Prepared for:
BASF Corporation
Wyandotte, Michigan

Tier 2 Risk Evaluation Summary Report for BASF North Works Facility, Wyandotte, Michigan

ENSR Corporation
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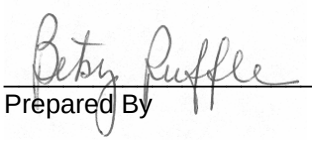

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1.0 Introduction

This report presents the results of the Tier 2 risk evaluation performed on soil and groundwater data collected at the BASF North Works Facility in Wyandotte, Michigan. The BASF North Works Facility (the "Facility") is located on the U.S. shore of the Detroit River at 1609 Biddle Avenue in Wayne County. It is bounded on the west by Biddle Avenue, on the north by Perry Place, on the south by James DeSana Drive, and on the east by the Detroit River (Trenton Channel) (the "river"). The Facility occupies approximately 230 acres. The Facility location is provided in Figure 1.

The BASF North Works Facility is subject to the requirements of Corrective Action as outlined in the Administrative Order on Consent (Docket No. V-W-011-94). BASF and the U.S. Environmental Protection Agency (USEPA), Region 5, entered into the Administrative Order on Consent on February 28, 1994 pursuant to Section 3008(h) of the Resource Conservation and Recovery Act (RCRA) and the Hazardous and Solid Waste Amendments (HSWA) to RCRA. The SWMU/AOCs that are the subject of corrective action are shown in Figure 2.

The Tier 2 risk evaluation builds on the results of the *Risk Screening Summary Report* dated April 6, 2005 (ENSR, 2005) herein referred to as the "Tier 1" risk screening. The Tier 1 risk screening identified potential constituents of interest (COI) present in the soil SWMUs and AOCs and in groundwater monitoring wells at concentrations higher than or approaching risk-based screening levels based on maximum detects thereby warranting further evaluation. Because of the very conservative nature of the Tier 1 risk screening, it is appropriate to consider more realistic assumptions and more refined methods of risk evaluation before concluding that certain SWMU/AOCs require corrective action for one or more COI. It is the objective of this Tier 2 risk evaluation to provide more appropriate assumptions and refined methods to identify SWMU/AOCs potentially requiring further evaluation or corrective action.

It should be noted that the Tier 2 approach for evaluating potential human health risks posed by the North Works site did not involve calculation of site-specific risks using site-specific exposure assumptions and worker activities, with the exception of a site redevelopment scenario evaluation. Rather, a simplified approach was used that involved comparing site data to cleanup criteria developed under the Part 201 program by the MDEQ Remediation and Redevelopment Division (RRD) (issued in December 2002). This approach was used in lieu of performing a site-specific risk assessment because of the limited number of criteria exceedances remaining at the conclusion of the Tier 1 risk screening. However, because of inherent conservatism in the Part 201 criteria, any criteria exceedances remaining at the conclusion of the Tier 2 may not necessarily warrant corrective action. It may be appropriate to consider site-specific factors that reflect realistic exposures at the facility and can be addressed using institutional controls. Where applicable, these are identified in the summary and conclusions of the Tier 2 risk evaluation.

The Tier 2 risk evaluation also includes a screening-level evaluation of potential ecological risks and a refined evaluation of Michigan Part 201 Groundwater Surface Water Interface (GSI) protection criteria exceedances in soil. Last, at the request of USEPA, a redevelopment scenario addressing potential utility/redevelopment worker exposures to soil and shallow groundwater is included in the Tier 2 human health risk evaluation. Based on the outcome of the Tier 2 risk evaluation, a final list of COI and SWMU/AOCs that may pose unacceptable risk are identified for consideration in the Corrective Measures Study (CMS) process. Because data gathering activities are ongoing, the results of this Tier 2 risk evaluation are not final but serve as a means to focus future evaluations on SWMUs and AOCs potentially requiring corrective action.

1.1 Background

The Tier 1 risk screening utilized historical data available from the site database, which included a round of groundwater samples collected in December 2003, as well as soil and groundwater data collected in the mid to

late 1990s. During an April 11, 2006 meeting between BASF and EPA to discuss the CMS, BASF and EPA agreed that the following additional data collection activities were needed to complete the Tier 2 risk evaluation and, therefore, Draft CMS Report:

- collect additional background groundwater data to determine site-specific GSI criteria for mercury and other applicable COI;
- install new nested pair groundwater monitoring wells along the river that are more representative of GSI monitoring wells;
- collect additional groundwater data from new GSI wells to establish more accurate baseline GSI conditions; and
- collect potentiometric head data to better define groundwater surface water interactions, especially along the steel sheet pile seawall adjacent to the Detroit River.

In August 2006, BASF and EPA agreed upon a GSI and background monitoring well plan that identified monitoring wells to be used for evaluating background groundwater quality and groundwater quality at the groundwater-surface water interface along the Detroit River. In addition, BASF and EPA agreed that four quarters of groundwater quality data would be collected from the GSI and background monitoring wells to provide data for completing the Tier 2 risk evaluation. Quarterly data were collected from 26 GSI and 8 background monitoring wells in August/September 2006, November 2006, February 2007 and May 2007. In July 2007, BASF, EPA and the Michigan Department of Environmental Quality (MDEQ) agreed to install an additional 6 background monitoring wells upgradient of the facility and conduct an additional 4 quarters of groundwater monitoring to augment the August 2006 background monitoring plan. The 6 additional background monitoring wells were installed in August 2007.

In addition to the background and GSI groundwater quality data, the results of the Tier 1 risk screening identified data gaps in the soil data set. To address these data gaps and support the Tier 2 risk evaluation and the Screening-Level Ecological Risk Assessment (SERA), the following soil samples were collected and analyzed (in July 2006 and May 2007):

- Two additional soil samples from AOC 2 and six soil samples from AOC 7C for arsenic analysis to supplement the existing data collected during the RFI and support statistical evaluations of arsenic in these two AOCs, particularly in relation to background concentrations of arsenic in soil;
- Two soil samples at RFIMW-24 for chromium III/VI analysis to address exceedance of Part 201 Particulate Soil Inhalation Criteria for ambient air at this location;
- Ten soil samples from SWMUs/AOCs for Total Organic Carbon (TOC) analysis to support fate and transport evaluation of polynuclear aromatic hydrocarbons (PAHs) and inorganics that exceeded Part 201 GSI criteria;
- Ten background soil samples from unaffected on-site locations and nearby off-site locations for analysis of inorganics;
- Ten shallow (0-2 feet) soil samples from AOC 6 to address exceedances of Part 201 Infinite Source Volatilization Soil Inhalation Criteria (VSIC) for ambient air:
- Ten shallow (0-2 feet) soil samples from SWMU F to address exceedances of Part 201 Infinite Source Volatilization Soil Inhalation Criteria (VSIC) for ambient air and Soil Volatilization to Indoor Air Inhalation Criteria (SVIIC); and
- Ten shallow (0-2 feet) soil samples from SWMU H for evaluation of ecological risk.

1.2 Summary of Tier 1 Risk Screening

The Tier 1 risk screening was performed in accordance with the EPA-approved work plan (ENSR, 2004). The Generic Cleanup Criteria developed under the Part 201 program by the MDEQ Remediation and Redevelopment Division (RRD) (issued in December 2002) were used as screening criteria for several reasons:

- Industrial soil and groundwater screening criteria are available, which is appropriate for the current and future use of the BASF Wyandotte Facility;
- Local climate has been accounted for in the derivation of the criteria (e.g., soil exposure frequency reflects local climate conditions); and
- Screening criteria are available for exposure pathways *potentially* applicable to the BASF Wyandotte Facility, including ingestion and dermal contact with soil, dermal contact with groundwater, inhalation of volatiles in ambient and indoor air, and inhalation of fugitive dust in ambient air; and the groundwater discharge to surface water pathway.

For soil, the maximum detected concentration of each constituent in each of the ten SWMU/AOCs and seven RFI monitoring wells was compared to all Part 201 screening criteria regardless of whether a particular exposure pathway was applicable to that SWMU/AOC/well. For groundwater, the maximum detected concentration of each constituent in each monitoring well was compared to the screening criterion. The data set selected for the groundwater risk screening was the most recent two years of monitoring data available for each well at that time, in order to best represent current site groundwater conditions.

Based on the results of the Tier 1 risk screening for soil, a limited suite of constituents and potential exposure pathways were identified as requiring further evaluation based on exceedances of one or more Part 201 criteria:

- Arsenic in soil exceeded its direct contact criterion (DCC) in AOC 2, AOC 6, AOC 7A, AOC 7C, SWMU F, SWMU G, and SWMU H;
- Chromium in soil exceeded its Particulate Soil Inhalation Criterion (PSIC) (for hexavalent chromium) at RFIMW 24;
- AOC 4 – a number of soil criteria exceedances for organics (PAH and BTEX), including soil saturation screening level (C_{sat}) for benzene, toluene and xylenes;
- AOC 6 – four PAH compounds exceeded their DCC, naphthalene and phenanthrene exceeded volatilization-based and groundwater contact protection criteria, benzene exceeded DCC, volatilization-based criteria, groundwater contact protection criterion, and C_{sat}, and xylenes exceeded its groundwater contact protection criterion and C_{sat};
- SWMU F - 1,2-Dichloropropane and bis(2-chloroisopropyl)ether exceeded volatilization-based criteria, and bis(2-chloroisopropyl)ether exceeded its DCC; and
- SWMU H - 1,2-Dichloropropane and bis(2-chloroisopropyl)ether exceeded DCC and volatilization-based criteria, chromium exceeded its particulate soil inhalation criterion (PSIC), and mercury exceeded volatilization soil inhalation criterion (VSIC).

In addition, 16 of the 17 soil exposure areas evaluated had exceedances of one or more Groundwater Surface Water Interface Protection (GSIP) criteria.

The Tier 1 risk screening for groundwater compared the analytical results at each well to Part 201 criteria[1]. With one exception, groundwater passed all Part 201 criteria except GSI. The single exception was exceedance of GCC and solubility limit criteria for bis(2-ethylhexyl)phthalate in one well (WHI2-1S), which is based on one historical sampling event. The elevated BEHP in WHI2-1S is believed to be a laboratory artifact, and as such, does not warrant further evaluation. No other constituents exceeded the GVIIC, GCC, or water solubility criteria in any wells while future use of on-site groundwater as drinking water will be prohibited via an institutional control.

The Tier 1 risk screening identified multiple GSI exceedances in groundwater. The GSI exceedances are evaluated further in this Tier 2 risk evaluation. In the Tier 1 screening, the results from all wells were compared to GSI criteria, not just wells located adjacent to the river. It is noted that GSI exceedances were observed in wells located along Biddle Avenue on the western (upgradient) side of the Facility (RFIMW-24, RFIMW-25, RFIMW-26, RFIMW-27, RFIMW-28, RFIMW-29, and P34N). These wells are upgradient of the Facility and are intended to serve as indicators of background conditions in groundwater.

1.3 Ecological Risk Assessment

To complement the Tier 2 human health risk evaluation, a screening-level ecological risk assessment (SERA) has also been completed to support the CMS. The screening ecological risk assessment, per USEPA Region 5 guidance (2005), provides an overview of the receptors potentially exposed to constituents at the Site, and presents a conservative screening of the constituent concentration data using standard ecological screening values. The purpose of the screening ecological risk assessment is not to assess risk, but to determine using very conservative methods, whether or not the Facility, or portions of the Facility, can be determined to pose no risk to ecological receptors, and thus require no further evaluation.

1.4 Organization of Report

In addition to the introduction section, the report is organized into the following sections:

Section 2.0 – Data Evaluation and Description of SWMU/AOCs
Section 3.0 – Tier 2 Human Health Risk Assessment
Section 4.0 – Screening-Level Ecological Risk Assessment
Section 5.0 – Tier 2 Evaluation of Groundwater Surface Water Interface (GSI) Pathway and Groundwater Contact Protection Criteria (GCPC) Pathway
Section 6.0 – Summary and Conclusions

[1] At the request of USEPA, the comparison of groundwater data to industrial drinking water criteria was included in the Tier 1 risk screening. Results were provided in an appendix, as the comparison was not relevant to current and future uses of the site. The industrial drinking water pathway is not evaluated further in this Tier 2 risk evaluation.

2.0 Data Evaluation and Description of SWMU/AOCs

An updated version of the database used for the Tier 1 risk screening was used for this Tier 2 risk evaluation. Updates included additional soil and groundwater data collected since April 2005, and, for data gathered before April 2005, information on sample identification, location, depth, date, result, qualifier, etc. were included where available[2]. Soil data are coded by the SWMU/AOC in which each sample is located, unless a particular sample is not associated with any SWMU/AOC. Figure 2 presents the SWMU/AOCs and monitoring wells at the Facility. There are a total of 116 wells at the Facility that have been sampled as part of the RFI and CMS. Of this total, 26 are identified as GSI wells (identified in Table 2-3). Figure 3 presents all sampling points where data have been collected, including soil samples. Figures 3a through 3e present enlargements of specific areas of the Facility depicting one or more SWMU/AOCs.

Two AOCs depicted in Figure 2 (AOC 5 and AOC 8) were not included in the 2005 Tier 1 risk screening. For AOC 5, the soil data (three soil samples) were collected in September 2006 as part of the DNAPL investigation in that AOC, and thus were not available at the time of the Tier 1 risk screening. These new data are included in the redevelopment scenario contained in this Tier 2 risk evaluation. For AOC 8, the soil samples are a subset of and associated with AOC 1, which was included in the Tier 1 risk screening. Based on the results of the Tier 1 risk screening, only benzene in AOC 1 soil exceeded its GSIP, however, benzene was detected in only one of 52 soil samples.

SWMU E also depicted on Figure 2 was also not included in the Tier 1 risk screening. SWMU E is a clay-lined wastewater retention pond that provides surge capacity for NPDES Outfall 1. Accumulated sediment at the bottom of the retention pond is periodically tested, removed and disposed of offsite at a licensed non-hazardous disposal facility. Analytical results of sediment samples collected from the base of the retention pond have indicated that the sediment is not hazardous (four post-excavation sediment samples were analyzed for waste characterization purposes (TCLP)). There is also no record of any releases from the retention pond. Therefore, SWMU E is not evaluated further in this Tier 2 risk evaluation and no further action is warranted for SWMU E.

A total of 8 wells located along the western boundary of the Facility (near Biddle Street) are designated as background wells (BG-MW-1, WHI2-3S, WHI3-1S, WHI3-3S, WHI4-2S, RFIMW-24, RFIMW-28 and P35NR). The designation of these wells as background wells was agreed to by BASF and USEPA in August 2006. Note that P35NR is a replacement for P34N which was destroyed. These 8 background wells are used to derive statistically-based background concentrations for inorganics in Facility groundwater (discussed in Section 5.0).

2.1 Summary Statistics

Summary statistics were calculated for detected constituents in soil and groundwater. For soil, summary statistics were calculated for constituents detected in each of the SWMUs and AOCs. As described above, additional soil data have been collected at a number of SWMU/AOCs/wells since the conduct of the Tier 1 risk screening. Therefore, for certain compounds, the updated summary statistics for soil presented in this Tier 2 report will differ from those presented in the risk screening report (ENSR, 2005).

For groundwater, updated summary statistics were calculated for detected constituents in each of the 116 wells. Consistent with the Tier 1 risk screening, the most recent data (last two years) comprise the data set for

[2] It should be noted that for a significant portion of the historical soil data collected in the RFI, depth information was not provided, and thus is missing from the project database. Depth information is available for approximately 40% of the soil data in the database.

groundwater. For most of the perimeter wells, this consists of five sampling events performed over the period beginning in September 2005 through the most recent event in May 2007 (September 2005, August/September 2006, November 2006, February 2007 and May 2007). For wells located within the Facility interior, this consists of groundwater data collected during the RFI (QST, 1999) and earlier investigations, since these wells were not sampled during the five sampling events occurring from the September 2005 to May 2007 period.

Tables 2-1 and 2-2 present summary statistics for constituents detected in soil and groundwater, respectively. Summary statistics for soil are presented for each of the eleven SWMU/AOCs evaluated further in this Tier 2 risk evaluation. All soil data regardless of sample depth are included in the summary statistics presented in Table 2-1. [Note: As discussed in Section 4.0 (Screening-Level Ecological Risk Evaluation or SERA), samples known to be collected from greater than 1 foot below ground surface were not included in the summary statistics used for ecological risk assessment.] Summary statistics for groundwater are presented for the 26 GSI wells for which recent monitoring data are available. The 26 GSI wells are identified in Table 2-3. Summary statistics for all wells for which data are available, including wells with only historical data, are provided in Appendix C. Table 2-4 identifies the soil samples included in each SWMU/AOC, sample date, and depth information, where available. Background soil samples are also shown in Table 2-4.

