* | 7% | 0% | 11,290* | 7% | 0% |
| Arsenic | 7440-38-2 | ug/L | Water | 28 | 100% | 6.09 | 5.55 | 1.1 | 28 | - | - | 10 | 14% | 0% | 10 | 14% | 0% |
| Boron | 7440-42-8 | ug/Kg | Soil | 28 | 100% | 4,148 | 2,600 | 830 | 11,000 | - | - | 10,000 | 7% | 0% | 100,000 | 0% | 0% |
| Boron | 7440-42-8 | ug/L | Water | 28 | 100% | 48.1 | 23.5 | 18 | 140 | - | - | 500 | 0% | 0% | 5,000 | 0% | 0% |
| Chromium, Hexavalent | 18540-29-9 | ug/Kg | Soil | 28 | 0% | - | - | - | - | 0.25 | 0.25 | 30,000 | 0% | 0% | 3,300 | 0% | 0% |
| Chromium, Hexavalent | 18540-29-9 | ug/L | Water | 28 | 4% | 2.68 | 3.59 | 21 | 21 | 0.004 | 0.004 | 100 | 0% | 0% | 11 | 4% | 0% |
| Cyanide, Total | 57-12-5 | ug/Kg | Soil | 28 | 93% | 88.7 | 70.0 | 16 | 240 | 0.012 | 0.012 | 4,000 | 0% | 0% | 390* | 0% | 0% |
| Cyanide, Total | 57-12-5 | ug/L | Water | 28 | 46% | 2.73 | 2.45 | 4.6 | 5.8 | 0.001 | 0.001 | 200 | 0% | 0% | 5.2 | 25% | 0% |
| Fluoranthene | 206-44-0 | ug/Kg | Soil | 28 | 79% | 176 | 458 | 15 | 2,400 | 12 | 12 | 730,000 | 0% | 0% | 5,500 | 0% | 0% |
| Fluoranthene | 206-44-0 | ug/L | Water | 28 | 0% | - | - | - | - | 0.77 | 0.77 | 210 | 0% | 0% | 1.6 | 0% | 0% |
| Hexachlorobenzene | 118-74-1 | ug/Kg | Soil | 28 | 7% | 194 | 785 | 1,300 | 4,000 | 9.1 | 9.1 | 1,800 | 4% | 0% | 350 | 7% | 0% |
| Hexachlorobenzene | 118-74-1 | ug/L | Water | 28 | 0% | - | - | - | - | 0.1 | 0.1 | 1 | 0% | 0% | 0.2 | 0% | 0% |
| Hexachlorobutadiene | 87-68-3 | ug/Kg | Soil | 28 | 4% | 9.05 | 25.66 | 140 | 140 | 8.4 | 8.4 | 26,000 | 0% | 0% | 91 | 4% | 0% |
| Hexachlorobutadiene | 87-68-3 | ug/L | Water | 28 | 0% | - | - | - | - | 0.12 | 0.12 | 15 | 0% | 0% | 0.053 | 0% | 100% |
| Lithium | 7439-93-2 | ug/Kg | Soil | 28 | 100% | 5,907 | 3,927 | 1,100 | 16,000 | - | - | 12,500* | 7% | 0% | 12,500* | 7% | 0% |
| Lithium | 7439-93-2 | ug/L | Water | 28 | 100% | 13.5 | 15.6 | 0.78 | 67 | - | - | 170 | 0% | 0% | 440 | 0% | 0% |
| Methylene chloride | 75-09-2 | ug/Kg | Soil | 28 | 0% | - | - | - | - | 0.24 | 0.25 | 100 | 0% | 0% | 30,000 | 0% | 0% |
| Methylene chloride | 75-09-2 | ug/L | Water | 28 | 32% | 1.74 | 2.96 | 1.2 | 9.2 | 0.19 | 0.19 | 5 | 18% | 0% | 1,500 | 0% | 0% |
| Pentachlorophenol | 87-86-5 | ug/Kg | Soil | 28 | 14% | 120 | 491 | 41 | 2,600 | 15 | 15 | 22 | 14% | 0% | 17,000 | 0% | 0% |
| Pentachlorophenol | 87-86-5 | ug/L | Water | 28 | 4% | 0.249 | 1.029 | 5.5 | 5.5 | 0.11 | 0.11 | 1 | 4% | 0% | 1.8 | 4% | 0% |
| Selenium | 7782-49-2 | ug/Kg | Soil | 28 | 100% | 474 | 142 | 160 | 790 | - | - | 4,000 | 0% | 0% | 770* | 4% | 0% |
| Selenium | 7782-49-2 | ug/L | Water | 28 | 25% | 0.566 | 0.377 | 0.88 | 1.7 | 0.00073 | 0.00073 | 50 | 0% | 0% | 5 | 0% | 0% |
| Strontium | 7440-24-6 | ug/Kg | Soil | 28 | 100% | 39,071 | 46,205 | 2,200 | 220,000 | - | - | 92,000 | 11% | 0% | 420,000 | 0% | 0% |
| Strontium | 7440-24-6 | ug/L | Water | 28 | 100% | 56.6 | 54.6 | 3.9 | 220 | - | - | 4,600 | 0% | 0% | 21,000 | 0% | 0% |
| Toluene | 108-88-3 | ug/Kg | Soil | 28 | 7% | 10.6 | 47.7 | 45 | 250 | 0.23 | 0.23 | 16,000 | 0% | 0% | 5,400 | 0% | 0% |
| Toluene | 108-88-3 | ug/L | Water | 28 | 75% | 36.1 | 109.4 | 0.13 | 420 | 0.12 | 0.12 | 790 | 0% | 0% | 270 | 7% | 0% |
| Xylenes, Total | 1330-20-7 | ug/Kg | Soil | 28 | 4% | 4.27 | 20.72 | 110 | 110 | 0.71 | 0.71 | 5,600 | 0% | 0% | 820 | 0% | 0% |
| Xylenes, Total | 1330-20-7 | ug/L | Water | 28 | 21% | 1.58 | 4.18 | 0.49 | 19 | 0.29 | 0.29 | 280 | 0% | 0% | 41 | 0% | 0% |
| Zinc | 7440-66-6 | ug/Kg | Soil | 28 | 100% | 44,564 | 64,664 | 4,800 | 350,000 | - | - | 2,400,000 | 0% | 0% | 220,000** | 4% | 0% |
| Zinc | 7440-66-6 | ug/L | Water | 28 | 100% | 121 | 428 | 7.8 | 2,300 | - | - | 2,400 | 0% | 0% | 220** | 4% | 0% |