Summary statistics consist of frequency of detection, minimum and maximum detected concentrations, and arithmetic mean concentration. Since the conduct of the Tier 1 risk screening, USEPA guidance on performing statistics for risk assessment has been updated. In April 2007, USEPA published a new version of their guidance and software for calculating upper confidence limits (UCLs), which includes methods for treatment of non-detect data (USEPA, 2007 a,b). The new USEPA guidance and ProUCL software (Version 4.0) were used in the calculation of the UCLs in the Tier 2 risk evaluation. However, because of complexities associated with determining the proper treatment of non-detect data (i.e., a default assumption of using one-half the detection limit as the proxy concentration of the non-detect result is not appropriate), the arithmetic means presented in Tables 2-1 and 2-2 were calculated using detected results only. Consequently, the arithmetic mean concentrations presented in Tables 2-1 and 2-2 are biased high. This is a conservative approach and results in an overestimate of the mean that generally increases with increasing number of non-detect results. It should be noted that the arithmetic mean concentrations are used in the SERA (in combination with maximum detected concentrations) and in the Tier 2 evaluation of the GSI exceedances.

Data collected since 2003 have been validated in accordance with the Quality Assurance Project Plan (QAPP) developed for this Facility. During data validation, data were either accepted without qualification, qualified as estimated, or rejected. A "J" qualifier was appended to those detected and undetected values that were usable, but should be considered as estimated. When calculating summary statistics, results with no qualifier or a “J” qualifier were defined as “detects”, and results with a “U” or “UJ” qualifier were considered non-detects.

The steps used to summarize the data by area/constituent are as follows:

Treatment of Duplicates: Data for samples and their duplicates were averaged before summary statistics were calculated, such that a sample and its duplicate were treated as one sample for calculation of summary statistics (including maximum detection and frequency of detection).

Treatment of Non-Detects:

- Summary statistics were not calculated for constituents that were not detected in a particular area/medium.
- Where constituents were detected in some samples and not in others in a particular area/medium:
  - For calculation of the arithmetic means presented in Tables 2-1 and 2-2, only detected concentrations were used as previously noted (as previously noted, this is a conservative approach);

- For calculation of the UCLs used in the Tier 2 human health evaluation (Section 3.0), non-detect data were included and handled in accordance with USEPA's ProUCL Version 4.0 software (USEPA, 2007c,d). UCLs are presented in Table 3-2 of Section 3.0.

Frequency of Detection: The frequency of detection is reported as a ratio and a percentage, and is based on the number of samples reported as detected for a specific constituent and the total number of samples.

Minimum Detected Concentration: This is the minimum detected concentration for each constituent/area/medium combination, after duplicates have been averaged.

Maximum Detected Concentration: This is the maximum detected concentration for each constituent/area/medium combination, after duplicates have been averaged.

For specific detected analytes, namely Aroclors, xylene isomers, and methylphenol isomers, the applicable Part 201 criteria are expressed as a "total" of the isomers (e.g., total PCBs, total xylenes, and total methylphenols). Therefore, for each sample, individual isomers were summed to yield a "total" concentration for inclusion in the summary statistics for that analyte group. For Aroclors, which were detected only in soil, only those Aroclors that were detected at least once on-site were included in the total PCB sums (i.e., Aroclors 1248, 1254, and 1260).

2.2 Description of SWMU/AOCs Evaluated

As noted above, eleven SWMU/AOCs are evaluated further in this Tier 2 evaluation. A description of each of the eleven SWMU/AOCs, including physical characteristics (presence of buildings, pavement, etc.) and current uses, is provided below to provide background on the North Works site. These descriptions were taken from the Phase I RCRA Facility Investigation Report for BASF-Wyandotte Facility prepared by QST Environmental dated February 26, 1999.

2.2.1 AOC 1 – Area South of Polyols Plant

AOC 1 is located south of the Polyols Plant. The sources of chemical constituents present in AOC 1 include styrene from the Polyols Plant (AOC 8), benzene, toluene, ethylbenzene, and xylenes (BTEX) from the former Coke and By-products Plant (AOC 2) and the associated North Tar Pit (AOC 4). The approximate area encompassing AOC 1, AOC 4 and AOC 8 was evaluated during the Toluene Remediation Investigation Project. In early 1990, three toluene limit exceedances at Outfall 001 were caused by contaminated stormwater runoff. Investigation identified the source of the toluene in the shallow soils around the Polyols Plant. To alleviate this problem temporarily, the stormwater system was modified to segregate and treat, by carbon adsorption, the contaminated stormwater. Recent grading in this area has reduced the volume of non-contaminated water that was being put through the carbon treatment system. The reduction in the amount of water brings the volume requiring treatment in line with the capacity of the system.

Surficial materials near AOC 1 are mostly gravels. These materials are heterogeneous containing coals, silts, wood, ash, and bricks. Typical thickness is approximately 10 feet. The industrial fill overlies 5 to 15 feet of lake sand and clay. Groundwater flow near AOC 1 was naturally toward the Detroit River. Groundwater flow is affected by surface infiltration and the two groundwater extraction wells in the northern part of the Facility.

2.2.2 AOC 2 – Old Coke Plant

AOC 2 is located in the east central portion of the Facility. The area is located to the south of the Thermoplastic Polyurethane Plant, north of the Vitamins Complex, and generally east of the railroad tracks. This AOC was formerly occupied by Kopper's process coke ovens and a by-products plant which operated in this area. AOC 2 was initially defined as an area approximately 650 feet by 250 feet. The eastern part of AOC 2 was recently used as a contractor parking area with scattered portions being maintained as open field containing weeds and grassy vegetation. Ongoing plant expansion activities have resulted in placement of

engineered fill in the eastern part of AOC 2. The western portion of AOC 2 extends into an area currently occupied by BASF trailer offices, a paved parking area, and a railyard spur.

A network of groundwater extraction wells is utilized to mitigate the migration of potentially impacted groundwater from this area. Two extraction wells, EI4NC and E15NC, have been utilized in this area to collect groundwater in the vicinity of AOC 2. Recovered groundwater is pumped to a central carbon treatment system prior to discharge to the POTW. In addition, a surface drainage control program has been implemented to minimize the migration of coke-related constituents from this area.

Surficial materials near AOC 2 are similar to AOC 1. These materials are heterogeneous but generally consist of industrial fill overlying lake sand, clay, and dolomite bedrock of the Dundee or Detroit River Group. Groundwater flow near the old coke plant naturally was toward the Detroit River. Groundwater flow is affected by surface infiltration through heterogeneous materials and by the two groundwater extraction wells located in the northern part of the facility.

2.2.3 AOC 4 – North Tar Pit

AOC 4 is located in the north central portion of the Facility. The area is located to the immediate south of a Polyol tankfarm, east of the railroad tracks, north of Sioux Street, and west of the Thermoplastic Polyurethane Plant. This AOC was utilized prior to 1966 for disposal of coal tar by-product from the Old Coke Plant. Limestone fill has periodically been placed across this AOC to facilitate vehicle/equipment parking. However, the tar material becomes fluid during the summer months and buoyancy raises it to the surface. During these periods, the area is sometimes incapable of supporting vehicles or equipment. AOC 4 is currently used as a contractor work area and equipment storage area.

A network of groundwater extraction wells is utilized to mitigate the migration of potentially impacted groundwater from this area. Two extraction wells, E14NC and E15NC, have been utilized in this area to collect groundwater in the vicinity of AOC 4. Recovered groundwater is pumped to a central carbon treatment system prior to discharge to the POTW.

Surficial materials near AOC 4 are similar to AOCs 1 and 2. These materials are heterogeneous but generally consist of industrial fill overlying lake sand, clay, and dolomite bedrock of the Dundee or Detroit River Group. Natural groundwater flow near AOC 4 was toward the Detroit River. Groundwater flow is affected by surface infiltration and by the two groundwater extraction wells.

2.2.4 AOC 5 – Propylene Dichloride (PDC) Spill Area

AOC 5 is located in the central portion of the Facility south of the Pilot Plant and Vitamins Complexes, north of the Engineered Plastics Complex, and east of the railroad tracks. AOC 5 also overlaps with SWMU H. AOC 5 was defined as an area approximately 1,000 feet by 500 feet. AOC 5 is currently maintained as an undeveloped area containing weeds and grassy vegetation.

In the early 1960s, a salt bed cavity beneath this area was utilized for the injection of propylene dichloride (PDC), also known as 1,2-dichloropropane. Although this cavity is apparently isolated from other aquifers, it is in communication with similar brine cavities beneath the Facility. As a result, not all of the injected PDC was recovered. Prior to injection, PDC was also released during the course of railroad tank car unloading operations over the years. Spillage in the vicinity of the unloading pad subsequently spread and impacted a larger area currently identified as AOC 5. The PDC injection well was plugged in the late 1970s.

In fulfilling one of the major objectives of the 1986 Michigan Department of Natural Resources Consent Decree, a network of groundwater extraction wells was installed to mitigate the migration of potentially impacted groundwater from this area. Nine groundwater extraction wells have been utilized within AOC 5 to control groundwater flow in the vicinity of this area. As an additional side benefit, the system has successfully

recovered more than 21,000 gallons of PDC from the shallow water-bearing fill and soils. Recovered groundwater is pumped to a central carbon treatment system prior to discharge to the POTW.

Storm sewer improvements have also been completed within AOC 5 to control migration of PDC from the area. The entire drainage system was replaced using a steel piping system with welded joints to prevent infiltration of groundwater to the discharge at Outfall 003. In addition, ground surface contouring has been performed to enhance drainage control and topsoil was added to promote vegetation growth.

Based on previous studies, surficial materials at AOC 5 are heterogeneous in content and transmissivity, but generally consist of industrial fill overlying interbedded sand/clay and bedrock units. Groundwater flow and PDC distribution are influenced by the heterogeneity of the surficial materials, the groundwater extraction system, and the redesigned stormwater drainage system.

2.2.5 AOC 6 – South Tar Pit

AOC 6 is an unpaved outdoor area located in the southern portion of the Facility. While the western portion of AOC 6 overlaps SWMU G, the majority of the area extends to the east of SWMU G.

BASF personnel suspect that low lying areas in this vicinity were filled with coal tar waste from the Coke Plant (AOC 2). AOC 6 was initially defined as an area approximately 420 feet by 220 feet. AOC 6 is currently maintained as an open field containing weeds and grassy vegetation.

A network of groundwater extraction wells is utilized to mitigate the migration of potentially impacted groundwater from this area. Recovered groundwater is pumped to a central carbon treatment system prior to discharge to the POTW. In addition, ground surface contouring has been performed in the past to enhance drainage control and topsoil was added to promote vegetation growth.

Surficial materials near AOC 6 are similar to those at SWMU G. These materials are heterogeneous but generally consist of industrial fill overlying lake sand, clay, and dolomite bedrock of the Dundee or Detroit River Group. Naturally, groundwater flow near the tar area was toward the Detroit River. Groundwater flow is affected by surface infiltration through heterogeneous materials and by the groundwater treatment extraction wells located in the southern portion of the facility.

2.2.6 AOC 7 – Prussian Blue Areas

AOC 7 was initially defined to include two areas in the northwest corner of the Facility. One additional area was identified in May 1997 during excavation activities for surface drainage modifications in the central portion of the Facility.

A surface drainage control program has been implemented at the AOC 7 areas. Topsoil has been added at selected locations to promote vegetation growth. Topsoil and paved areas also serve to prevent direct contact with any potential Prussian Blue waste materials. In addition, a network of groundwater extraction wells is utilized to mitigate the migration of potentially impacted groundwater from the area surrounding AOC 7C. Four extraction wells have been utilized in this area to collect groundwater in the vicinity of this AOC. Recovered groundwater is pumped to a central carbon treatment system prior to discharge to the POTW.

2.2.6.1 AOC 7A

AOC 7A is located to north of the Kreelon Building and west of the railroad tracks. The Detroit City Gas Company previously leased this area from 1927-37 for the operation of a gas purification facility. Waste materials from this operation in the form of blue ferric ferrocyanide filings (Prussian Blue) have been encountered in this area. Prussian Blue is also typically used in current markets as an anticaking agent in road salt. This area is currently maintained part landscaped grass and part open field containing weeds and grassy vegetation.

2.2.6.2 AOC 7B

AOC 7B is also located in the northwest corner of the Facility to the south of the Steam Plant. BASF personnel suspect that low lying areas in this vicinity were backfilled with materials containing Prussian Blue. This area is currently maintained as a parking lot and landscaped frontage area between the lot and Biddle Avenue to the west.

2.2.6.3 AOC 7C

The third recently discovered area (AOC 7C) is located in the central portion of the Facility to the north of Alkali Street and west of Wyandotte Street. BASF personnel suspect that low lying areas in this vicinity were backfilled with materials containing Prussian Blue. This area is currently maintained as an open field containing weeds and grassy vegetation.

2.2.7 SWMU F – Filter Cake Disposal Area

SWMU F is an unpaved outdoor area located in the east central portion of the Facility. The area is located to the east of Wyandotte Drive and the Vitamins Complex. From 1957 to 1979, SWMU F was utilized as an abovegrade disposal area for 1) spent magnesium silicate filter cake (Britesorb) and filter paper used within the Polyols Plant, and 2) soda ash, sodium bicarbonate, lime wastes, clinker, and ash from the Boilerhouse. The filter cake material is considered hazardous only by virtue of its physical potential for combustibility, not due to chemical composition. SWMU F was initially defined as an area approximately 400 ft by 250 ft.

During excavation activities performed at SWMU F in 1990, waste filter cake material was encountered. Samples were subsequently collected for waste characterization purposes at an off-site laboratory. Analytical results indicated that the primary constituents of the filter cake were magnesium silicate and polyols. Based on the analytical results, the filter cake did not exhibit any characteristics of a RCRA hazardous waste.

Subsurface materials at SWMU F are similar to other SWMUs. These materials consist of industrial fill ranging from 8 to 22 feet in thickness, overlying lacustrine sand, clay, and dolomite bedrock (Dundee or Detroit River Group). The fill in this area (filter cake and DBO) has a low permeability and propensity to hydrate chemically. Groundwater flow is influenced by surface infiltration, heterogenous transmissivities of surficial material, steel retaining wall along the Detroit River, and the groundwater extraction wells near the center of the Facility.

A network of groundwater extraction wells is utilized to mitigate the migration of potentially impacted groundwater from this area. Recovered groundwater is pumped to a central carbon treatment system prior to discharge via an NPDES-permitted outfall. In addition, ground surface contouring was performed to enhance drainage control and topsoil was added to promote vegetation growth. Topsoil has also been added to help preserve the moisture content of the material and prevent direct contact with the deposited waste materials. Combustion of the filter cake material represents a concern only when the material is present in a dried state (e.g. moisture content of material has been depleted).

2.2.8 SWMU G – Two Nominal Rubble Staging Areas

SWMU G is an unpaved outdoor area approximately 600 feet by 450 feet located in the southern portion of the Facility. The area identified as SWMU G has been built up with industrial fill from approximately 1890 through the 1980s. The Consent Order references a subsequent period when the Soda Ash Complex was dismantled and the area was used to stage rubble and debris. Concrete, steel, and other debris were piled in this area prior to removal from the Facility. Some soda ash, lime fines, and cinders may have been present as residual material in hoppers or bins, but these materials are not classified as RCRA hazardous wastes. Some rubble including bricks, concrete, and reinforcing steel has been found in the top layers of soil in the area. SWMU G is currently maintained as an open field containing weeds and grassy vegetation.

Subsurface materials in the area of SWMU G are heterogeneous, generally consisting of fill overlying glacial sand, clay and dolomite bedrock. Surface and groundwater flow is generally east toward the Detroit River.

The direction of groundwater flow is influenced by four groundwater extraction wells located near this SWMU.

The entire area ascribed to these two units has been built up by industrial fill over the period from 1890 to 1980. The EPA's reference in the Consent Order to an early 1980s report categorizing these sites as disposal sites for rubble seems to reference a time when the area was used as a staging area for demolition of the Soda Ash Complex. Concrete, steel and other debris was piled in this area prior to removal from the North Works. Some soda ash, lime fines and cinders may have been present as residual material in hoppers or bins, but these materials are not hazardous waste. The ground surface elevation before and after the period referenced did not change appreciably. Some rubble such as bricks, concrete and reinforcing steel can be found in the top layer of soil in the area.

2.2.9 SWMU H – Emergency Containment Pond

SWMU H is located in the east central portion of the Facility south of the Pilot Plant and Vitamins Complexes, north of the Engineered Plastics Complex, and east of the railroad tracks. SWMU H was historically utilized as a retention pond and drainage system which discharged to an outfall on the Detroit River (currently identified as Outfall 003). SWMU H was initially defined as including approximately 1,600 linear feet of trenching.

Origin of the drainage system dates back to the late 1800s when it was used in dewatering/filling activities for the original Detroit River marshland. Since fragmental records from the 1920s indicate that the Facility utilized only one drainage network, the system likely was utilized as a combined drainage system for stormwater, non-contact cooling water, contact wastewater, and sanitary wastestreams. SWMU H gradually evolved into the current configuration of SWMU H at which time the primary effluents consist of stormwater, non-contact cooling water, contact wastewater from the Pilot Plant, and subsequent contact wastewater from the Chemical Engineering Building. Over the years, the Pilot Plant manufactured/handled a wide variety of materials including polyols, urethane latex, isocyanates, amines, magnesium silicate, methanol, methylene chloride, isopropyl alcohol, and Basalin (a herbicide). None of the drainage system was lined; it was periodically dredged to maintain flow.

The emergency containment pond was equipped with entrance/discharge pipe valves to isolate spills from the Pilot Plant. Portions of the drainage system also incorporated piping to facilitate roadways over the ditches and control drainage flow. Other containment features (primarily weirs) were likely used to isolate downstream impoundments from periodic source releases, although written documentation of these events was not available. Upon the advent of US EPA's NPDES program, all sampling/discharge events associated with the open drainage system were regulated under the Facility's NPDES permit.

Beginning in the early 1980s, this drainage system was gradually filled in and replaced with a steel piping system with welded joints to prevent infiltration of groundwater to the discharge at Outfall 003. SWMU H is currently used only as the subsurface corridor for the hard-piped drainage system. The overlying areas are maintained as open field areas containing weeds and grassy vegetation.

The fill material in SWMU H is heterogeneous; however, several generalizations can be drawn regarding the stratigraphy within this unit. Several feet of material extending beneath the ground surface typically consist of sandy gravelly clay. Beneath the surficial clay, a sequence of black slag gravel and coarse-grained sand interbedded with clay-rich layers was often encountered. This sequence is typically saturated and appears to be relatively permeable. Beneath the gravel sequence, many of the borings failed to recover any material within the spoon. This occurrence is likely due to very high liquid content and low compressive strength of the clay-like material which was noted to cover the outside of the spoons upon recovery. The thickness of the soft clay-like material was variable, possibly indicating that it acts as a channel fill material. Underlying the fill material, occurrences of peat overlying native fine-grained sand were noted. Groundwater flow near SWMU H would naturally be toward the Detroit River. Groundwater flow is affected by surface infiltration, heterogeneous materials and by the nine groundwater extraction wells located in the center of the facility.

3.0 Tier 2 Human Health Risk Assessment

This section presents the Tier 2 human health risk assessment performed for this Tier 2 risk evaluation for the Facility. The Tier 2 risk evaluation builds on the results of the Tier 1 risk screening (ENSR, 2005), which was described in Section 1.1. As previously discussed, the Tier 1 risk screening using a conservative approach in that maximum detected concentrations were compared to MDEQ Part 201 Generic Cleanup Criteria. Exceedances of MDEQ Part 201 Generic Cleanup Criteria are addressed in this Tier 2 analysis using refined approaches, including:

- Consideration of low frequency of detection (provided detection limits are not elevated);
- Use of alternative exposure point concentrations (EPC) such as the upper confidence limit (UCL) on the arithmetic mean concentration;
- Incorporation of site-specific parameters into modeling-based criteria;
- Consideration of site-specific background concentrations for inorganics; and
- Consideration of institutional controls.

Alternative, site-specific exposure assumptions, such as lower exposure frequencies that are more representative of potential worker exposures at the SWMU/AOCs, were not quantitatively incorporated in this Tier 2 human health risk assessment. Rather, the exposure assumptions inherent in the Part 201 generic cleanup criteria for soil (Industrial and Commercial II) were utilized, which is conservative for many of the SWMU/AOCs where workers are likely to be present on only an occasional basis. In addition, soil data from all depths were combined for comparison to Part 201 direct contact criteria (DCC), which is consistent with MDEQ guidance for use of the generic cleanup criteria (MDEQ, 2005). However, it is expected that on-site workers or visitors would be exposed only to the top-most layer of soil most of the time, and not soil at depth. Since available site characterization data indicate that concentrations of COI are higher at depth, the approach of combining all depth data is conservative and the resulting EPCs may not be representative of actual surface soil concentrations. Thus, the results of the Tier 2 human health risk assessment are conservative, which should be taken into account when considering the need for corrective action at a particular SWMU/AOC. Criteria exceedances that may not be sufficiently addressed using refined methods are potentially candidates for corrective action and identification of appropriate media protection standards (MPS).

Section 3.0 is organized into four sections. Section 3.1 discusses the background evaluation performed for inorganics in soil. Section 3.2 discusses the Tier 2 analysis performed for the criteria exceedances in soil that involve direct contact, volatilization or dust emission pathways. The Tier 2 analysis performed for the leaching-based soil criteria exceedances and groundwater criteria exceedances is presented in Section 5.0. Section 3.3 presents the redevelopment scenario evaluation requested by USEPA. Section 3.4 summarizes the SWMU/AOC and COI remaining at the conclusion of the Tier 2 human health evaluation.

It should be noted that BASF is currently undertaking development of portions of the site as part of plant expansion plans (the area of proposed plant expansion is shown in Figure 4). The ongoing redevelopment has entailed placement of over 16,000 cubic yards of engineered fill ranging in depth from 1 to 2 feet in thickness predominantly in the areas of SWMU F, AOC 2 and AOC 5. Addition of the engineered fill (which is comprised of 21AA limestone containing fines) in these areas has resulted in a change in the distribution of COI concentrations, effectively reducing overall exposure point concentrations in these SWMU/AOCs. Due to a lack of chemistry data on the engineered fill, it is not possible to predict the “new” EPCs. However, they are clearly lower than estimated using the current site database. Where appropriate, the impact of the engineered fill on potential exposure and risk is discussed.

3.1 Background Evaluation for Soil

Twenty (20) soil samples were collected from off-site and unimpacted on-site locations and analyzed for TAL metals. The results of background soil sampling were used in a background evaluation for inorganics to determine whether any of the COI in soil may be attributable to natural background, and thus not be Facility-related. It should be noted that organic compounds from off-site anthropogenic sources, such as PAH compounds, may have deposited from the air onto site surface soil. While these compounds are not site-related, they were not included in this background evaluation for soil.

The background evaluation for soil was performed for each of the seven SWMU/AOCs with sufficient sample size (five or more samples per USEPA guidance (2002b)):

- AOC 2
- AOC 6
- AOC 7A
- AOC 7C
- SWMU F
- SWMU G
- SWMU H

The background comparison was conducted in accordance with the USEPA *Guidance for Comparing Background and Chemical Concentrations in Soil for CERCLA Sites* (USEPA, 2002b). Separate background evaluations were performed for the human health and ecological risk assessments. The background evaluation for human health utilized both the shallow and deeper background samples, whereas for ecological risk, only the shallow background data were used. A total of 14 background soil samples were collected from the shallow (0-2 ft) range, and 6 background soil samples were collected at depths greater than 2 ft below ground surface (see Table 2-4). The pooling of shallow and deeper background samples into one data set for human health is consistent with the approach used in the Tier 2 which involved comparing all soil samples throughout the soil interval with the Part 201 criteria, whereas inclusion of the shallow background soil samples only is consistent with the ecological risk assessment approach. Appendix A describes the methods and results in detail.

The following inorganics were included in the background evaluation for human health: antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, nickel, selenium, silver, thallium, tin, vanadium, and zinc. As recommended by the guidance, inorganics with at least 50% frequency of detection in both the site and background data sets were considered appropriate for statistical evaluation. As previously noted, a minimum of five samples is also recommended. Based on these two criteria, background comparisons could not be performed on antimony, beryllium, cobalt, mercury, selenium, thallium, and tin. In addition, background comparisons could not be performed for AOC 4 and AOC 7B because the number of soil samples in each is less than five. Mercury was detected in 8 of the 18 background soil samples (less than 50% frequency of detection). Because of the importance of mercury at the North Works site, a qualitative evaluation of mercury soil concentrations detected in each SWMU/AOC relative to the background soil data set was performed. Results of this qualitative evaluation are discussed below.

3.1.1 Results of Background Evaluation Using USEPA Guidance

Based on the results of the statistical background evaluation performed using USEPA guidance (2002b), concentrations of several inorganic COI in the soil of several SWMU/AOCs were found to be consistent with background soil concentrations. These results are considered in the Tier 2 risk evaluation of Part 201 soil criteria exceedances and summarized as follows.

Soil COI Consistent with Background

AOC 2	Arsenic
	Barium
	Cadmium
	Copper
	Lead
	Nickel
	Vanadium
AOC 6	Barium
	Cadmium
	Chromium
	Lead
	Nickel
	Vanadium
	Zinc
AOC 7A	Arsenic
	Barium
	Cadmium
	Vanadium
	Zinc
AOC 7C	Barium
	Chromium
	Copper
	Vanadium
SWMU F	Chromium
	Lead
	Vanadium
	Zinc
SWMU G	Chromium
	Nickel
	Vanadium
SWMU H	Arsenic
	Barium
	Cadmium
	Lead
	Zinc

3.1.2 Qualitative Evaluation of Background Mercury in Soil

Although a quantitative background comparison was not possible with the mercury data set, a qualitative evaluation of mercury concentrations in soil was conducted by plotting the background mercury data set with the mercury data set from each SWMU/AOC. The data set included both detected and undetected values. This graphical display (included in Appendix A) presents the distribution of the mercury data from each SWMU/AOC relative to the background mercury levels.

This qualitative evaluation indicates that in the small mercury data sets of AOC 4 (2 samples) and AOC 7B (4 samples), all mercury concentrations are fully within the range of the background mercury concentrations (i.e., mercury concentrations within these AOCs are below the background maximum detect of 3 mg/kg).

Within AOC 6, AOC 7A, AOC 7C, and SWMU G, the majority of the mercury concentrations are within the background range, but one or two samples are slightly in excess of the maximum background mercury concentration (SWMU G has the highest mercury concentration among these SWMU/AOCs at 5.4 mg/kg). As shown in the plots for AOC 6 and AOC 7A, the data distribution indicates that many of the mercury concentrations are in the vicinity of the upper range of the background data set (i.e., although most samples are below the maximum background concentration, the majority of the data for these two AOCs are skewed toward the upper end of that range). The smaller data sets of AOC 7C (5 samples) and SWMU G (10 samples) are more evenly distributed throughout the range of background mercury soil concentrations.

Each of the remaining SWMU/AOCs (AOC 2, SWMU F, SWMU H) contain an individual sample with mercury concentrations at least six times higher than the maximum background mercury concentration. Within AOC 2, the majority of the 8 mercury concentrations are within the range of the background mercury concentrations. However, one sample has a detected mercury concentration of 17.1 mg/kg. A similar trend is observed within the mercury concentrations at SWMU F (with two elevated concentrations; 3.5 mg/kg and 21.1 mg/kg) and SWMU H which had the highest detected mercury concentration (52.9 mg/kg).

Based on this qualitative evaluation of mercury in soil, for the majority of SWMU/AOCs, detected mercury concentrations generally fall within the range of background mercury concentrations, with one or two samples slightly above the upper end of the range of background mercury. For a limited number of SWMU/AOCs, specifically AOC 2, SWMU F, and SWMU H, the majority of soil mercury concentrations are consistent with background, but mercury in one sample in each SWMU/AOC is well above the maximum concentration in the site-specific background data set.

3.2 Tier 2 Risk Evaluation for Soil Criteria Exceedances

Table 3-1 presents a summary of the Tier 1 risk screening results for soil (this table is the same as Table 2-3 of the Risk Screening Summary Report) (ENSR, 2005). For constituents with criteria based on both potential cancer and non-cancer effects, the risk screening addressed both sets of criteria. Part 201 criteria are available for all soil COI except bis(2-chloroisopropyl)ether. Consistent with the Tier 1 risk screening approach, the Part 201 numeric criteria established for bis(2-chloroethyl)ether are used for bis(2-chloroisopropyl)ether (for which Part 201 criteria are lacking), based on structural similarity of the two compounds

As shown in Table 3-1, the following Part 201 criteria have one or more exceedances of COI in soil:

- Direct Contact Criteria (DCC);
- Particulate Soil Inhalation Criteria (Ambient Air) (PSIC);
- Soil Volatilization to Indoor Air Inhalation Criteria (SVIIC);
- Infinite Source Volatilization Inhalation Criteria (Ambient Air) (VSIC);
- Soil Saturation Screening Level (C_{sat});
- State Background Screening Level;
- Groundwater Contact Protection Criteria (GCPC); and
- Groundwater Surface Water Interface Protection Criteria (GSIPC).

These exceedances are addressed on an AOC/SWMU-specific basis as discussed below, except as noted herein: 1) compounds that exceeded State Default Background Screening Levels are not evaluated further because exceedance of background in and or itself does not constitute a human health concern; and 2) the Tier 2 risk evaluation of the exceedances of GSIPC and GCPC (which are both leaching-based criteria) is discussed in Section 5.0. For some soil areas, exceedance of one or more GSIPC is the only pathway

requiring further evaluation (AOC 1, AOC 7B, RFIMW25, RFIMW26, RFIMW27, RFIMW28). These areas (some of which are not areas, but soil samples collected from monitoring wells) are discussed in Section 5.0.

MDEQ guidance allows for consideration of the 95% UCL as the exposure point concentration (EPC) to use in some criteria comparisons. Use of the UCL is also acceptable under USEPA guidance (USEPA, 1989; 2002a; 2007c,d). As previously noted, USEPA published a new version of guidance and software for calculating upper confidence limits (UCLs), which includes methods for treatment of non-detect data (USEPA, 2007c,d). The new USEPA guidance and ProUCL software (Version 4.0) were used to calculate the UCLs included in the Tier 2 risk evaluation. Appendix B presents the UCL calculation output tables from ProUCL. Sample concentrations were entered into the program after duplicate results were averaged. Table 3-2 presents summary statistics and UCLs for COI in soil addressed in this section. As shown in Table 3-2, ten to 22 data points are available for each COI in the SWMU/AOCs for which UCLs were calculated.

UCLs were not calculated for AOC 4 (n = 2 samples) and AOC 5 (n = 3 samples) due to the limited data sets. However, AOC 4 is not included in the Tier 2 risk evaluation. Because of elevated concentrations of a number of organic COI in soil in AOC 4 (including concentrations in excess of soil saturation screening levels for benzene, toluene, and xylenes), AOC 4 has been identified for inclusion in the CMS process and not included in the refined risk evaluation process included in this document. AOC 5 is included in the redevelopment scenario evaluation using maximum detected concentrations as EPCs. Use of maximum detected concentrations is conservative and likely leads to an overestimate of potential soil risk at AOC 5.

The exceedances of the Part 201 criteria identified in the Tier 1 risk screening are addressed on an AOC/SWMU-specific basis as discussed below.

AOC 2

AOC 2 is located in the east central portion of the Facility and was formerly occupied by Kopper's process coke ovens and a by-products plant which operated in this area. AOC 2 is 10.8 acres in size. The eastern part of AOC 2 was recently used as a contractor parking area with scattered portions being maintained as open field containing weeds and grassy vegetation. Ongoing plant expansion activities have resulted in placement of engineered fill in the eastern part of AOC 2. The western portion of AOC 2 extends into an area currently occupied by BASF trailer offices, a paved parking area, and a railyard spur.

In the Tier 1 screening, the only Part 201 criteria exceedance (besides GSIPC which, as noted, is addressed in Section 5.0), was arsenic for DCC (Cancer) in the Tier 1 risk screening. As allowed by MDEQ guidance, the 95% UCL may be compared to the DCC instead of the maximum detected concentration. Using the ten soil samples analyzed for arsenic in AOC 2, the UCL was calculated to be 2.54E+04 ug/kg. [The comparison to DCC applies to all soil throughout the unsaturated zone, thus all soil samples were included in the arsenic EPC.] As shown in Table 3-3, the UCL of 2.54E+04 ug/kg is below the arsenic DCC (Cancer) of 3.68E+04 ug/kg. Further, as previously noted in Section 3.1, arsenic in AOC 2 soil is consistent with background.

Therefore, no further action on arsenic in AOC 2 with regard to the soil direct contact pathway is required.

AOC 4

AOC 4 is located in the north central portion of the Facility and was formerly utilized for disposal of coal tar by-product from the Old Coke Plant. Limestone fill has been placed across AOC 4 to facilitate vehicle/equipment parking. AOC 4 is 0.6 acres in size and is currently used as a contractor work area and equipment storage area.