Notes:

There are no field duplicates in this data set.

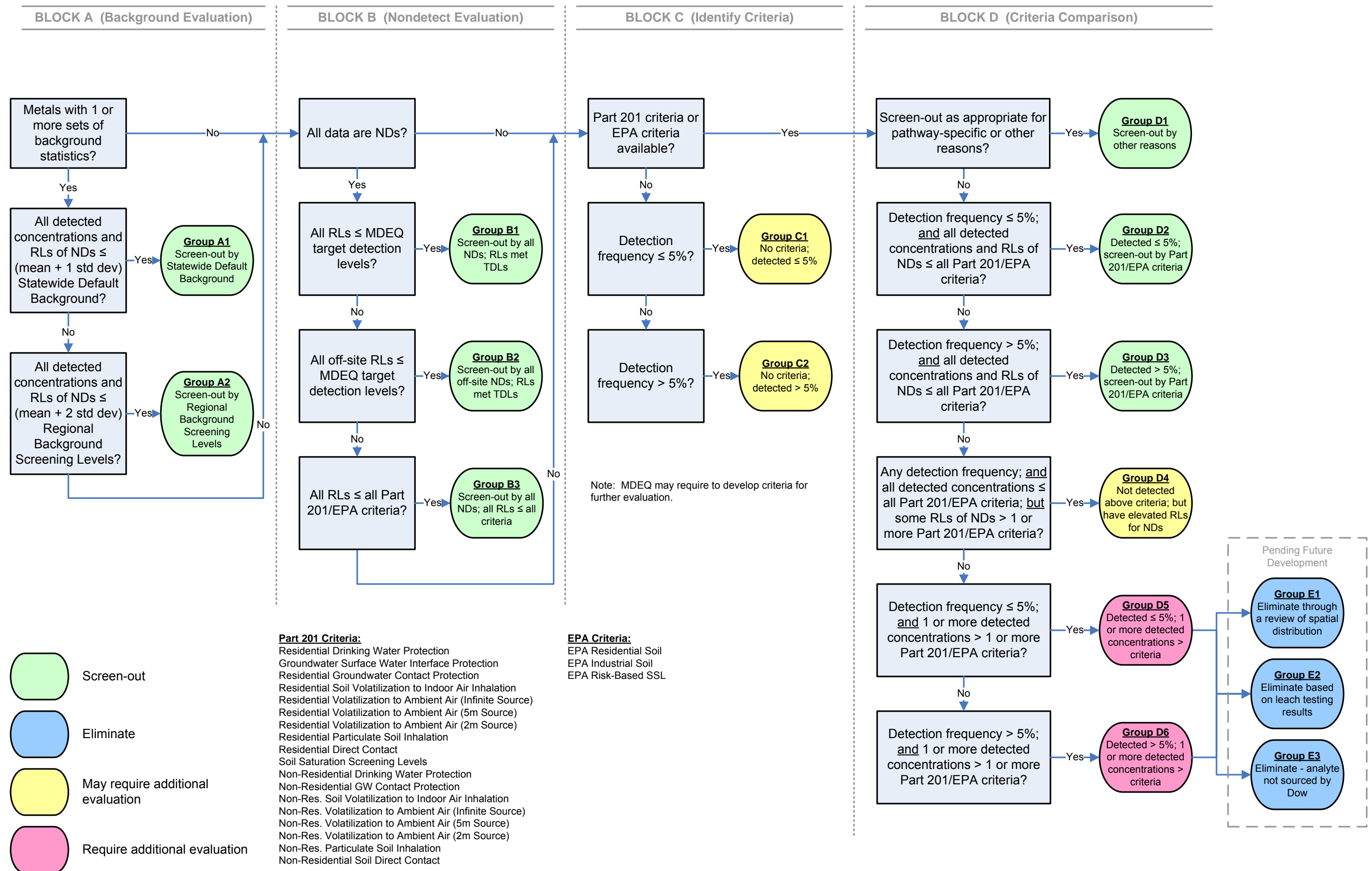
Nondetects were substituted by half of reporting limit (RL) for the computation of summary statistics.

Laboratory QAQC results are not included.

* = Statewide Default Background Level or Regional Background Screening Level was used for criteria, per R 299.5750(B).

** = Generic facility-specific Part 201 Groundwater Surface Water Interface (GSI) and Soil GSI Protection Criteria were calculated for zinc using hardness data collected from receiving waters.