A number of constituents in AOC 4 soil, including several PAH compounds, benzene, toluene, xylenes, and methylphenol exceed one or more Part 201 criteria, including DCC, PSIC, SVIIC, VSIC, GCPC, and soil saturation screening levels (benzene, toluene and xylenes). Due to the limited number of samples (n=2) and

the elevated concentrations of organics generally observed in both samples (above soil saturation screening levels for benzene, toluene, and xylenes), no refined risk analysis is performed for the DCC, PSIC, SVIIC, and VSIC exceedances for AOC 4. Rather, it is recommended that corrective measures be evaluated for these potential exposure pathways. The leaching-based criteria exceedances (GCPC and GSIPC) as well as C_{sat} are evaluated further in Section 5.0.

AOC 6

AOC 6 is an unpaved outdoor area located in the southern portion of the Facility currently maintained as an open field containing weeds and grassy vegetation, and there are no active operations in the vicinity of this area. The western portion of AOC 6 overlaps SWMU G; the majority of AOC 6 extends to the east of SWMU G. Anecdotal information suggests that low lying areas in this vicinity were filled with coal tar waste from the Coke Plant (AOC 2). A network of groundwater extraction wells is utilized to mitigate the migration of potentially impacted groundwater from this area. Recovered groundwater is pumped to a central carbon treatment system prior to discharge to the POTW. AOC 6 is 1.4 acres in size.

The COI exceeding Part 201 criteria in AOC 6 soil based on the Tier 1 risk screening are presented below:

- arsenic exceeded its DCC (Cancer);
- benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and dibenz(ah)anthracene exceeded their DCC (Cancer);
- naphthalene exceeded its SVIIC (Noncancer), Infinite VSIC (Cancer and Noncancer), and GCPC;
- phenanthrene exceeded its Infinite VSIC (Noncancer);
- anthracene exceeded its GCPC;
- benzene exceeded its DCC (Cancer), SVIIC (Cancer), Infinite VSIC (Cancer), GCPC, and C_{sat}; and
- xylenes exceeded its GCPC and C_{sat}.

DCC Criteria Evaluations

For the six COI that exceeded DCC in the Tier 1 screening, the UCL concentration was calculated using all soil data and compared to the respective DCC (see Appendix B for UCL calculations) in this Tier 2 evaluation. As shown in Table 3-3, the UCLs for benzo(a)anthracene, benzo(b)fluoranthene and dibenz(ah)anthracene are below their respective DCC. For arsenic, benzene, and benzo(a)pyrene, the UCL exceeds the respective DCC. It should be noted that the benzene exceedance is marginal (UCL of 8.43E+05 ug/kg vs DCC of 8.38E+05 ug/kg).

Volatilization Criteria Evaluations

The exceedances of the VSIC and SVIIC were evaluated using alternate EPCs, including soil samples collected from the vadose zone, and consideration of finite source criteria in the case of VSIC, as discussed below.

The models upon which the Part 201 generic default VSIC and SVIIC are based apply to soil in the unsaturated (vadose) zone. Site characterization data (124 soil borings as part of the RFI) suggest that the source is approximately 9 to 10 feet (3+ m) thick and the depth to groundwater is approximately 3 to 4 feet (1 to 1.5 m) below ground surface (bgs). Therefore, most of the source is beneath the water table. Since data records are not conclusive on sample depth and since it appears that the highest concentrations of these constituents are present in deeper soils located beneath the water table, ten soil samples were collected from AOC 6 in May 2007 to characterize concentrations of volatile and semivolatile constituents in the vadose zone. These data are considered in this Tier 2 evaluation of VSIC and SVIIC exceedances in AOC 6.

The exceedances of the infinite source VSIC for benzene, naphthalene and phenanthrene were evaluated using the Part 201 finite source VSIC, as well as alternate exposure point concentrations that account for COI concentrations in the vadose zone. Part 201 generic criteria are already provided for 2 meter and 5 meter source thicknesses, so calculation of site-specific VSIC was not performed (note that the infinite source VSIC and finite source VSIC are the same for naphthalene and phenanthrene). A 2 meter source thickness was assumed, which is conservative, but accounts for potential low groundwater table conditions). Because the Part 201 generic VSIC are derived assuming a 0.5 acre source size, it is necessary to modify the VSIC using a modifier based on the actual source size. AOC 6 is approximately 1.4 acres in size, which is close to a source size of 1 acre provided in MDEQ's Technical Support Document for Generic Soil Inhalation Criteria for Ambient Air (MDEQ, 2007). The appropriate modifier for a 1 acre source size is 0.87. The generic 2-meter finite source VSIC were multiplied by the modifier and the resulting size-adjusted site-specific VSIC are presented in Table 3-4. As shown in Table 3-4, the UCLs calculated using 10 soil samples collected above the vadose zone in May 2007 are below their respective VSIC.

The exceedances of the SVIIC criteria for benzene and naphthalene were evaluated using alternate exposure point concentrations, including consideration of soil samples collected from the vadose zone (above the water table in AOC 6). As shown in Table 3-4, the UCLs calculated using 10 soil samples collected above the vadose zone in May 2007 are below their respective infinite source SVIIC.

Based on consideration of vadose zone data, no further evaluation of the volatilization criteria is warranted at AOC 6.

In summary, based on the results of the Tier 2 evaluation of the Part 201 soil criteria comparisons for AOC 6, only arsenic, benzene, and benzo(a)pyrene exceed DCC. The exceedance of the DCC for arsenic is likely due to a single soil sample with 200 mg/kg arsenic (SP-61). This sample likely represents an outlier in the data set of 22 soil samples, as the next highest arsenic concentration in AOC 6 soil is 47.8 mg/kg. The exceedance of the DCC for benzene (which is slight) is due to two soil samples with elevated benzene concentrations in excess of the soil saturation level (C_{sat}) for benzene (1400 mg/kg at SP-61 and 850 mg/kg at SP-62). Available site characterization data suggest that these two samples represent deeper subsurface soils, where on-site workers do not have regular access. It is noted that the UCL for benzene in the shallow soil, where worker exposure is more likely to occur, is well below the DCC for benzene. The exceedance of the DCC for benzo(a)pyrene is likely due to sample SP-62 (380 mg/kg benzo(a)pyrene). Given the depth of the highest concentrations and the likelihood that they are beneath the water table, the DCC criteria exceedances do not pose a current or future risk to on-site workers who may come into contact with shallow soil in AOC 6. Last, it should be noted that as part of the redevelopment scenario evaluation, the future redevelopment/utility worker is evaluated for potential contact with deeper soils in AOC 6, as discussed in Section 3.3.

Benzene and xylenes were identified as exceeding their soil saturation screening levels (C_{sat}). For benzene, the exceedance of the Part 201 C_{sat} screening level of 400 mg/kg is limited to the two samples discussed above (SP-61 and SP-62), which are located in the deeper soils. For xylenes, only one sample slightly exceeds the Part 201 C_{sat} screening level of 150 mg/kg (176 mg/kg at SP-62), and this sample is also located at depth.

The leaching-based criteria exceedances (GCPC and GSIPC) are discussed in Section 5.0.

AOC 7A

AOC 7 is comprised of three areas: AOC 7A, AOC 7B, and AOC 7C.

The first area (AOC 7A) is located to north of the Kreelon Building and west of the railroad tracks. The Detroit City Gas Company previously leased this area from 1927-37 for the operation of a gas purification facility. Waste materials from this operation in the form of blue ferric ferrocyanide filings (Prussian Blue) have been

encountered in this area. This area is currently maintained part landscaped grass and part open field containing weeds and grassy vegetation.

Only arsenic in AOC 7A exceeded its DCC (Cancer) in the Tier 1 risk screening. As shown in Table 3-3, the UCL of 2.84E+04 ug/kg is below the arsenic DCC (Cancer) of 3.68E+04 ug/kg. Further, as previously noted, arsenic in AOC 7A soil is consistent with background. No further evaluation of arsenic in AOC 7A with regard to the soil direct contact pathway is warranted. The leaching-based criteria exceedances (GSIPC) are discussed in Section 5.0.

AOC 7B

As previously noted, the only exceedances of Part 201 criteria in AOC 7B soil are GSIPC, which are addressed in Section 5.0.

AOC 7C

AOC 7C is located in the central portion of the Facility to the north of Alkali Street and west of Wyandotte Street. AOC 7C lies within the footprint of AOC 5. Anecdotal information suggests that low lying areas in this vicinity were backfilled with materials containing Prussian Blue. A removal action performed at AOC 7C in the fall of 1998 resulted in excavation and off-site disposal of several hundred cubic yards of soil. Thus, the RFI soil data contained in the project database are not expected to represent current conditions at AOC 7C, as these data were collected prior to the removal action. However, due to the absence of post-excavation soil data, the historical RFI data were included in the Tier 1 risk screening and are also considered in this Tier 2 evaluation. This area is currently maintained as an open field containing weeds and grassy vegetation.

Only arsenic in AOC 7C exceeded its DCC (Cancer) in the Tier 1 risk screening. As shown in Table 3-3, the UCL of 2.37E+04 ug/kg is below the arsenic DCC (Cancer) of 3.68E+04 ug/kg. Therefore, no further action on arsenic with regard to the soil direct contact pathway is required. The leaching-based criteria exceedances (GSIPC) are discussed in Section 5.0.

RFIMW-24

RFIMW-24 is considered a background soil and groundwater sampling location. However, for the Tier 1 risk screening (ENSR, 2005), all soil data were compared to the Part 201 screening criteria, including soil data from background locations. The maximum concentration of chromium detected at RFIMW-24 exceeded its PSIC (Cancer and Non-cancer) for ambient air. For the Tier 1 risk screening, chromium was assumed to be present in the hexavalent form to be conservative.

In July/August 2006, two soil samples were collected next to RFIMW-24 (at two feet and five feet bgs) for the purpose of speciating the forms of chromium present in soil. These two samples were analyzed for total chromium, trivalent chromium, and hexavalent chromium. Analytical results and comparison to the PSIC for hexavalent chromium are as follows:

	Chromium (ug/kg)			PSIC Cr^{+6} (ug/kg)	
	Total	Trivalent	Hexavalent	Cancer	Non-cancer
RFIMW24-GP-S(2')	7680	7200	480	327,000	235,000
RFIMW24-GP-S(5')	7440	7000	440	327,000	235,000

Based on the 2006 speciated chromium soil data, the use of Part 201 generic cleanup criteria for hexavalent chromium is inappropriate, as only 6 to 7 percent (%) of the total chromium detected in these two soil samples

is of the hexavalent form. In addition, detected concentrations of hexavalent, as well as trivalent and total chromium, in the two soil samples collected at RFIMW-24 are well below the PSIC for hexavalent chromium.

Based on this refined evaluation, no further evaluation of chromium and the PSIC ambient air pathway at RFIMW-24 is warranted. The leaching-based criteria exceedances (GSIPC) are discussed in Section 5.0.

SWMU F

SWMU F is an unpaved area located in the central part of the Facility that was used for waste filter cake disposal, as well as disposal of soda ash, sodium bicarbonate, lime wastes, and boilerhouse clinker and ash. SWMU F is 0.95 acres in size and rises approximately eight feet above grade, and is located within the boundary of the area of the current proposed plant expansion.

In the Tier 1 risk screening, 1,2-dichloropropane and bis(2-chloroisopropyl)ether exceeded their VSIC, 1,2-dichloropropane exceeded its SVIIC, and bis(2-chloroisopropyl)ether and arsenic exceeded their DCC.

DCC Criteria Evaluations

As shown in Table 3-3, the UCL for bis(2-chloroisopropyl) ether of 5.91+03 ug/kg is below its DCC of 5.78E+04 ug/kg; therefore, no further evaluation of bis(2-chloroisopropyl) for the soil DCC pathway is warranted. The UCL for arsenic of 4.22E+04 exceeds its DCC of 3.68E+04 ug/kg, although the mean of 2.32E+04 ug/kg is below the arsenic DCC. While the background evaluation discussed in Section 3.1 indicates that arsenic levels in SWMU F are not consistent with background, the background evaluation is conservative. This is supported by a comparison of arsenic statistics. The mean and maximum concentrations of arsenic in SWMU F are less than the mean and maximum concentrations, respectively, of arsenic in background. Therefore, based on the weight of evidence, no further evaluation of arsenic for the soil DCC pathway is warranted.

Volatilization Criteria Evaluations

The exceedance of the SVIIC criterion for 1,2-dichloropropane was not evaluated using a finite source modeling approach, because the depth of the source is 10 feet and the depth to groundwater is approximately 6 to 8 feet. As previously noted, only a source thickness of less than two meters may warrant further evaluation using the finite source model (MDEQ, 2007). It should be noted that as part of ongoing plant expansion activities, one to two feet of engineered fill containing crushed limestone ranging in particle size from fine dust to 1½ inches has been placed across the surface of SWMU F, increasing the vertical distance between ground surface and the underlying source and serving to attenuate any vapor migration that may occur.

As shown in Table 3-5, the UCL for 1,2-dichloropropane calculated using all soil data (10,900 ug/kg) exceeds the SVIIC (7400 ug/kg). While depth information for soil samples containing elevated levels of 1,2-dichloropropane is uncertain, shallow soil samples collected in SWMU F in May 2007 show considerably lower concentrations of 1,2-dichloropropane than the historical data. The historical data may include deeper samples collected beneath the water table that are not representative of 1,2-dichloropropane concentrations in the vadose zone. The UCL calculated using the shallow soil data does not exceed the SVIIC (UCL of 232 ug/kg vs SVIIC of 7400 ug/kg). As noted above, up to two feet of engineered fill have been brought in and spread across SWMU F, increasing the thickness of the soil layer through which soil vapors would travel and effectively reducing overall exposure point concentrations in the vadose zone. Based on the weight of evidence, the vapor intrusion to indoor air pathway does not warrant further evaluation.

The exceedances of the infinite source VSIC for 1,2-dichloropropane and bis(2-chloroisopropyl)ether were evaluated using alternate exposure point concentrations. As shown in Table 3-5, the UCLs calculated for 1,2-

dichloropropane and bis(2-chloroisopropyl)ether using all soil data, including shallow soil samples collected in May 2007, are below their respective infinite source VSIC.

On the basis of the Tier 2 analysis performed for the direct contact and the volatilization-based criteria exceedances, no further evaluation of SWMU F is warranted.

The leaching-based criteria exceedances (GSIPC) are discussed in Section 5.0.

SWMU G

SWMU G is an unpaved outdoor area located in the southern portion of the Facility, and has been built up with industrial fill from approximately 1890 through the 1980s. SWMU G is 6.3 acres in size and is currently maintained as an open field containing weeds and grassy vegetation, and there are no active operations in the vicinity of this area.

Only arsenic in SWMU G exceeded its DCC (Cancer) in the Tier 1 risk screening. As shown in Table 3-2, the UCL of 5.21E+04 ug/kg exceeds the arsenic DCC (Cancer) of 3.68E+04 ug/kg, although the mean concentration of 2.67E+04 ug/kg is below the DCC (Cancer). The background evaluation discussed in Section 3.1 indicates that arsenic levels in SWMU G are not consistent with background; however, the background evaluation is conservative. Further, the mean concentration of arsenic in SWMU G is less than the mean concentration of arsenic in background, and the maximum concentrations of arsenic in SWMU G and background are the same. Therefore, based on the weight of evidence, no further evaluation of arsenic for the soil DCC pathway is warranted.

SWMU H/AOC 5

SWMU H is a drainage ditch system that historically collected waste water, stormwater, and noncontact cooling water from the plant. SWMU H covers a total of approximately one acre in size spread across four narrow areas. Both the two western segments of SWMU H and most of the central segment of SWMU H run through the footprint of AOC 5. The eastern segment of SWMU H lies to the east of AOC 5. SWMU H is currently used as the subsurface corridor for the hard-piped drainage system. The overlying areas are maintained as open field areas containing weeds and grassy vegetation. Active industrial operations take place adjacent to the south of SWMU H/AOC 5.

The COI exceeding Part 201 criteria in SWMU H soil based on the Tier 1 risk screening are presented below:

- Arsenic, 1,2-dichloropropane and bis(2-chloroisopropyl)ether exceeded their DCC (Cancer);
- 1,2-Dichloropropane and bis(2-chloroisopropyl)ether exceeded their infinite source SVIIC and VSIC;
- 1,2-Dichloropropane, bis(2-chloroisopropyl)ether and mercury exceeded their GCPC;
- 1,2-Dichloropropane exceeded its C_{sat};
- Mercury exceeded its VSIC; and
- Chromium exceeded its PSIC.