APPENDIX A
FLOW CHART OF COI SCREENING PROCESS



APPENDIX B
LEACH STUDY DATA PACKAGE
[CD ATTACHMENT]

APPENDIX C
SURFACE WATER RESULTS AND MDEQ FACILITY-
SPECIFIC CALCULATION WORKSHEETS

Midland Area Soils Leachability Testing Study
Surface Water - Chemical Monitoring Data
Third Quarter 2011

| <u>Location</u> | <u>Sample Date</u> | <u>Constituent</u> | <u>Unit</u> | <u>RL</u> | <u>Result</u> | <u>Comments</u> |
|-----------------|--------------------|--------------------|-------------|-----------|---------------|-----------------|
| PSW1 | 9/28/2011 | Calcium | ug/L | 500 | 54,000 | |
| PSW1 | 9/28/2011 | Hardness | ug/L | 2000 | 210,000 | |
| PSW1 | 9/28/2011 | Magnesium | ug/L | 200 | 18,000 | |
| PSW1 | 9/28/2011 | pH | S.U. | | 8.19 | |
| PSWTWO | 9/28/2011 | Calcium | ug/L | 500 | 70,000 | |
| PSWTWO | 9/28/2011 | Hardness | ug/L | 2000 | 250,000 | |
| PSWTWO | 9/28/2011 | Magnesium | ug/L | 200 | 19,000 | |
| PSWTWO | 9/28/2011 | pH | S.U. | | 7.88 | |
| PSW3 | 9/28/2011 | Calcium | ug/L | 500 | 61,000 | |
| PSW3 | 9/28/2011 | Hardness | ug/L | 2000 | 220,000 | |
| PSW3 | 9/28/2011 | Magnesium | ug/L | 200 | 15,000 | |
| PSW3 | 9/28/2011 | pH | S.U. | | 7.39 | |
| PSW4 | 9/28/2011 | Calcium | ug/L | 500 | 78,000 | |
| PSW4 | 9/28/2011 | Hardness | ug/L | 2000 | 250,000 | |
| PSW4 | 9/28/2011 | Magnesium | ug/L | 200 | 14,000 | |
| PSW4 | 9/28/2011 | pH | S.U. | | 7.29 | |

Abbreviations:

RL = Reporting Limit

ug/L = Microgram per Liter

S.U. = Standard Units

Calculation of Generic Facility-Specific Part 201 Groundwater Surface Water Interface (GSI) Criteria for {G} Footnoted Hazardous Substances

Directions for calculating generic facility-specific GSI criteria:

1. Enter "**hardness**" (Column C) or "**pH**" (Column D). Click the green check mark to the left of the Excel formula bar or press the "Enter" key.
2. The GSI criteria for surface water **not** protected as a source of drinking water are the lower of the final chronic value (FCV), wildlife value (WV), and the surface water human non-drinking water value (HNDV). These criteria are presented in Column L.
3. The GSI criteria for surface water protected as a source of drinking water are the lower of the FCV, WV, and surface water human drinking water value (HDV). Surface water protected as a source of drinking water includes the Great Lakes and their connecting waters, and inland surface water in close proximity to a water supply intake. These criteria are presented in Column M. Refer to Part 201 Criteria Application Guidesheet #3 for further guidance on selecting the applicable GSI criterion.
4. The final acute values (FAV) protective of aquatic life are presented in column E. The calculation of the FAV is provided to allow the identification of any exceedance of an acute GSI criterion. Where an exceedance of an acute GSI criterion exists, an evaluation must be done to determine appropriate action in accordance with provisions of R 299.5716, R 299.5526(4) and RRD Operational Memorandum No. 5.

| Calculate GSI in ug/L (ppb) | | | | | | | | | | | | |
|-----------------------------|--|--------------------------------|------------|-------------------------|-----------------------|---------------------------|-----------------------|---------------------|---|--|---|---|
| Hazardous Substance | Chemical Abstract Service Number (CAS #) | * ENTER Hardness in mg CaCO3/L | * ENTER pH | Final Acute Value (FAV) | FAV Conversion Factor | Final Chronic Value (FCV) | FCV Conversion Factor | Wildlife Value (WV) | Surface Water Human Non-Drinking Water Value (HNDV) | Surface Water Human Drinking Water Value (HDV) | GSI Criteria for Surface Water Not Protected for Drinking Water Use | GSI Criteria for Surface Water Protected for Drinking Water Use |
| Acetate | 71501 | NA | 8.19 | 191761.5592 | NA | 1.1E+4 | NA | NA | 1.3E+6 | 16,000 | 1.1E+4 | 1.1E+4 |
| Acetic acid | 64197 | NA | 8.19 | 191761.5592 | NA | 1.1E+4 | NA | NA | 1.3E+6 | 16,000 | 1.1E+4 | 1.1E+4 |
| Barium | 7440393 | 210 | NA | 5496.905598 | NA | 9.6E+2 | NA | NA | 1.6E+5 | 1,900 | 9.6E+2 | 9.6E+2 |
| Beryllium | 7440417 | 210 | NA | 281.0276679 | NA | 1.6E+1 | NA | NA | 1,200 | 160 | 1.6E+1 | 1.6E+1 |
| Cadmium | 7440439 | 210 | NA | 19.04699294 | 0.912949021 | 3.9E+0 | 0.877949021 | NA | 130 | 3 | 3.9E+0 | 2.5E+0 |
| Chromium (III) | 16065831 | 210 | NA | 2092.291556 | NA | 1.4E+2 | 0.86 | NA | 9,400 | 120 | 1.4E+2 | 1.2E+2 |
| Copper | 7440508 | 210 | NA | 54.07488805 | NA | 1.7E+1 | 0.96 | NA | 38,000 | 470 | 1.7E+1 | 1.7E+1 |
| Lead | 7439921 | 210 | NA | 406.9997459 | 0.682902962 | 2.3E+1 | 0.682902962 | NA | 190 | 14 | 2.3E+1 | 1.4E+1 |
| Manganese | 7439965 | 210 | NA | 15976.90075 | NA | 3.7E+3 | NA | NA | 59,000 | 1,300 | 3.7E+3 | 1.3E+3 |
| Nickel | 7440020 | 210 | NA | 1754.252552 | NA | 9.7E+1 | 0.997 | NA | 2.1E+5 | 2,600 | 9.7E+1 | 9.7E+1 |
| Zinc | 7440666 | 210 | NA | 439.4420185 | NA | 2.2E+2 | 0.986 | NA | 16,000 | 3,300 | 2.2E+2 | 2.2E+2 |
| Pentachlorophenol | 87865 | NA | 8.19 | 57.69076915 | NA | 2.2E+1 | NA | NA | 2.8 | 1.8 | 2.8E+0 | 1.8E+0 |
| Sample PSW1 | | | | | | | | | | | | |

NA = Criterion or value is not available or not applicable.

* The formulas in this spreadsheet depend upon appropriate entries in these cells. Do not leave these cells blank. If numeric hardness or pH values are not available, enter the word "hardness" or "pH" in the appropriate cell.

Calculation of Generic Facility-Specific Part 201 Soil GSI Protection Criteria (GSI PC)

Directions for calculating a generic facility-specific soil GSI PC:

1. Manually type in the "GSI" criterion calculated on the previous page, rounded to 2 significant figures. DO NOT CUT AND PASTE as this will enter the unrounded value and generate a different value. Click the green check mark to the left of the Excel formula bar or press the "Enter" key.
2. The GSI PC will calculate and appear in Column W. The GSI PC are the higher of the Soil-Water Partition Value for GSI (Column U) and the 20 X GSI value (Column V).

| Calculate Soil GSI PC in ug/Kg (ppb) | | | | | | | | |
|--------------------------------------|--|-------------|--|---------------------------------------|--|--|----------------|-------------------|
| Hazardous Substance | Chemical Abstract Service Number (CAS #) | * ENTER GSI | Soil-Water Distribution Coefficients (Kd) L/Kg | Henry's Law Constant (HLC) atm-m3/mol | Soil Organic Carbon-Water Partition Coefficient (Koc) L/Kg | Soil-Water Partition Value for GSI ug/Kg | 20 X GSI ug/Kg | Soil GSI PC ug/Kg |
| Acetate | 71501 | 11000 | NA | NA | NA | NA | 2.2E+5 | 2.2E+5 |
| Acetic acid | 64197 | 11000 | NA | NA | NA | NA | 2.2E+5 | 2.2E+5 |
| Barium | 7440393 | 960 | 41 | NA | NA | 6.3E+5 | 1.9E+4 | 6.3E+5 |
| Beryllium | 7440417 | 16 | 790 | NA | NA | 2.0E+5 | 3.2E+2 | 2.0E+5 |
| Cadmium | 7440439 | 2.5 | 75 | NA | NA | 3.0E+3 | 5.0E+1 | 3.0E+3 |
| Chromium (III) | 16065831 | 120 | 1.8E+6 | NA | NA | 3.5E+9 | 2.4E+3 | 3.5E+9 |
| Copper | 7440508 | 17 | 360 | NA | NA | 9.8E+4 | 3.4E+2 | 9.8E+4 |
| Lead | 7439921 | 14 | 11,000 | NA | NA | 2.5E+6 | 2.8E+2 | 2.5E+6 |
| Manganese | 7439965 | 1300 | NA | NA | NA | NA | 2.6E+4 | 2.6E+4 |
| Nickel | 7440020 | 97 | 65 | NA | NA | 1.0E+5 | 1.9E+3 | 1.0E+5 |
| Zinc | 7440666 | 220 | 62 | NA | NA | 2.2E+5 | 4.4E+3 | 2.2E+5 |
| Pentachlorophenol | 87865 | 1.8 | NA | 2.44E-8 | 592 | 1.7E+4 | 3.6E+1 | 1.7E+4 |
| Sample PSW1 | | | | | | | | |

NA = Criterion or value is not available or not applicable.

* The formulas in this spreadsheet depend upon appropriate entries in these cells. Do not leave these cells blank. If numeric GSI values are not available, enter "GSI" in the appropriate cell.

Calculation of Generic Facility-Specific Part 201 Groundwater Surface Water Interface (GSI) Criteria for {G} Footnoted Hazardous Substances

Directions for calculating generic facility-specific GSI criteria:

1. Enter "**hardness**" (Column C) or "**pH**" (Column D). Click the green check mark to the left of the Excel formula bar or press the "Enter" key.
2. The GSI criteria for surface water **not** protected as a source of drinking water are the lower of the final chronic value (FCV), wildlife value (WV), and the surface water human non-drinking water value (HNDV). These criteria are presented in Column L.
3. The GSI criteria for surface water protected as a source of drinking water are the lower of the FCV, WV, and surface water human drinking water value (HDV). Surface water protected as a source of drinking water includes the Great Lakes and their connecting waters, and inland surface water in close proximity to a water supply intake. These criteria are presented in Column M. Refer to Part 201 Criteria Application Guidesheet #3 for further guidance on selecting the applicable GSI criterion.
4. The final acute values (FAV) protective of aquatic life are presented in column E. The calculation of the FAV is provided to allow the identification of any exceedance of an acute GSI criterion. Where an exceedance of an acute GSI criterion exists, an evaluation must be done to determine appropriate action in accordance with provisions of R 299.5716, R 299.5526(4) and RRD Operational Memorandum No. 5.