The criteria exceedances for 1,2-dichloropropane and bis(2-chloroisopropyl)ether in SWMU H soil are associated with AOC 5, which will be evaluated in the CMS. Elevated concentrations of 1,2-dichloropropane and bis(2-chloroisopropyl)ether are present in subsurface soil and groundwater in the southwestern corner of AOC 5. Therefore, no further evaluation of these two organics is performed for SWMU H/AOC 5 as part of this Tier 2 evaluation of Part 201 criteria exceedances. Note that SWMU H/AOC 5 is included in the redevelopment scenario presented in Section 3.3.

The UCL concentrations for the three inorganics with criteria exceedances were calculated and are provided in Table 3-2 (see Appendix B for UCL calculations). As shown in Table 3-3, the arsenic UCL of 2.73E+04 ug/kg is below its DCC of 3.68E+04 ug/kg. In addition, as previously noted in Section 3.1, arsenic in SWMU H soil is consistent with background. Therefore, no further evaluation of arsenic in SWMU H with regard to the soil direct contact pathway is warranted.

The exceedance of the PSIC for chromium was evaluated using the UCL as allowed by MDEQ guidance and the modifier for a one acre source size. As shown in Table 3-6, the chromium UCL of 5.33E+04 ug/kg slightly exceeds the size-adjusted site-specific PSIC for hexavalent chromium of 4.44E+04 ug/kg. Comparing total chromium soil data to hexavalent chromium criteria is overly conservative. Based on the chromium speciation data collected at RFIMW-24, it is likely that the predominant form of chromium in SWMU H soil is trivalent, not hexavalent. As shown in Table 3-6, the chromium UCL of 5.33E+04 ug/kg is well below the size-adjusted site-specific PSIC for trivalent chromium of 1.31E+08 ug/kg. Therefore, based on the fact that the exceedance of the hexavalent chromium PSIC is slight and that the chromium is likely to be predominantly trivalent, no further evaluation of chromium in SWMU H with regard to the particulate soil inhalation pathway is warranted.

The exceedance of the infinite source VSIC for mercury was evaluated using the UCL and consideration of source size. The finite source VSIC are the same as the infinite source VSIC for mercury. Using the MDEQ modifier for a one acre source size, the resulting size-adjusted site-specific VSIC is presented in Table 3-6. As shown in Table 3-6, the mercury UCL of 2.81E+04 ug/kg is less than the size-adjusted site-specific VSIC of 5.39E+04 ug/kg. Therefore, no further evaluation of mercury in SWMU H with regard to the soil volatilization to ambient air pathway is warranted.

In summary, based on the results of the Tier 2 criteria evaluation, only 1,2-dichloropropane and bis(2-chloroisopropyl)ether in SWMU H soils associated with AOC 5, warrant further evaluation in the CMS. This includes C_{sat} exceedance for 1,2-dichloropropane in one soil sample (5E+07 ug/kg at SP09A).

The leaching-based criteria exceedances (GCPC and GSIPC) are discussed in Section 5.0.

3.3 Evaluation of Redevelopment Scenario

At the request of USEPA, the Tier 2 risk assessment for the North Works facility included an evaluation of a utility/redevelopment worker who may be involved in redevelopment of the site. As previously noted, BASF is currently undertaking development of portions of the site as part of plant expansion plans (the area of proposed plant expansion is shown in Figure 4). The ongoing redevelopment has entailed placement of over 16,000 cubic yards of clean engineered fill ranging in depth from 1 to 2 feet in thickness predominantly in the areas of SWMU F, AOC 2 (eastern half) and AOC 5 (northeastern corner). BASF has stated that their approach for site redevelopment in the future will involve “building up” with clean fill rather than excavation and removal of existing soil. This is due to the fact that the majority of the site was formerly marsh and the industrial fill used to cover the marsh areas was inconsistent from a geotechnical perspective. This has resulted in a fill layer of varying content and load bearing strength that complicates design and construction of subsurface installations. Consequently, BASF’s approach is to build up from the ground surface. However, for the purposes of the redevelopment scenario evaluation, it is assumed that a worker excavates down into the subsurface and encounters soil and shallow groundwater. The likelihood that a utility/redevelopment worker will contact groundwater while on-site is very low, particularly given BASF’s approach of building up and avoiding excavation into the subsurface and the likelihood that excavation areas in shallow groundwater would be dewatered. However, at the request of USEPA, potential worker contact with groundwater was included in the redevelopment scenario evaluation. The redevelopment scenario evaluation was performed on each of the AOCs and SWMUs.

3.3.1 Selection of COIs

The approach for selecting COI for the redevelopment scenario was agreed upon with USEPA in email correspondence dated June 14 and 15, 2007. For soil, the constituents identified in the 2005 Tier 1 risk

screening as exceeding any of the applicable Michigan Part 201 soil criteria (specifically the direct contact criteria (DCC), Volatile Soil Inhalation Criteria (VSIC), and Particulate Soil Inhalation Criteria (PSIC)) were identified as COPCs for soil. This resulted in a total of 14 soil COI in eight SWMU/AOCs.

As requested by USEPA, the Michigan Part 201 drinking water criteria (for a commercial/industrial scenario) were used to select COI for groundwater. It should be noted that if a Maximum Contaminant Level (MCL) is available, it is identified as the commercial/industrial drinking water criterion under the Part 201 program (MDEQ, 2006a). At the request of USEPA, Region 3 tap water risk-based concentrations (RBCs) were used if no Part 201 criterion was available (USEPA, 2007b). Use of drinking water criteria to select groundwater COI for the redevelopment scenario is very conservative, given that the criteria are derived to be protective of a residential drinking water scenario and site groundwater will never be used as drinking water.

The selection of COI for groundwater entailed first identifying monitoring wells located within or in the vicinity of each AOC and SWMU. If at least one well was not located within or immediately adjacent to a SWMU/AOC, then the closest downgradient well(s) was identified. Table 3-7 presents the wells associated with each SWMU/AOC. From this subset of 26 wells, maximum detected concentrations within each SWMU/AOC grouping were compared to the drinking water criteria. A total of 25 COI were selected for groundwater (see Table D-2 in Appendix D for selection of groundwater COI). Table 3-8 presents the 31 COI for soil and groundwater included in the quantitative risk calculations for the utility/redevelopment worker.

3.3.2 Exposure Assessment

The utility/redevelopment worker represents a worker who is present on the site only during redevelopment and plant expansion activities and is performing work that may involve encountering subsurface soil and shallow groundwater. The contractor with the greatest potential for soil contact during excavation activities is a utility worker who may be installing new underground utilities or repairing or removing old ones.

3.3.2.1 Exposure Assumptions for Redevelopment Scenario

The utility/redevelopment worker is assumed to incidentally ingest and dermally contact surface and subsurface soil, and inhale soil-derived volatiles and particulates (dust). It is likely that an excavation will be dewatered thereby preventing the worker's contact with groundwater. However, as previously noted, at the request of USEPA, the worker is assumed to incidentally ingest and dermally contact shallow groundwater, and inhale volatiles from shallow groundwater in the excavation trench.

Table 3-9 presents the exposure assumptions for the utility/redevelopment worker. These exposure assumptions were reviewed and approved (with one exception discussed below) by Bhooma Sundar of USEPA during a June 14, 2007 conference call and in subsequent email correspondence. The USEPA's parameters for soil ingestion rate, body surface area exposed to soil, body weight, soil adherence factor, and inhalation rate for a construction scenario were used (USEPA, 2002c). These assumptions are known to be conservative, especially the soil ingestion rate, which is the 95th percentile value for adult soil intake rates reported in a soil ingestion mass-balance study by Stanek et al. (1997). The rate is based on a limited number of study participants (n = 10 subjects) and is even acknowledged by the authors to be highly uncertain. The exposed body surface area of 3300 cm^2 is also conservative, in that it assumes that the hands, forearms and entire head of the worker is covered with soil and in contact with groundwater. This is highly unlikely for a utility/redevelopment worker.

Based on discussions with BASF plant personnel, it is unlikely that a utility worker would be on-site for more than a two week period. It was conservatively assumed that the utility/redevelopment worker is on-site performing soil and groundwater contact activities for a four week period (i.e., 20 days assuming a five day work week). USEPA recommended a higher exposure frequency than 20 days, such as 40 or 60 days, or the use of an Institutional Control that would limit a worker's exposure to 20 days. However, it should be noted that 20 days is consistent with the exposure frequency used by MDEQ in their derivation of the Part 201

groundwater contact criteria (GCC). The Part 201 GCC were developed to protect workers exposed to contamination in subsurface excavations for up to 20 days/year (MDEQ, 2006b).

It is assumed that the utility/redevelopment worker is in contact with standing groundwater at the bottom of the trench for only a portion of the 8 hour work day (i.e., 2 hours per day). This is a very conservative assumption, given that conventional excavation practices involve trench dewatering to prevent or limit accumulation of standing groundwater at the bottom of the trench. A groundwater contact exposure time of 2 hours is consistent with the exposure time used by MDEQ in their derivation of the Part 201 GCC (MDEQ, 2006b).

3.3.2.2 Exposure Point Concentrations

Exposure point concentrations consisted of either the upper confidence limit (UCL) or maximum detected concentration. UCLs were calculated for the soil COI with 10 or more samples (seven of the eight soil SWMU/AOCs) using USEPA's Version 4.0 ProUCL software (USEPA, 2007c,d). Maximum detected concentrations were used for the one AOC with only 3 soil samples (AOC 5) and for each groundwater SWMU/AOC due to the limited number of data points in the groundwater areas (one to five groundwater wells for each SWMU/AOC). Tables 3-10 and 3-11 present EPCs for soil and groundwater, respectively. USEPA's models were used for estimating soil-derived volatiles and fugitive dust concentrations in air during a construction/excavation event (USEPA, 2002c). Tables D-4 through D-9 in Appendix D present the assumptions and calculations used to derive the volatilization factor (VF) and particulate emission factor (PEF) used to estimate concentrations of COI in air from soil. A trench model was used to estimate concentrations of volatiles in air from standing groundwater in an excavation trench (see Table D-10 in Appendix D for assumptions and worksheet used to derive COI-specific groundwater to trench air attenuation factors). Tables 3-12 and 3-13 present EPCs for soil-derived volatiles and dust and groundwater-derived volatiles, respectively.

3.3.2.3 Exposure Dose Calculations

The calculation of exposure doses via ingestion, dermal and inhalation exposure to soil, groundwater, and air followed USEPA's guidance (USEPA, 1989; 2004a). Exposure doses are defined differently for potential carcinogenic and noncarcinogenic effects. The Chronic Average Daily Dose (CADD) is used to estimate a receptor's potential intake from exposure to a COI with noncarcinogenic effects. According to USEPA (1989), the CADD should be calculated by averaging the dose over the period of time for which the receptor is assumed to be exposed. Therefore, the averaging period is the same as the exposure duration. For COI with potential carcinogenic effects, however, the Lifetime Average Daily Dose (LADD) is employed to estimate potential exposures. In accordance with USEPA (1989) guidance, the LADD is calculated by averaging exposure over the receptor's assumed lifetime (70 years). Therefore, the averaging period is the same as the receptor's assumed lifetime. The standardized equations for estimating a receptor's daily intake (both lifetime and chronic) are presented below.

3.3.3 Estimating Potential Exposure to COI in Soil

The following equations are used to calculate the estimated exposure from incidental ingestion of and dermal contact with COI in soil:

Daily Intake (Lifetime and Chronic) Following Incidental Ingestion of Soil (mg/kg-day):

$$\text{Daily Intake} = \frac{CS \times SIR \times EF \times ED \times CF}{BW \times AT}$$

where:

CS = Soil Concentration (mg/kg soil)

SIR = Soil Ingestion Rate (mg soil/day)

EF = Exposure Frequency (days/year)

ED = Exposure Duration (year)

CF = Unit Conversion Factor (kg soil /10^6 mg soil)

BW = Body Weight (kg)

AT = Averaging Time (days)

Daily Intake (Lifetime and Chronic) Following Dermal Contact with Soil (mg/kg-day):

$$DAD = \frac{DA_{event} \times EF \times ED \times EV \times SA}{BW \times AT} \qquad DA_{event} = CS \times CF \times AF \times ABS_d$$

where:

DAD = Dermal Absorbed Dose (mg/kg-day)

DA_{event} = Absorbed dose per event (mg/cm^2-event)

SA = Exposed Skin Surface Area (cm^2)

EV = Event frequency (events/day)

EF = Exposure Frequency (days/year)

ED = Exposure Duration (year)

BW = Body Weight (kg)

AT = Averaging Time (days)

CS = Soil Concentration (mg/kg soil)

CF = Unit Conversion Factor (kg soil /10^6 mg soil)

AF = Soil to Skin Adherence Factor (mg soil /cm^2-event)

ABS_d = Dermal Absorption Fraction (constituent-specific) (unitless)

3.3.4 Estimating Potential Exposure to COI via Inhalation

The following equation is used to estimate exposure to COI in air (fugitive dust and volatiles) via inhalation:

Daily Intake (Lifetime and Chronic) Following Inhalation of COI (mg/kg-day):

$$Daily\,Intake = \frac{CA \times IR \times ET \times EF \times ED}{BW \times AT}$$

where:

CA = Air Concentration (mg/m^3)

IR = Inhalation Rate (m^3/hr)

ET = Exposure Time (hours/day)

EF = Exposure Frequency (days/year)

ED = Exposure Duration (year)

BW = Body Weight (kg)

AT = Averaging Time (days)

3.3.5 Estimating Potential Exposure to COI from Groundwater

The following equation is used to estimate exposure to COI via incidental ingestion of groundwater:

Daily Intake (Lifetime and Chronic) Following Ingestion of Groundwater or Surface Water (mg/kg-day):

$$\text{Daily Intake} = \frac{CW \times IR \times EF \times ED \times ET}{BW \times AT}$$

where:

CW = Water Concentration (mg/L)

IR = Water Ingestion Rate (L/hr)

EF = Exposure Frequency (days/year)

ED = Exposure Duration (year)

ET = Exposure Time (hour/day)

BW = Body Weight (kg)

AT = Averaging Time (days)

Calculation of the dose from dermal exposure to water follows USEPA guidance (2004a) which differentiates between organics and inorganics, as presented below. The following equations are used to estimate the dermally absorbed dose (DAD) following dermal contact with groundwater:

$$DAD = \frac{DA_{event} \times EV \times EF \times ED \times SA}{BW \times AT}$$

where:

DAD = Dermally Absorbed Dose (mg/kg-day)

DA_{event} = Absorbed Dose per Event (mg/cm^2-event)

SA = Surface Area (cm^2)

EV = Event Frequency (events/day)

EF = Exposure Frequency (days/year)

ED = Exposure Duration (years)

BW = Body Weight (kg)

AT = Averaging Time (days)

The calculation of the dose absorbed per unit area per event (DA_{event}) is as follows for inorganics or highly ionized organics:

$$DA_{event} = CW \times PC \times ET \times CF$$

where:

DA_{event} = Absorbed Dose per Event (mg/cm^2-event)

CW = Concentration in Water (mg/L)

PC = Permeability Constant (cm/hr)

ET = Exposure Time (hr/event)

CF = Conversion factor (L/1000 cm^3)

The calculation of DAevent is as follows for organics:

If ET < t*, then: $$DA_{event} = 2FA \times PC \times CW \times CF \sqrt{\frac{6T \times ET}{\pi}}$$

If ET > t*, then $$DA_{event} = FA \times PC \times CW \times CF \times \left[\frac{ET}{1+B} + 2T \left(\frac{1+3B+3B^2}{(1+B)^2} \right) \right]$$

where:

DAevent = Absorbed Dose per Event (mg/cm^2-event)

FA = Fraction Absorbed water (dimensionless)

PC = Permeability Constant (cm/hour)

CW = Concentration in Water (mg/L)

T = Lag Time per event (hr/event)

ET = Exposure Time (hr/event)

t* = Time to Steady State (hr) = 2.4T

B = Dimensionless ratio of the PC of a chemical through the stratum corneum relative to its permeability constant across the viable epidermis

CF = Conversion Factor (L/1000 cm^3)

3.3.6 Toxicity Assessment

Dose-response values were obtained for each COI using available USEPA sources, including IRIS (USEPA, 2007a), provisional values from NCEA, and HEAST (USEPA, 1997c), as well as ATSDR. Due to the lack of a USEPA oral reference dose for 1,2-dichloropropane, which is a key COI at AOC 5, the MDEQ oral reference dose provided in the Part 201 program was used (MDEQ, 2006a). Oral and inhalation values were obtained for both potential carcinogenic and noncarcinogenic effects. Where available, subchronic dose-response values were used to evaluate noncarcinogenic effects, because the period of exposure is considered subchronic (USEPA, 1989). When subchronic values were not available, chronic dose-response values were used, which is conservative. Tables 3-14 through 3-17 present the noncarcinogenic oral and inhalation and carcinogenic oral and inhalation dose-response values, respectively.

Where available, USEPA's gastrointestinal absorption values were used to adjust oral dose-response values to absorbed dermal dose-response values (USEPA, 2004a). In addition, USEPA's dermal absorption fractions (DAF) for dermal soil exposure were used, as well as USEPA's dermal permeability constants for dermal water exposure. Table 3-18 presents the DAFs and Tables 3-19a and 3-19b present the dermal permeability constants.

3.3.7 Risk Characterization

Tables 3-20 and 3-21 present total potential carcinogenic risks and noncarcinogenic hazard indices, respectively, for each SWMU/AOC. Spreadsheets used to derive pathway-specific risks and hazard indices are provided in Tables D-11 through D-14 in Appendix D.

As shown in Table 3-20, the cumulative potential excess lifetime cancer risk (PELCR) exceeds the upper end of USEPA's target risk range of 1×10^{-6} to 1×10^{-4} at AOC 5, AOC 7C, and the western end of SWMU H. All three of these areas are co-located in the southwestern corner of AOC 5. The risk drivers are bis(2-chloroethyl)ether, bis(2-chloroisopropyl)ether, and 1,2-dichloroethane in groundwater.

As shown in Table 3-21, the cumulative potential hazard index exceeds USEPA's target of 1 at AOC 5, AOC 6, AOC 7C, and all three segments of SWMU H. As previously noted, AOC 5, AOC 7C, the western segment of SWMU H and most of the central segment of SWMU H are co-located and fall within the footprint of AOC 5. The risk drivers in these four areas are 1,2-dichloropropane and bis(2-chloroisopropyl)ether in groundwater and 1,2-dichloropropane in soil. The risk drivers in AOC 6 are benzene and naphthalene in soil.

Constituents of concern (COCs) were identified for each SWMU/AOC with an exceedance of either the upper end of the cumulative carcinogenic target risk range (1×10^{-6} to 1×10^{-4}) or noncarcinogenic risk target (HI =1). If the cumulative carcinogenic risk exceeds 1×10^{-4}, any individual COI with a risk greater than 1×10^{-6} is identified as a COC. If the cumulative noncarcinogenic hazard index exceeds 1, any individual COI with a hazard index greater than 0.1 is identified as a COC. The target risk levels used for the identification of COCs are based on USEPA guidance. Specifically, USEPA provides the following guidance (USEPA, 1991):

> "Where the cumulative carcinogenic site risk to an individual based on reasonable maximum exposure for both current and future land use is less than 10^{-4}, and the non-carcinogenic hazard quotient is less than 1, action generally is not warranted unless there are adverse environmental impacts." and,
>
> "The upper boundary of the risk range is not a discrete line at 1×10^{-4}, although EPA generally uses 1×10^{-4} in making risk management decisions. A specific risk estimate around 10^{-4} may be considered acceptable if justified based on site-specific conditions."

Table 3-22 presents COCs identified for each SWMU/AOC based on cumulative risks. Preliminary remediation goals (PRGs) were calculated for each COC using the following formula:

$$PRG = \frac{EPC \times Allowable\ (Risk\ or\ HQ)}{Calculated\ (Risk\ or\ HQ)}$$

The EPC is the exposure point concentration used in the risk calculations. Where only one constituent is the risk driver, the allowable risk per constituent to be used in the PRG calculation is 1×10^{-4} minus the total risk from other constituents for that receptor. Similarly, the allowable HQ per constituent is 1 minus the HQ from other constituents with similar toxic endpoints. For chemicals with noncarcinogenic effects, only chemicals that act on the same target organ or toxic endpoint (e.g., liver effects, central nervous system effects, blood effects, etc.) are considered to have additive adverse effects. Thus, the derivation of PRGs for COCs with noncarcinogenic effects takes into account the target organ(s) of each COC.

When there is more than one constituent identified as a COC for a given scenario, the target risk level (or HQ for noncarcinogens) is again 1×10^{-4} (or 1 for noncarcinogens) minus the total risk (or HI for noncarcinogens) from other constituents for that receptor. However, this target risk (or HQ for noncarcinogens) is then apportioned between the identified COCs. This apportioning can be done in any manner, though most commonly it is done equally between all of the COCs (and is the approach used in this risk assessment). If a chemical is identified as a COC based on both potential carcinogenic and noncarcinogenic risk, PRGs are derived for both endpoints and the lower of the two is selected as the PRG.

Table 3-22 presents the PRGs derived for each COC and SWMU/AOC. Note that for some COCs the selected PRG is higher than the EPC used in the risk calculations (these COCs are minor contributors to total site risk). For these COCs, no further action is needed to ensure that the cumulative risk does not exceed the

target cumulative risk of 1 x 10^{-4} and/or a cumulative HI of 1. The spreadsheets used to derive PRGs are provided in Table D-15 (carcinogenic COCs) and Table D-16 (non-carcinogenic COCs) in Appendix D.

3.3.7.1 Risk Characterization for Lead

Lead was identified as a COI in groundwater for the redevelopment scenario. The USEPA's Adult Lead Model (ALM) for soil (Version dated 05/19/03) was modified for lead exposure via incidental ingestion of groundwater (USEPA, 1996). Dermal exposure to lead in groundwater was not quantified, however, percutaneous absorption is generally not a significant route of exposure for inorganic lead. While the ALM was developed for soil exposure, it may be applied to groundwater exposure with appropriate modification for lead bioavailability and absorption in the gastrointestinal tract. The default ALM absorption fraction for lead in soil of 12% was changed to the absorption fraction for soluble lead of 20% (USEPA, 1996). Site-specific parameters were used for water ingestion rate and exposure frequency.

As shown in the calculation worksheets provided in Appendix D (Table D-17A for homogeneous population and Table D-17B for heterogeneous population), the redevelopment worker's incidental exposure to lead in groundwater using the maximum detected concentration of lead in site-wide groundwater has a negligible impact on the blood lead concentration of an adult, and the fetus of an adult woman, for both homogeneous and heterogeneous populations. Predicted blood lead levels for both populations are well below the target blood lead level of concern of 10 ug/dL, and the probability that exposed fetuses would exceed the blood level of concern is well below the target of 5%. Thus, lead is not identified as a groundwater COC and does not warrant further evaluation.

3.4 Summary of Results for Tier 2 Human Health Risk Evaluation

Based on the results of the Tier 2 human health risk evaluation, no further action or evaluation is required for soil at AOC 2, AOC 7A, AOC 7C, RFIMW-24, SWMU F, and SWMU G. Further evaluation and/or corrective measures planning in the CMS is warranted for soil for the following COC and AOC/SWMUs:

- AOC 4 - several PAH compounds, benzene, toluene, xylenes, and methylphenols
- AOC 5/SWMU H (west end) – 1,2-dichloropropane, bis(2-chloroisopropyl)ether, and mercury
- AOC 6 – arsenic, benzene, benzo(a)pyrene, naphthalene, and xylenes (C_{sat} only)
- SWMU H (central and east ends) – 1,2-dichloropropane

Based on the results of the Tier 2 redevelopment scenario evaluation, five COCs were identified in groundwater in the southwestern corner of AOC 5, which is co-located with AOC 7C and the western segment of SWMU H (1,2-dichloroethane, 1,2-dichloropropane, bis(2-ethylhexyl)phthalate, bis(2-chloroethyl)ether, and bis(2-chloroisopropyl)ether). The COCs in this area warrant further evaluation and/or corrective measures planning in the CMS.

3.4.1 Uncertainty Evaluation

Within any of the steps of the risk assessment process, assumptions are made due to a lack of absolute scientific knowledge. Some of the assumptions are supported by considerable scientific evidence, while others have less support. Every assumption introduces some degree of uncertainty into the risk assessment process. Regulatory risk assessment methodology requires that conservative assumptions be made throughout the risk assessment to ensure that public health is protected. Therefore, when all of the assumptions are combined, it is much more likely that risks are overestimated rather than underestimated.

The assumptions that introduce the greatest amount of uncertainty in this risk assessment are discussed in this section. They are discussed in qualitative terms, because for most of the assumptions there is not enough information to assign a numerical value to the uncertainty that can be factored into the calculation of risk.

3.4.1.1 Data Evaluation

Uncertainty is associated with the data evaluation performed for the North Works site, due to limitations of available site data as well as methods used to analyze the data. The main areas of uncertainty are discussed below.

There is uncertainty associated with the adequacy of the site data set, which is comprised of analytical results obtained over the course of several historical field investigations conducted from the early 1990s up through 2007. For soil data gathered before April 2005, information on sample depth and result qualifier were very limited. This introduces uncertainty into the risk evaluation for pathways where exposure to only surficial soil would be expected, such as incidental contact with soil by a plant worker or visitor. Since available site characterization data indicate that concentrations of COI are higher at depth, the approach of combining all depth data is conservative and the exposure point concentrations used in the Tier 2 risk assessment are likely to overestimate surficial soil concentrations. Another example of uncertainty is that associated with the soil data for AOC 7C. It is uncertain to what extent the available analytical data represent current soil concentrations, since the samples were collected prior to soil excavation activities performed at AOC 7C. The extent to which historical data collected prior to ENSR's investigations were validated is also uncertain. Consequently, there is uncertainty associated with the site data set, especially for soil. For the majority of COI in soil, the number of samples available for each SWMU/AOC is sufficient to calculate summary statistics.

Because of complexities associated with determining the proper treatment of non-detect data, arithmetic means were calculated using detected results only. [Note: UCLs used in the Tier 2 human health risk evaluation were calculated using USEPA's ProUCL guidance which includes automated methods of statistically handling non-detect results.] Consequently, the arithmetic mean concentrations are biased high, with increasing bias as the number of non-detects increases. Thus, it is important to note that the arithmetic mean concentrations, which were used in the SERA and Tier 2 evaluation of GSI exceedances, are conservative.

For the redevelopment scenario evaluation, a subset of constituents detected in site soil and groundwater were selected for quantitative risk calculations by comparing maximum detected concentrations against risk-based screening levels. A subset of constituents detected at a site is generally selected for quantitative analysis for several reasons. A review of the results of risk assessments demonstrate that in most cases risks are attributable only to one or a few constituents, and that many of the constituents quantitatively evaluated do not contribute significantly to total risk estimates (USEPA, 1993a). The screening process is conducted to identify the COI that may contribute the greatest to potential risk. The screening process used here is conservative, and 31 COI were included in the redevelopment scenario risk calculations. Although the excluded constituents may pose a finite level of risk, that risk would contribute negligibly to the total site risk. Therefore, not evaluating the excluded constituents does not measurably affect the numerical estimates of hazard or risk, and does not affect remedial decision-making at the site.

3.4.1.2 Toxicity Assessment

Several aspects of the toxicity assessment introduce uncertainty in the risk results. The Tier 2 human health risk evaluation utilized two sources of toxicity values:

- toxicity values inherent in the MDEQ Part 201 criteria, and
- toxicity values provided in USEPA and other sources used in the redevelopment scenario evaluation.

There is inherent uncertainty associated with the toxicity values used in regulatory risk assessment. Uncertainties are associated with:

- Animal-to-human extrapolation
- Study selection

- Interspecies dose conversion
- High-to-low dose extrapolation

To compensate for uncertainties associated with estimating human health risks from low level chemical exposures encountered in the environment, regulatory agencies develop toxicity values that are biased toward overestimating rather than underestimating potential health risks. There is also uncertainty associated with applying the toxicity values and/or risk-based criteria derived for one chemical as a surrogate for another chemical that lacks values. This was done for bis(2-chloroisopropyl)ether, using bis(2-chloroethyl)ether as the surrogate based on structural similarity of the two compounds. While this practice introduces uncertainty into the results, it is preferable to not quantifying the potential risk associated with bis(2-chloroisopropyl)ether given its significance at the North Works site.

3.4.1.3 Exposure Assessment

Exposure assessment consists of three basic steps: 1) development of exposure scenarios including identifying appropriate exposure assumptions, (2) estimation of exposure point concentrations, and 3) estimation of human dose.

Exposure Scenarios and Assumptions

Exposure scenarios in a risk assessment are selected to be representative of potential exposures to COI in media that may be experienced by human receptors based on current and reasonably foreseeable land use. These exposure scenarios are developed for a hypothetical receptor, but one that would represent the reasonable maximal exposure (RME) scenario for the site. Therefore, exposure levels are assumed for these receptors that are much greater than expected to occur in an actual population. When limited information is available to establish exposure assumptions, conservative (i.e., health-protective) estimates of potential exposure are employed. Default exposure assumptions recommended by the USEPA and MDEQ are intended to be conservative and representative of an individual who consistently and frequently contacts environmental media at a site, a scenario that rarely occurs. Most individuals will contact media at non-site locations, while the risk assessment assumes that all exposure to environmental media will occur at the site. Moreover, it is often assumed that contact with environmental media occurs in the areas having the highest constituent concentrations for the entire exposure frequency/duration used in the risk assessment, due to both statistical handling of the data and the original sampling plan.

The use of Part 201 criteria for the human health evaluation of soil at the North Works site relied on use of the exposure scenarios inherent in the Industrial and Commercial II generic cleanup criteria. Because of the intended broad use of the Part 201 cleanup criteria at sites across the state of Michigan, they are inherently conservative and likely overestimate potential exposures at most if not all of the SWMU/AOCs at the North Works site. Further, all criteria were assumed to apply at each SWMU/AOC, even if a particular exposure pathway is currently incomplete.

The redevelopment scenario evaluation used a number of conservative agency exposure assumptions, including soil ingestion rate (USEPA), exposed body surface area (USEPA), inhalation rate (USEPA and MDEQ), groundwater exposure time (MDEQ), and exposure frequency (MDEQ). The use of conservative assumptions leads to overestimates rather than underestimates of potential risk. Consequently, predicted risks for the utility/redevelopment worker are likely to be overestimates of potential health risk.

Estimation of Exposure Point Concentrations

Sample Statistics: Exposure to COI is best estimated by the use of the arithmetic mean concentration of a COI in each medium. Because of the uncertainty associated with estimating the true average concentration at a site, the USEPA has required the use of the 95% UCL on the arithmetic mean as the EPC (USEPA, 2002a; 2007c,d). Therefore, the 95% UCL is a very conservative estimate of the true arithmetic mean.

The soil EPCs used in the Tier 2 human health risk evaluation represent the lower of the maximum detected concentration or the 95% UCL on the mean (USEPA, 2002a). UCLs were calculated using USEPA's ProUCL Version 4.0 software (USEPA, 2007c,d). The UCL recommended by ProUCL was selected. Uncertainty can arise if the test results show the data set to be normally distributed when it is actually lognormally distributed, or vice-versa. This source of uncertainty, however, is unlikely to lead to large differences in the calculated dose for a given receptor. A review of the UCL type recommended by ProUCL, as shown in Table 3-2, indicates that, for a number of soil COI, the 99% UCL was used. In short, the UCLs used in the Tier 2 human health risk evaluation are unlikely to underestimate the mean concentration in each area.

Due to the limited number of shallow wells in or adjacent to each SWMU/AOC (n = 1 to 5 wells), EPCs for groundwater are maximum detected concentrations, which again represents a very conservative estimate of potential groundwater EPCs.

In addition, the data used to calculate the EPCs are assumed to be representative of specific exposure areas and general site conditions. Sample locations in the various exposure areas were identified to be as representative of site conditions as possible. However, as previously noted, depth information was not available for a significant percentage of the soil data (approximately 60% of soil samples lack sample depth information). The approach used in the Tier 2 was to include all samples within a SWMU/AOC regardless of depth in the EPC calculation, except in specific cases where relevant, available depth information was considered (i.e., use of only vadose zone soil data in the volatilization criteria comparisons in AOC 6 and SWMU F). As previously noted, this introduces uncertainty into the risk evaluation, but is expected to be conservative where exposures would be limited to surficial soil.

The use of all data to calculate the soil EPCs is conservative, as it is likely that some soil samples located beneath the water table and thus not representative of soil available for direct contact, volatilization or particulate emission, were included in the EPCs. This approach contributes to uncertainty in the risk results in particular for AOC 6, where unacceptable risks were predicted for a limited suite of COC. The exact depths of the samples with the highest concentrations of these COC in this AOC is not known, but anecdotal information suggests the higher concentrations are at depth. Thus, the uncertainty associated with the lack of soil sample depth information must be taken into account when evaluating corrective measures at SWMU/AOCs with predicted unacceptable risks.