| Calculate GSI in ug/L (ppb) | | | | | | | | | | | | |
|-----------------------------|--|--------------------------------|------------|-------------------------|-----------------------|---------------------------|-----------------------|---------------------|---|--|---|---|
| Hazardous Substance | Chemical Abstract Service Number (CAS #) | * ENTER Hardness in mg CaCO3/L | * ENTER pH | Final Acute Value (FAV) | FAV Conversion Factor | Final Chronic Value (FCV) | FCV Conversion Factor | Wildlife Value (WV) | Surface Water Human Non-Drinking Water Value (HNDV) | Surface Water Human Drinking Water Value (HDV) | GSI Criteria for Surface Water Not Protected for Drinking Water Use | GSI Criteria for Surface Water Protected for Drinking Water Use |
| Acetate | 71501 | NA | 7.88 | 176189.6058 | NA | 9.8E+3 | NA | NA | 1.3E+6 | 16,000 | 9.8E+3 | 9.8E+3 |
| Acetic acid | 64197 | NA | 7.88 | 176189.6058 | NA | 9.8E+3 | NA | NA | 1.3E+6 | 16,000 | 9.8E+3 | 9.8E+3 |
| Barium | 7440393 | 250 | NA | 6616.096415 | NA | 1.2E+3 | NA | NA | 1.6E+5 | 1,900 | 1.2E+3 | 1.2E+3 |
| Beryllium | 7440417 | 250 | NA | 436.6801716 | NA | 2.4E+1 | NA | NA | 1,200 | 160 | 2.4E+1 | 2.4E+1 |
| Cadmium | 7440439 | 250 | NA | 23.00144948 | 0.905654075 | 4.4E+0 | 0.870654075 | NA | 130 | 3 | 4.4E+0 | 2.5E+0 |
| Chromium (III) | 16065831 | 250 | NA | 2413.445339 | NA | 1.6E+2 | 0.86 | NA | 9,400 | 120 | 1.6E+2 | 1.2E+2 |
| Copper | 7440508 | 250 | NA | 63.72937886 | NA | 2.0E+1 | 0.96 | NA | 38,000 | 470 | 2.0E+1 | 2.0E+1 |
| Lead | 7439921 | 250 | NA | 489.2400483 | 0.65749793 | 2.7E+1 | 0.65749793 | NA | 190 | 14 | 2.7E+1 | 1.4E+1 |
| Manganese | 7439965 | 250 | NA | 18621.11201 | NA | 4.3E+3 | NA | NA | 59,000 | 1,300 | 4.3E+3 | 1.3E+3 |
| Nickel | 7440020 | 250 | NA | 2033.067702 | NA | 1.1E+2 | 0.997 | NA | 2.1E+5 | 2,600 | 1.1E+2 | 1.1E+2 |
| Zinc | 7440666 | 250 | NA | 509.4009397 | NA | 2.6E+2 | 0.986 | NA | 16,000 | 3,300 | 2.6E+2 | 2.6E+2 |
| Pentachlorophenol | 87865 | NA | 7.88 | 42.2475845 | NA | 1.6E+1 | NA | NA | 2.8 | 1.8 | 2.8E+0 | 1.8E+0 |
| Sample PSWTWO | | | | | | | | | | | | |

NA = Criterion or value is not available or not applicable.

* The formulas in this spreadsheet depend upon appropriate entries in these cells. Do not leave these cells blank. If numeric hardness or pH values are not available, enter the word "hardness" or "pH" in the appropriate cell.

Calculation of Generic Facility-Specific Part 201 Soil GSI Protection Criteria (GSI PC)

Directions for calculating a generic facility-specific soil GSI PC:

1. Manually type in the "**GSI**" criterion calculated on the previous page, rounded to 2 significant figures. DO NOT CUT AND PASTE as this will enter the unrounded value and generate a different value. Click the green check mark to the left of the Excel formula bar or press the "Enter" key.
2. The GSI PC will calculate and appear in Column W. The GSI PC are the higher of the Soil-Water Partition Value for GSI (Column U) and the 20 X GSI value (Column V).

| Calculate Soil GSI PC in ug/Kg (ppb) | | | | | | | | |
|--------------------------------------|--|-------------|--|---------------------------------------|--|--|----------------|-------------------|
| Hazardous Substance | Chemical Abstract Service Number (CAS #) | * ENTER GSI | Soil-Water Distribution Coefficients (Kd) L/Kg | Henry's Law Constant (HLC) atm-m3/mol | Soil Organic Carbon-Water Partition Coefficient (Koc) L/Kg | Soil-Water Partition Value for GSI ug/Kg | 20 X GSI ug/Kg | Soil GSI PC ug/Kg |
| Acetate | 71501 | 9.8E+03 | NA | NA | NA | NA | 2.0E+5 | 2.0E+5 |
| Acetic acid | 64197 | 9.8E+03 | NA | NA | NA | NA | 2.0E+5 | 2.0E+5 |
| Barium | 7440393 | 1.2E+03 | 41 | NA | NA | 7.9E+5 | 2.4E+4 | 7.9E+5 |
| Beryllium | 7440417 | 2.4E+01 | 790 | NA | NA | 3.0E+5 | 4.8E+2 | 3.0E+5 |
| Cadmium | 7440439 | 2.5E+00 | 75 | NA | NA | 3.0E+3 | 5.0E+1 | 3.0E+3 |
| Chromium (III) | 16065831 | 1.2E+02 | 1.8E+6 | NA | NA | 3.5E+9 | 2.4E+3 | 3.5E+9 |
| Copper | 7440508 | 2.0E+01 | 360 | NA | NA | 1.2E+5 | 4.0E+2 | 1.2E+5 |
| Lead | 7439921 | 1.4E+01 | 11,000 | NA | NA | 2.5E+6 | 2.8E+2 | 2.5E+6 |
| Manganese | 7439965 | 1.3E+03 | NA | NA | NA | NA | 2.6E+4 | 2.6E+4 |
| Nickel | 7440020 | 1.1E+02 | 65 | NA | NA | 1.1E+5 | 2.2E+3 | 1.1E+5 |
| Zinc | 7440666 | 2.6E+02 | 62 | NA | NA | 2.6E+5 | 5.2E+3 | 2.6E+5 |
| Pentachlorophenol | 87865 | 1.8E+00 | NA | 2.44E-8 | 592 | 1.7E+4 | 3.6E+1 | 1.7E+4 |
| Sample PSWTWO | | | | | | | | |

NA = Criterion or value is not available or not applicable.