Air Modeling: Models were used to derive outdoor air concentrations of volatile and non-volatile constituents. Although assumptions are made about constituent behavior in each of these models, the assumptions used are conservative in that they tend to result in over-predictions rather than under-predictions of air concentrations. It should also be noted that there is some uncertainty associated with use of the trench model at AOC 5, where concentrations of some VOCs in groundwater samples are approaching solubility limits (e.g., 1,2-dichloropropane). The trench model is intended for use with dissolved concentrations in water. However, given that AOC 5 will be included in the CMS, uncertainty associated with predicted trench air concentrations at AOC 5 can be evaluated as needed in the CMS process.

Environmental Degradation. It is assumed that the EPCs calculated in the risk assessment based on current site conditions remain constant for the assumed exposure duration – for an industrial scenario this is typically a period of 25 years. However, it is well known in the scientific community that constituents in the environment are subject to natural attenuation and biodegradation processes. Organic constituents are naturally degraded in the environment by a variety of processes (i.e., photodegradation, microbial activity, hydrolysis, etc.). Environmental half-lives vary for specific constituents based on environmental conditions (i.e., presence of bacteria, pH, exposures to sunlight and oxygen), and there are respected literature sources of such information. However, environmental degradation is not typically accounted for in the calculation of risks for hazardous waste sites. This has likely resulted in an over-estimation of site risks.

3.4.1.4 Risk Characterization

The potential risk of adverse human health effects is characterized based on estimated potential exposures and potential dose-response relationships. Three areas of uncertainty are introduced in this phase of the risk assessment: the evaluation of potential exposure to multiple constituents, the combination of upper-bound exposure estimates with upper-bound toxicity estimates, and the risk to sensitive populations.

Risk from Multiple Constituents

Once potential exposure to and potential risk from each COI is estimated, the total upper-bound potential risk posed by the site is determined by combining the estimated potential health risk from each of the COI. Presently, potential carcinogenic effects are added unless evidence exists indicating that the COI interact synergistically (a combined effect that is greater than a simple addition of potential individual effects) or antagonistically (a combined effect that is less than a simple addition of potential individual effects) with each other. For most combinations of constituents, little if any evidence of interaction is available. Therefore, additivity is assumed.

For noncarcinogenic effects, the HI should only be summed for constituents that have the same or similar toxic endpoints (USEPA, 1989). The toxic endpoint is defined as the most sensitive noncarcinogenic health effect used to derive the RfD or other suitable toxicity value (USEPA, 1989). Again, there is little evidence to suggest whether those COI associated with a common toxicity endpoint are additive, synergistic, antagonistic, or independent in terms of mechanism of action. Whether assuming additivity leads to an underestimation or overestimation of risk is unknown.

Combination of Several Upper-Bound Assumptions

Generally, the goal of a risk assessment is to estimate an upper-bound, but reasonable, potential exposure and risk. Most of the assumptions about exposure and toxicity used in this evaluation are representative of statistical upper-bounds or even maxima for each parameter. The result of combining several such upper-bound assumptions is that the final estimate of potential exposure or potential risk is extremely conservative (health-protective).

This is best illustrated by a simple example. Assume that potential risk depends upon three variables (soil consumption rate, COI concentration in soil and CSF). The mean, upper 95% bound and maximum are available for each variable.

One way to generate a conservative estimate of potential risk is to multiply the upper 95% bounds of the three parameters in this example. Doing so assumes that the 5% of the people who are most sensitive to the potential carcinogenic effects of a COI will also ingest soil at a rate that exceeds the rate for 95% of the population, and that all the soil these people eat will have a constituent concentration that exceeds the concentration in 95% of the soil on Site. The consequence of these assumptions is that the estimated potential risk is representative of 0.0125% of the population (0.05 x 0.05 x 0.05 = 0.000125 x 100 = 0.0125%). Put another way, these assumptions overestimate risks for 9,999 out 10,000 people, or 99.99% of the population. Thus, the majority of people will have a much lower level of potential risk. The very conservative nature of the potential risks estimated by the risk assessment process is not generally recognized. In reality, the estimates are more conservative than outlined above, because usually more than three upper 95% assumptions are used to estimate potential risk(s).

Alternatively, if a single upper 95% assumption of the CSF is combined with average (50th percentile) assumptions for soil concentration and soil ingestion rate, the resulting estimates of potential risk still overpredict risk for 99% of the potentially exposed population. This is a conservative and health protective approach that substantially overestimates the “average” level and even the reasonable maximum level of potential risk.

The Tier 2 risk assessment approach used here employed upper 95% bounds or maxima for most exposure and toxicity assumptions. Thus, it produces estimates of potential risk two to three orders of magnitude greater than the risk experienced by the average member of the potentially exposed populations.

Risk to Sensitive Populations

The health risks estimated in the risk characterization generally apply to the receptors whose activities and locations were described in the exposure assessment. Some people will always be more sensitive than the average person and, therefore, will be at greater risk. Dose-response values used to calculate risk, however, are frequently derived to account for additional sensitivity of subpopulations (e.g., the uncertainty factor of 10 used to account for intraspecies differences). Therefore, it is unlikely that this source of uncertainty contributes significantly to the overall uncertainty of the risk assessment.

Use of USEPA's Adult Lead Model for Groundwater Exposure

There is uncertainty associated with modifying the USEPA's Adult Lead Model (ALM) for soil (Version dated 05/19/03) for lead exposure via incidental ingestion of groundwater. It seems reasonable to apply the ALM to exposures other than soil provided appropriate adjustments for absorption are made. In fact, USEPA's "Frequently Asked Questions (FAQs) about the ALM (http://www.epa.gov/superfund/programs/lead/adult.htm) states that the ALM could be used to establish fish advisories for lead. There is also uncertainty associated with applying the ALM to a short period of exposure (20 days). The guidance indicates that a minimum exposure duration of 90 days with at least one day per week of exposure) is recommended to allow blood lead concentrations to approach quasi-steady state. To evaluate the effect of a longer exposure duration, the exposure frequency was increased from 20 days/year to 90 days/year. The change in predicted blood lead concentrations was negligible, increasing from 6.0 ug/dL to 6.1 ug/dL in the fetus (for the more conservative heterogeneous adult population). In summary, it is unlikely that the uncertainty associated with use of the ALM for evaluating the redevelopment/utility worker's exposure to lead in groundwater contributes significantly to the overall uncertainty of the risk assessment.

3.4.1.5 Summary of Sources of Uncertainty in the Tier 2 Human Health Risk Assessment

The large number of assumptions made in the risk characterization introduces uncertainty in the results. While this could potentially lead to underestimates of potential risk, the use of numerous conservative (i.e., protective of human health) assumptions, as was done here, results in overestimates of potential risks. Any one person's potential exposure and subsequent risk are influenced by all the parameters mentioned above and will vary on a case-by-case basis. Despite inevitable uncertainties associated with the steps used to derive potential risks, the use of numerous health-protective assumptions will most likely lead to a very large overestimate of potential risks from the site. The results of the Tier 2 human health risk assessment must be carefully interpreted considering the uncertainty and conservatism associated with the analysis, especially where site management decisions are made.

4.0 Screening Ecological Risk Assessment

This section discusses the screening ecological risk assessment (SERA) performed for the Facility. The SERA at the BASF site is being conducted in accordance with relevant state and federal guidance, including the following:

- USEPA Region 5 ecological risk assessment guidance website (http://www.USEPA.gov/region5/superfund/ecology/index.html);
- Region 5 Guidance for Ecological Risk Assessment (ERA) (USEPA Region 5, 2000a, 2005);
- Intermittent "ECO Update" Bulletins of USEPA;
- Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments (Interim Final) (USEPA, 1997a); and
- Guidelines for Ecological Risk Assessment (USEPA, 1998).

No ecological risk assessment (ERA) guidance is currently available from Michigan.

Like human health risk assessments, ERAs are often conducted in tiers, with each successive tier providing more detailed information and reducing uncertainty. Under USEPA Region 5 guidance (USEPA, 2005a), three tiers of environmental risk assessment are recognized:

Screening ecological risk assessment (SERA) – The SERA is the most conservative level of ecological risk assessment in the Region 5 guidance. In a screening level ecological risk assessment, hazard quotients (HQs) are calculated by dividing the maximum concentration of constituents in each medium by conservative effects-based screening values. When HQ>1, the potential for risk cannot be ruled out.

Preliminary ecological risk assessment (PERA) – In a PERA, receptors are selected that are representative of the site habitats and complete exposure pathways are investigated, which may include food chain evaluation.

Detailed ecological risk assessment (DERA) – The DERA often involves site-specific collection of data including toxicity testing, tissue residue analysis, or additional ecological studies such as egg hatchability or population studies. Uncertainty in the quantitative risk assessment is usually quantified using probability analysis.

As noted, the Tier 1 risk screening did not consider ecological receptors, with the exception that the Part 201 GSI criteria are derived to be protective of aquatic and wildlife receptors (as well as human receptors). As a result, this Tier 2 risk evaluation includes a screening level assessment of ecological receptors for groundwater.

4.1 SERA Components and Organization

The principal components of the SERA conducted for the BASF North Works Facility include:

- Problem Formulation: In this step, the objectives of the ERA are defined, and a plan for characterizing and analyzing risks is determined. Available information regarding stressors and the specific site is integrated. Products generated through problem formulation include measurement and assessment endpoints and the conceptual site model (CSM).
- Risk Analysis: Risk analysis is directed by the problem formulation. Data are evaluated to characterize potential ecological exposures and effects.

- Risk Characterization: During risk characterization, exposure and stressor response profiles are integrated through risk estimation. Risk characterization also includes a summary of uncertainties, strengths, and weaknesses associated with risk assessment.

The SERA report has been organized according to these components.

4.2 Problem Formulation

Problem formulation is the initial step of the ERA process and provides the basis for decisions regarding the scope and objectives of the ERA. Information is collected in order to develop a CSM, in which the constituents of potential interest (COIs) and exposure pathways are identified. The problem formulation phase includes:

- Definition of risk assessment objectives;
- Ecological characterization and definition of geographic area to be considered;
- Identification of exposure pathways;
- Selection of endpoints to be assessed; and
- Development of the CSM.

4.2.1 Definition of Risk Assessment Objectives

The primary objective of this SERA is to evaluate whether or not populations of ecological receptors are potentially at risk due to exposure to chemical stressors in media (i.e., soil and water) at the Facility in Wyandotte, Michigan. The following ecological receptor groups were evaluated in this SERA:

- Terrestrial invertebrates (e.g., earthworms);
- Terrestrial plants (e.g., ruderal growth vegetation);
- Aquatic life (e.g., fish, aquatic invertebrates and aquatic plants); and
- Terrestrial vertebrates (e.g., mammals, birds, and predatory wildlife).

These groups of receptors species were selected because they are: (1) potentially exposed to chemical stressors in surficial media at the Facility; (2) presumed to play key roles in site ecosystems; (3) have complex life cycles; (4) characterized by rapid larval growth rates (e.g., invertebrates); and (5) representative of the range of trophic levels in food webs and food chains at the Facility.

4.2.2 Ecological Characterization

The major ecological habitats found at the Facility include grassland and riverine habitat. The majority of the Facility is developed land with several feet of fill. During a site visit in January, 2007, limited wet soils were noted in AOC 6 and SWMU G; however a formal wetland delineation has not been conducted. The following sections describe these habitats at the Facility, as provided in the *Current Conditions Report* (Parsons, 1998).

Terrestrial Habitats

Throughout the Facility, vegetation is homogeneously distributed of low diversity, consisting primarily of pioneering grass and weeds including wild carrot (*Daucus carota*), clover (*Trifolium repens*), dandelion (*Taraxacum officinale*), and wild strawberry (*Fragaria virginiana*). Open fields have been seeded with grass and have since been invaded by pioneering weed species.

Shrub and tree species at the Facility include primarily planted ornamental varieties. The highest diversity of vegetation appears along the shoreline, consisting primarily of invading stress tolerant weed species including American elm (*Ulmus americana*), cottonwood (*Populus deltoides*), box elder (*Acer negundo*), willow (*Salix*

exiguna), dogwood (*Synanthedon scitula*), goldenrod (*Salidago* sp.), asters (*Aster* sp.), red osier (*Cornus sericea*), gray dogwood (*Cornus racemosa*), sumac (*Rhus* sp.), deadly night shade (*Solanum dulcamara*), reed grass (*Phragmites communis*), wild grape (*Vitis* spp.) and wild rose (*Rosa acicularis*).

Aquatic Habitats

No environmentally sensitive habitats exist at the Facility, although wetlands are present off the Facility in other areas along the river. Rare, threatened or endangered plant or animal species have not been observed at the Facility (ERM, 1991). The river is the largest habitat potentially affected by the Facility. The river connects Lake St. Clair with Lake Erie. Flow in the river is complex due to numerous islands and channels particularly in the southern half of its length, and to effects from fluctuating water levels in Lake Erie. The River is approximately 2,500 to 5,000 feet wide, and drops 3 feet over its 31.7-mile length. The depths in the channels range from 30 to 50 feet.

The Facility lies directly on the Trenton Channel harbor line which is maintained by the Corps of Engineers to a depth of approximately 26 feet. The bottom sediments are subjected to regular scouring from the propeller wash of passing freighters. The river contains approximately 31 coastal wetland and submersed macrophyte (plant) beds (Manny et al, 1998), covering a total of 1382 hectares; approximately half of this area lies in Michigan and half in Ontario. At least 20 species of submersed macrophytes are present in the river. The wetlands and submersed macrophytes constitute critical habitat for plants, fish, and birds.

The river fish population is a mixture of natural and introduced species most of which are warm water species. Per MDEQ water quality classifications (MDEQ Part 4 Water Quality Standards, Chapter 323.1043), the river is designated and protected as a cold water fishery. Introduced species include the common carp, rainbow smelt, alewives, sea lamprey and white perch. Approximately 60 natural species reside, spawn or migrate into the river half of which use mainly the lower river along the islands and the mainland shoreline for spawning (DNR & OME 1991).

Rare, Threatened and Endangered Species

Letters were sent to the United States Fish and Wildlife Service (USFWS) and Michigan Department of Natural Resources (MIDNR) requesting information regarding the presence of rare, threatened, or endangered species that are known or suspected to occur in the area, for which the Facility provides appropriate habitat. These letters and responses are included in Appendix E.

According to USFWS, Wayne County is home to two federally-listed species: the endangered Indiana bat (*Myotis sodalist*) and northern riffleshell (*Epioblasma torulosa rangiana*). The breeding range of the Indiana bat includes Wayne County, and the northern riffleshell has been documented in the river. USFWS concludes, however, that these species are unlikely to be adversely affected by the Facility.

MIDNR listed four species that may occur at the Facility or in the Detroit River adjacent to the Facility: the state-threatened common tern (*Sterna hiundo*), spotted turtle (*Clemmys guttata*) and lake sturgeon (*Acipenser fulvescens*), and the state species of special concern silver chub (*Macrhybopis storeriana*). Habitat at the Facility is not favorable for these species, particularly the spotted turtle and common tern.

As noted previously, rare, threatened or endangered plant or animal species have not been observed at the Facility (ERM, 1991).

4.2.3 Identification of Receptors and Potentially Complete Exposure Pathways

USEPA (1997, 1998) defines a complete exposure pathway as “one in which the chemical can be traced or expected to travel from the source to a receptor that can be affected by chemicals.” Therefore, in order for a complete exposure pathway to exist, a chemical, a migration pathway, a receptor and mechanisms of toxicity

of that chemical must be demonstrated. This subsection identifies the ecological receptors that may be affected at or by the Facility, and identifies potentially complete exposure pathways.

Ecological exposure pathways evaluated in this SERA include the following:

- Direct contact with soils at the Facility by terrestrial plant species;
- Direct contact with soils at the Facility by terrestrial invertebrate species;
- Direct contact with surface water (as groundwater discharge) by fish or aquatic invertebrates;
- Direct contact with surface water (as groundwater discharge) by fish or aquatic vertebrates;
- Incidental ingestion of soils and surface water (as groundwater discharge) by vertebrate wildlife; and
- Vertebrate wildlife ingestion of prey items that may have bioaccumulated COIs from surface water (as groundwater discharge) and site soils.

All possible potential routes of exposure could not be realistically evaluated in this SERA. In accordance with Region 5 guidance for ERA (USEPA Region 5, 2005), this SERA focuses the risk evaluation on the pathways for which: (1) chemical exposures are the highest and most likely to occur; and, (2) there are adequate data pertaining to the receptors, exposure pathways, and toxicity for completion of risk analyses. Exposure pathways evaluated include direct and indirect exposures.