* The formulas in this spreadsheet depend upon appropriate entries in these cells. Do not leave these cells blank. If numeric GSI values are not available, enter "GSI" in the appropriate cell.

Calculation of Generic Facility-Specific Part 201 Groundwater Surface Water Interface (GSI) Criteria for {G} Footnoted Hazardous Substances

Directions for calculating generic facility-specific GSI criteria:

1. Enter "**hardness**" (Column C) or "**pH**" (Column D). Click the green check mark to the left of the Excel formula bar or press the "Enter" key.
2. The GSI criteria for surface water **not** protected as a source of drinking water are the lower of the final chronic value (FCV), wildlife value (WV), and the surface water human non-drinking water value (HNDV). These criteria are presented in Column L.
3. The GSI criteria for surface water protected as a source of drinking water are the lower of the FCV, WV, and surface water human drinking water value (HDV). Surface water protected as a source of drinking water includes the Great Lakes and their connecting waters, and inland surface water in close proximity to a water supply intake. These criteria are presented in Column M. Refer to Part 201 Criteria Application Guidesheet #3 for further guidance on selecting the applicable GSI criterion.
4. The final acute values (FAV) protective of aquatic life are presented in column E. The calculation of the FAV is provided to allow the identification of any exceedance of an acute GSI criterion. Where an exceedance of an acute GSI criterion exists, an evaluation must be done to determine appropriate action in accordance with provisions of R 299.5716, R 299.5526(4) and RRD Operational Memorandum No. 5.

| Calculate GSI in ug/L (ppb) | | | | | | | | | | | | |
|-----------------------------|--|--------------------------------|------------|-------------------------|-----------------------|---------------------------|-----------------------|---------------------|---|--|---|---|
| Hazardous Substance | Chemical Abstract Service Number (CAS #) | * ENTER Hardness in mg CaCO3/L | * ENTER pH | Final Acute Value (FAV) | FAV Conversion Factor | Final Chronic Value (FCV) | FCV Conversion Factor | Wildlife Value (WV) | Surface Water Human Non-Drinking Water Value (HNDV) | Surface Water Human Drinking Water Value (HDV) | GSI Criteria for Surface Water Not Protected for Drinking Water Use | GSI Criteria for Surface Water Protected for Drinking Water Use |
| Acetate | 71501 | NA | 7.39 | 154114.0205 | NA | 8.6E+3 | NA | NA | 1.3E+6 | 16,000 | 8.6E+3 | 8.6E+3 |
| Acetic acid | 64197 | NA | 7.39 | 154114.0205 | NA | 8.6E+3 | NA | NA | 1.3E+6 | 16,000 | 8.6E+3 | 8.6E+3 |
| Barium | 7440393 | 220 | NA | 5775.538161 | NA | 1.0E+3 | NA | NA | 1.6E+5 | 1,900 | 1.0E+3 | 1.0E+3 |
| Beryllium | 7440417 | 220 | NA | 316.0976151 | NA | 1.8E+1 | NA | NA | 1,200 | 160 | 1.8E+1 | 1.8E+1 |
| Cadmium | 7440439 | 220 | NA | 20.03036858 | 0.911002623 | 4.0E+0 | 0.876002623 | NA | 130 | 3 | 4.0E+0 | 2.5E+0 |
| Chromium (III) | 16065831 | 220 | NA | 2173.545699 | NA | 1.4E+2 | 0.86 | NA | 9,400 | 120 | 1.4E+2 | 1.2E+2 |
| Copper | 7440508 | 220 | NA | 56.49776389 | NA | 1.8E+1 | 0.96 | NA | 38,000 | 470 | 1.8E+1 | 1.8E+1 |
| Lead | 7439921 | 220 | NA | 427.5439301 | 0.67612453 | 2.4E+1 | 0.67612453 | NA | 190 | 14 | 2.4E+1 | 1.4E+1 |
| Manganese | 7439965 | 220 | NA | 16643.29043 | NA | 3.9E+3 | NA | NA | 59,000 | 1,300 | 3.9E+3 | 1.3E+3 |
| Nickel | 7440020 | 220 | NA | 1824.669369 | NA | 1.0E+2 | 0.997 | NA | 2.1E+5 | 2,600 | 1.0E+2 | 1.0E+2 |
| Zinc | 7440666 | 220 | NA | 457.109145 | NA | 2.3E+2 | 0.986 | NA | 16,000 | 3,300 | 2.3E+2 | 2.3E+2 |
| Pentachlorophenol | 87865 | NA | 7.39 | 25.81865211 | NA | 9.9E+0 | NA | NA | 2.8 | 1.8 | 2.8E+0 | 1.8E+0 |
| Sample PSW3 | | | | | | | | | | | | |

NA = Criterion or value is not available or not applicable.

* The formulas in this spreadsheet depend upon appropriate entries in these cells. Do not leave these cells blank. If numeric hardness or pH values are not available, enter the word "hardness" or "pH" in the appropriate cell.

Calculation of Generic Facility-Specific Part 201 Soil GSI Protection Criteria (GSI PC)

Directions for calculating a generic facility-specific soil GSI PC:

1. Manually type in the "GSI" criterion calculated on the previous page, rounded to 2 significant figures. DO NOT CUT AND PASTE as this will enter the unrounded value and generate a different value. Click the green check mark to the left of the Excel formula bar or press the "Enter" key.
2. The GSI PC will calculate and appear in Column W. The GSI PC are the higher of the Soil-Water Partition Value for GSI (Column U) and the 20 X GSI value (Column V).

| Calculate Soil GSI PC in ug/Kg (ppb) | | | | | | | | |
|--------------------------------------|--|-------------|--|---------------------------------------|--|--|----------------|-------------------|
| Hazardous Substance | Chemical Abstract Service Number (CAS #) | * ENTER GSI | Soil-Water Distribution Coefficients (Kd) L/Kg | Henry's Law Constant (HLC) atm-m3/mol | Soil Organic Carbon-Water Partition Coefficient (Koc) L/Kg | Soil-Water Partition Value for GSI ug/Kg | 20 X GSI ug/Kg | Soil GSI PC ug/Kg |
| Acetate | 71501 | 8.6E+03 | NA | NA | NA | NA | 1.7E+5 | 1.7E+5 |
| Acetic acid | 64197 | 8.6E+03 | NA | NA | NA | NA | 1.7E+5 | 1.7E+5 |
| Barium | 7440393 | 1.0E+03 | 41 | NA | NA | 6.6E+5 | 2.0E+4 | 6.6E+5 |
| Beryllium | 7440417 | 1.8E+01 | 790 | NA | NA | 2.3E+5 | 3.6E+2 | 2.3E+5 |
| Cadmium | 7440439 | 2.5E+00 | 75 | NA | NA | 3.0E+3 | 5.0E+1 | 3.0E+3 |
| Chromium (III) | 16065831 | 1.2E+02 | 1.8E+6 | NA | NA | 3.5E+9 | 2.4E+3 | 3.5E+9 |
| Copper | 7440508 | 1.8E+01 | 360 | NA | NA | 1.0E+5 | 3.6E+2 | 1.0E+5 |
| Lead | 7439921 | 1.4E+01 | 11,000 | NA | NA | 2.5E+6 | 2.8E+2 | 2.5E+6 |
| Manganese | 7439965 | 1.3E+03 | NA | NA | NA | NA | 2.6E+4 | 2.6E+4 |
| Nickel | 7440020 | 1.0E+02 | 65 | NA | NA | 1.0E+5 | 2.0E+3 | 1.0E+5 |
| Zinc | 7440666 | 2.3E+02 | 62 | NA | NA | 2.3E+5 | 4.6E+3 | 2.3E+5 |
| Pentachlorophenol | 87865 | 1.8E+00 | NA | 2.44E-8 | 592 | 1.7E+4 | 3.6E+1 | 1.7E+4 |
| Sample PSW3 | | | | | | | | |

NA = Criterion or value is not available or not applicable.

* The formulas in this spreadsheet depend upon appropriate entries in these cells. Do not leave these cells blank. If numeric GSI values are not available, enter "GSI" in the appropriate cell.

Calculation of Generic Facility-Specific Part 201 Groundwater Surface Water Interface (GSI) Criteria for {G} Footnoted Hazardous Substances

Directions for calculating generic facility-specific GSI criteria:

1. Enter "**hardness**" (Column C) or "**pH**" (Column D). Click the green check mark to the left of the Excel formula bar or press the "Enter" key.
2. The GSI criteria for surface water **not** protected as a source of drinking water are the lower of the final chronic value (FCV), wildlife value (WV), and the surface water human non-drinking water value (HNDV). These criteria are presented in Column L.
3. The GSI criteria for surface water protected as a source of drinking water are the lower of the FCV, WV, and surface water human drinking water value (HDV). Surface water protected as a source of drinking water includes the Great Lakes and their connecting waters, and inland surface water in close proximity to a water supply intake. These criteria are presented in Column M. Refer to Part 201 Criteria Application Guidesheet #3 for further guidance on selecting the applicable GSI criterion.
4. The final acute values (FAV) protective of aquatic life are presented in column E. The calculation of the FAV is provided to allow the identification of any exceedance of an acute GSI criterion. Where an exceedance of an acute GSI criterion exists, an evaluation must be done to determine appropriate action in accordance with provisions of R 299.5716, R 299.5526(4) and RRD Operational Memorandum No. 5.

| Calculate GSI in ug/L (ppb) | | | | | | | | | | | | |
|-----------------------------|--|--------------------------------|------------|-------------------------|-----------------------|---------------------------|-----------------------|---------------------|---|--|---|---|
| Hazardous Substance | Chemical Abstract Service Number (CAS #) | * ENTER Hardness in mg CaCO3/L | * ENTER pH | Final Acute Value (FAV) | FAV Conversion Factor | Final Chronic Value (FCV) | FCV Conversion Factor | Wildlife Value (WV) | Surface Water Human Non-Drinking Water Value (HNDV) | Surface Water Human Drinking Water Value (HDV) | GSI Criteria for Surface Water Not Protected for Drinking Water Use | GSI Criteria for Surface Water Protected for Drinking Water Use |
| Acetate | 71501 | NA | 7.29 | 149960.6192 | NA | 8.3E+3 | NA | NA | 1.3E+6 | 16,000 | 8.3E+3 | 8.3E+3 |
| Acetic acid | 64197 | NA | 7.29 | 149960.6192 | NA | 8.3E+3 | NA | NA | 1.3E+6 | 16,000 | 8.3E+3 | 8.3E+3 |
| Barium | 7440393 | 250 | NA | 6616.096415 | NA | 1.2E+3 | NA | NA | 1.6E+5 | 1,900 | 1.2E+3 | 1.2E+3 |
| Beryllium | 7440417 | 250 | NA | 436.6801716 | NA | 2.4E+1 | NA | NA | 1,200 | 160 | 2.4E+1 | 2.4E+1 |
| Cadmium | 7440439 | 250 | NA | 23.00144948 | 0.905654075 | 4.4E+0 | 0.870654075 | NA | 130 | 3 | 4.4E+0 | 2.5E+0 |
| Chromium (III) | 16065831 | 250 | NA | 2413.445339 | NA | 1.6E+2 | 0.86 | NA | 9,400 | 120 | 1.6E+2 | 1.2E+2 |
| Copper | 7440508 | 250 | NA | 63.72937886 | NA | 2.0E+1 | 0.96 | NA | 38,000 | 470 | 2.0E+1 | 2.0E+1 |
| Lead | 7439921 | 250 | NA | 489.2400483 | 0.65749793 | 2.7E+1 | 0.65749793 | NA | 190 | 14 | 2.7E+1 | 1.4E+1 |
| Manganese | 7439965 | 250 | NA | 18621.11201 | NA | 4.3E+3 | NA | NA | 59,000 | 1,300 | 4.3E+3 | 1.3E+3 |
| Nickel | 7440020 | 250 | NA | 2033.067702 | NA | 1.1E+2 | 0.997 | NA | 2.1E+5 | 2,600 | 1.1E+2 | 1.1E+2 |
| Zinc | 7440666 | 250 | NA | 509.4009397 | NA | 2.6E+2 | 0.986 | NA | 16,000 | 3,300 | 2.6E+2 | 2.6E+2 |
| Pentachlorophenol | 87865 | NA | 7.29 | 23.35000459 | NA | 9.0E+0 | NA | NA | 2.8 | 1.8 | 2.8E+0 | 1.8E+0 |
| Sample PSW4 | | | | | | | | | | | | |

NA = Criterion or value is not available or not applicable.

* The formulas in this spreadsheet depend upon appropriate entries in these cells. Do not leave these cells blank. If numeric hardness or pH values are not available, enter the word "hardness" or "pH" in the appropriate cell.

Calculation of Generic Facility-Specific Part 201 Soil GSI Protection Criteria (GSI PC)

Directions for calculating a generic facility-specific soil GSI PC:

1. Manually type in the "**GSI**" criterion calculated on the previous page, rounded to 2 significant figures. DO NOT CUT AND PASTE as this will enter the unrounded value and generate a different value. Click the green check mark to the left of the Excel formula bar or press the "Enter" key.
2. The GSI PC will calculate and appear in Column W. The GSI PC are the higher of the Soil-Water Partition Value for GSI (Column U) and the 20 X GSI value (Column V).

| Calculate Soil GSI PC in ug/Kg (ppb) | | | | | | | | |
|--------------------------------------|--|-------------|--|---------------------------------------|--|--|----------------|-------------------|
| Hazardous Substance | Chemical Abstract Service Number (CAS #) | * ENTER GSI | Soil-Water Distribution Coefficients (Kd) L/Kg | Henry's Law Constant (HLC) atm-m3/mol | Soil Organic Carbon-Water Partition Coefficient (Koc) L/Kg | Soil-Water Partition Value for GSI ug/Kg | 20 X GSI ug/Kg | Soil GSI PC ug/Kg |
| Acetate | 71501 | 8.3E+03 | NA | NA | NA | NA | 1.7E+5 | 1.7E+5 |
| Acetic acid | 64197 | 8.3E+03 | NA | NA | NA | NA | 1.7E+5 | 1.7E+5 |
| Barium | 7440393 | 1.2E+03 | 41 | NA | NA | 7.9E+5 | 2.4E+4 | 7.9E+5 |
| Beryllium | 7440417 | 2.4E+01 | 790 | NA | NA | 3.0E+5 | 4.8E+2 | 3.0E+5 |
| Cadmium | 7440439 | 2.5E+00 | 75 | NA | NA | 3.0E+3 | 5.0E+1 | 3.0E+3 |
| Chromium (III) | 16065831 | 1.2E+02 | 1.8E+6 | NA | NA | 3.5E+9 | 2.4E+3 | 3.5E+9 |
| Copper | 7440508 | 2.0E+01 | 360 | NA | NA | 1.2E+5 | 4.0E+2 | 1.2E+5 |
| Lead | 7439921 | 1.4E+01 | 11,000 | NA | NA | 2.5E+6 | 2.8E+2 | 2.5E+6 |
| Manganese | 7439965 | 1.3E+03 | NA | NA | NA | NA | 2.6E+4 | 2.6E+4 |
| Nickel | 7440020 | 1.1E+02 | 65 | NA | NA | 1.1E+5 | 2.2E+3 | 1.1E+5 |
| Zinc | 7440666 | 2.6E+02 | 62 | NA | NA | 2.6E+5 | 5.2E+3 | 2.6E+5 |
| Pentachlorophenol | 87865 | 1.8E+00 | NA | 2.44E-8 | 592 | 1.7E+4 | 3.6E+1 | 1.7E+4 |
| Sample PSW4 | | | | | | | | |

NA = Criterion or value is not available or not applicable.

* The formulas in this spreadsheet depend upon appropriate entries in these cells. Do not leave these cells blank. If numeric GSI values are not available, enter "GSI" in the appropriate cell.

APPENDIX D
RESIDENTIAL WATER WELL DATA PACKAGE
[CD ATTACHMENT]