Mammals, plants, birds, reptiles, invertebrates and possibly amphibians have the potential to be affected by constituents in the media at the Facility. Exposure to terrestrial receptors may include ingestion, direct dermal contact and inhalation of particulates. Higher trophic level receptors such as mammals, birds, and reptiles may also be exposed to constituents in the soil, or from ingestion of prey items that have accumulated constituents in their tissue. Terrestrial plants can uptake constituents present in the soil and groundwater through their roots.

Mammals, plants, birds, amphibians, reptiles and invertebrates in proximity of the river have the potential to be affected by constituents entering the groundwater or surface water from the Facility. Exposure may include ingestion, direct dermal contact, and inhalation of particulates. Higher trophic level receptors, such as mammals, birds, amphibians, reptiles, and fish, may have accumulated site-related constituents in their tissue.

4.2.4 Incomplete Exposure Pathways

On March 20, 2007, representatives from BASF, ENSR and USEPA had a conference call which included a discussion of the ecological risk assessment, potentially complete exposure pathways, and the implications of pending construction activities at the Facility on the potentially complete exposure pathways at the Facility. Based on the results of this discussion, the following AOCs were excluded from the ERA:

AOC 1 – Historically, a toluene spill occurred at AOC 1. The primary route of exposure for toluene from the spill is from migration and discharge of groundwater. BASF and USEPA agreed that there is no potential for exposure via soils. No complete exposure pathways remain at AOC 1. The groundwater is being investigated in the ERA on a site-wide basis.

AOC 2 – The majority of AOC 2 is covered by pavement. The open area on the eastern edge of the AOC is either included in the footprint of a new building and the surrounding parking lot to be constructed for the building, or has been covered by clean fill to support the new construction. As a result, all potentially complete exposure pathways at AOC 2 have been eliminated.

AOC 4 – BASF and USEPA came to an agreement that AOC 4 does not constitute viable habitat. The AOC consists of a small area between a building and the roads that is currently covered by rip rap. No complete exposure pathways occur at AOC 4.

AOC 7B – The majority of AOC 7B is covered by asphalt. No complete exposure pathways exist at AOC 7B, and this area was eliminated from consideration in the ERA.

AOC 7C – This area was investigated and soils were excavated. No complete exposure pathways remain at the AOC.

SWMU F – This SWMU is included in the footprint of area impacted by recent development on the Facility. As part of the development, SWMU F has been covered with 1-2 feet of imported fill soils. With the cover of soils, complete ecological exposure pathways have been eliminated at SWMU F.

4.2.5 Selection of Assessment Endpoints and Measures of Effect

Assessment endpoints are "the explicit expression of the ecological values to be protected" (USEPA 1997). The selection of assessment endpoints depends on knowledge of the receiving environment, knowledge about the constituents released (including ecotoxicological properties and concentrations that cause adverse impacts), and understanding of the values that will drive risk management decision-making (Suter, 1995).

Assessment Endpoints

According to the USEPA (1998, 2003), assessment endpoints are formal expressions of the actual environmental value to be protected. They usually describe potential adverse effects to long-term persistence, abundance, or reproduction of populations of key species or key habitats. For the purposes of this SERA, the protection of avian, mammalian and reptilian wildlife is inferred from the protection of the aquatic and benthic communities. More specifically, the benchmarks used in this SERA can be inferred to be protective of the following assessment endpoints:

- Sustainability of terrestrial invertebrate and plant communities that may be exposed to constituents detected in soils at the Facility;
- Sustainability of terrestrial wildlife (e.g., mammals and birds) that may be exposed to constituents detected in soils at the Facility; and
- Sustainability of aquatic invertebrate and plant communities that may be exposed to Facility-related constituents in river surface water.

Since direct measurement of assessment endpoints is often not feasible, surrogate endpoints (called measures of effect) are used to provide the information necessary to evaluate whether the values associated with the assessment endpoint are being protected. A measure of effect is a measurable ecological characteristic and/or response to a stressor (USEPA, 1998).

Measures of Effect

In order to conduct an ERA, it is necessary to define a set of criteria or "measures of effect" that can be used to evaluate potential risks to the assessment endpoint. Typically, measures of effect have clearly defined numeric criteria. In a SERA, the measure of effects should provide a "general indication of the potential for ecological risk or lack thereof" (USEPA, 2001b). In the screening level assessment, measures of effect are highly conservative, often comparing worst-case scenarios to conservative ecological benchmarks with no consideration for bioavailability or viability of habitat. For this SERA, the measures of effect include:

- Comparison of maximum detected soil concentrations from two AOCs (AOC 6 and AOC 7A) to USEPA Ecological Soil Screening Levels (Eco-SSLs) and/or USEPA 5 Ecological Screening Levels (ESL) for soils;
- Comparison of maximum detected soil concentrations from the two SWMU areas (SWMU G and SWMU H) to Eco-SSLs and/or USEPA Region 5 ESLs for soil; and

- Comparison of maximum detected groundwater concentrations from 26 GSI groundwater monitoring wells (CMS-MW-2, RFI-MW10, RFI-MW10F, RFI-MW10I, RFI-MW11, RFI-MW11F, RFI-MW12, RFI-MW12F, RFI-MW22, RFI-MW4, RFI-MW5, RFI-MW6, RFI-MW7F, RFI-MW7I, RFI-MW8, RFI-MW8F, RFI-MW8I, RFI-MW9, RFI-MW9F, RFI-MW9I, WHI6-1F, WHI6-1S, WHI6-2F, WHI6-2S, WHI6-4F and WHI6-4S), to MDEQ water quality screening values, preferentially, or USEPA Region 5 surface water ESLs when MDEQ values were unavailable.

Maximum detected concentrations of a constituent were defined as the maximum actual concentration of that constituent in a study area. Hazard Quotients (HQs) were calculated for quantification of these endpoints. HQs are the ratio of chemical concentrations in media from the Facility to ecotoxicological screening benchmarks considered protective of ecological receptors. An HQ of 1 or less demonstrates no impact; however, HQs exceeding a value of 1 do not necessarily indicate that adverse impacts may occur for ecological receptors. Rather, an HQ greater than 1 indicates that the potential for minimal ecological risk could not be eliminated, and that further risk investigation might be warranted.

Limited or small wet areas that may provide intermittent wetland habitat are present at the Facility. Exposure to these small areas is expected to be minimal and the measures of effect used to evaluate terrestrial receptors are assumed to be protective of exposures to these wet areas.

4.2.6 Conceptual Site Model (CSM)

The CSM for the Facility is presented as a series of working hypotheses regarding how the COIs might pose hazards to the ecosystem and ecological receptors at the Facility. The CSM for the Facility helps describe the origin, fate, transport, exposure pathways, and receptors of concern.

Surface Water Hydrology

Surface water/storm water runoff from the Facility and surrounding area flows into the river. Water discharges from the Facility through several pathways. These pathways include regulated Outfalls 001, 002 and 003; the Wayne County sewer system; and, surface water flow. BASF graded the Facility to reduce run off; in general, run off is controlled on the north half of the Facility and some limited run off may occur on the undeveloped south half of the Facility.

Based on an assessment of storm water runoff patterns during a heavy rain-event, the following runoff locations were identified:

- Along the northern property boundary of the Facility to the east of AOC 7A;
- Along the shoreline of the river on the southeast side of the Facility east of AOC 6; and
- Adjacent to a cemetery located on the southwest portion of the property.

Small quantities of water may also leave the Facility by diffuse flow to the river along the portion of the waterfront that does not have a steel retaining wall and by flow patterns across the north boundary near Perry Place (Parsons ES, 1998); although, this flow may have been affected by the installation of groundwater extraction system.

There are two potential primary constituent release mechanisms at the Facility; runoff and groundwater transport. Historic releases of Facility-related constituents to the soil during routine operations occurred. Since the major concern was migration of the contaminants into the Detroit River, an overall approach of controlling impacted groundwater from reaching the river was taken. There are thousands of feet of buried pipe at the North Works. Brine, water, sewer, process and other miscellaneous pipelines were buried routinely until about 1986. Records exist for some of these lines. Numerous lines have been removed from service. Removing a line from service has ranged from merely cutting the lines to cementing and removal. Many of the old lines that

have not been physically removed have caved in or been plugged. There may be groundwater migration channels within the North Works along these abandoned pipelines if a suitable force can drive a fluid. In general, there is seldom much driving force unless one end of the line has an open discharge to an existing sewer. Contaminated groundwater may flow to the Detroit River along the portion of waterfront that does not have a steel retaining wall and along the north boundary near Perry Place (Parsons ES, 1998).

As previously noted, surface water runoff occurs at several locations at the North Works: along the northern property boundary of the Facility; to the east of AOC 7A; along the shoreline of the river on the southeast side of the Facility east of AOC 6; and adjacent to a cemetery located on the southwest portion of the property.

Receptor Exposure

The primary source(s) of chemical stressors in the surficial media at the Facility is historic spills and releases, Facility operations, and potentially land reclamation activities using fill containing anthropogenic materials. Leaching of constituents has impacted groundwater which has the potential to discharge to the river. Overland runoff is another potential migration pathway of COIs to the river.

Terrestrial plants, invertebrates and vertebrates may be exposed to COIs in soil through direct contact. Plants may also take up COIs via their roots and animals may ingest COIs from direct ingestion of soil, or ingestion of prey and food items that may have accumulated COIs in their tissue. Aquatic organisms may be exposed to COIs in groundwater upon discharge of groundwater to the river. Once COIs have migrated to surface water, aquatic organisms may be exposed via direct contact, ingestion, or ingestion of food items that may have accumulated COIs in their tissues.

Potential uptake of COIs through a generalized food web at the Facility is described below. The first step of the food web is the conversion of solar energy to organic material by vegetation. Primary productivity at North Works is predominantly from the landscaped and ruderal vegetation that dominate this Facility. Primary consumers make up the second trophic level; these organisms depend on energy that initially entered the system through the primary producers. Primary consumers include herbivores, omnivores, and detritivores. Detritivores consume decaying plant material and may derive energy from decaying organisms of other trophic levels. Detritivores at the Facility appear to be limited, and include macroinvertebrates (e.g., insects and annelids), fungi, bacteria and microinvertebrates (e.g., nematodes).

The third trophic level consists of carnivores, secondary consumers that depend on energy obtained from ingestion of other animals. Because energy tends to be poorly transferred up food chains, there are fewer secondary consumers (e.g., carnivores) in an ecosystem than primary consumers. In many cases, carnivores consume other carnivores, adding additional trophic levels to the food web. Carnivores at the Facility include mammals such as such as mustellids, foxes and birds, including piscivorous birds, raptors, and owls.

4.3 Risk Analysis

The risk analysis phase of the BASF North Works SERA is based on the CSM developed in problem formulation. Risk analysis includes the characterization of potential ecological exposure and corresponding effects. The ecological exposure assessment involves the identification of potential exposure pathways and an evaluation of the magnitude of exposure of identified ecological receptors.

Exposure assessment is the process of estimating or measuring the amount of COIs in environmental media (i.e., soil and surface water) to which an ecological receptor may be exposed via the evaluated exposure routes. In order to evaluate the potential exposure to the groups of ecological receptors evaluated in this ERA, exposure point concentrations (EPCs) were established and exposure assumptions were defined for aquatic wildlife and terrestrial wildlife and vegetation at the Facility.

4.3.1 Soil Data Used in the SERA

Soil data used in the SERA is presented in Table 4-1 by SWMU/AOC.

Actual sample depth for the majority of soil samples was not available because historical logs did not specify it. Subsequent sampling efforts have clearly logged depths; however, based on these locations alone, adequate data was not available for surface soil characterization (< 1 foot below ground surface (bgs)). As a result, additional soil data were collected in 2007 from selected AOCs and SWMUs. With the exception of AOC 7A and SWMU G, at which additional data were not collected in 2007, only data collected from the top 2 feet of the soil horizon are presented in the SERA. At AOC 7A and SWMU G, samples known to be collected from greater than 1 foot below ground surface were not included in the ecological risk assessment. The data used from these areas include known surface soils and samples collected from an unknown depth.

Summary statistics were calculated for constituents detected in each potential exposure area. To evaluate potential risk to ecological receptors, the maximum detected concentration was used as the EPC for each potential exposure area.

4.3.2 Groundwater Data Used in the SERA

Table 4-1 presents the wells used in the SERA and the samples associated with each well. Wells located downgradient of SWMUs and AOCs, and adjacent to the river (i.e., the GSI wells) were used in the SERA to conservatively estimate potential exposure of aquatic organisms in the river to site-related constituents. EPCs were calculated on a per-well basis using the most recent two years of data (i.e., data collected since July 1, 2005). The maximum detected concentration in each well represented the groundwater EPCs used in the SERA. Groundwater data was evaluated on a Facility-wide basis and in individual groundwater wells.

4.3.3 Screening Values

Screening values for terrestrial exposures to soil were obtained from the USEPA Eco-SSL (USEPA, 2005b-k), which were selected preferentially for soil ecological screening values (ESVs). Since a variety of receptors may be present at the facility, the lowest of invertebrate, plant, mammal or avian Eco-SSLs were selected for the SERA. When no Eco-SSL was available, the USEPA (2003) Region 5 Ecological Screening Levels (ESLs) were used at the ESV.

Screening values for aquatic exposures were obtained from two sources: Final Chronic Values (FCVs) from MDEQ (MDEQ Part 4 Water Quality Standards, Chapter 323.1057) and USEPA Region 5 ESLs (USEPA, 2003). Screening values were normalized to a hardness of 100 mg/L when necessary. MDEQ surface water values were selected preferentially and Region 5 ESLs were selected when MDEQ values were not available. Screening values used in the SERA are presented in Table 4-2.

4.3.4 Background Evaluation

Fourteen (14) surface soil samples were collected from off-site and unimpacted on-site locations and analyzed for TAL metals. The results of background soil sampling were used in a background evaluation for inorganics to determine whether any of the COI in soil may be attributable to natural background, and thus not be Facility-related. The background evaluation for soil was performed for each of the SWMU/AOCs with sufficient sample size (five or more samples) with inorganic COI retained from the screening:

- AOC 6
- AOC 7A
- SWMU G
- SWMU H

The background comparison was conducted in accordance with the USEPA *Guidance for Comparing Background and Chemical Concentrations in Soil for CERCLA Sites* (USEPA, 2002b). Appendix A describes the methods and results in detail.

The following inorganics were included in the background evaluation: antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, cyanide, lead, mercury, nickel, selenium, silver, thallium, tin, vanadium, and zinc. Inorganics with at least 50% frequency of detection in both the site and background data sets were considered appropriate for statistical evaluation. A minimum of five samples was also required. Based on these two criteria, background comparisons could not be performed for any of the inorganics from AOC 6, SWMU G or SWMU H, or for beryllium, cobalt, selenium and silver from AOC 7A.

Based on the results of the background evaluation, concentrations of several inorganic COI in the soil of AOC 7A were found to be consistent with background soil concentrations: arsenic, barium, cadmium, lead, nickel, vanadium and zinc.

4.3.4.1 Qualitative Evaluation of Background

A qualitative background evaluation was conducted when the inorganic data sets did not meet the criteria for inclusion in the quantitative background evaluation (i.e., a minimum of five samples and a frequency of detection of at least 50%). This qualitative evaluation of concentrations in soil was conducted by plotting the background data set for a particular inorganic chemical with the associated data set for that chemical from each SWMU/AOC. The data set considered in this evaluation included both detected and undetected values. This graphical display (included in Appendix A) presents the distribution of chemical data from each SWMU/AOC relative to the background levels of that chemical.

This evaluation was conducted to provide a general description of the distribution of the data sets (site and background), and has not been used to eliminate COI from the CMS. The qualitative background evaluation for the detected inorganic COI in each SWMU/AOC is discussed below.

AOC 6 – Within AOC 6, concentrations of seven COI (arsenic, copper, mercury, lead, antimony, selenium, and vanadium) are distributed fully within the range of the background concentrations for those COI (i.e., the maximum background concentration is higher than the concentrations within this AOC). For cadmium, the maximum background concentration and the maximum AOC 6 concentration are the same (1.4 mg/kg) and the data are similarly distributed with slightly more elevated concentrations found within the AOC 6 data set. The maximum AOC 6 concentrations of nickel and zinc are elevated above the maximum background concentrations for these COI. The nickel data are distributed with slightly more elevated concentrations found within AOC 6 and the highest AOC 6 concentration is twice the maximum background concentration. The majority of the AOC 6 zinc concentrations are distributed evenly throughout the background concentrations with only one AOC 6 concentration higher than the maximum background concentration. Based on this evaluation, all inorganic constituents in AOC 6 in this qualitative evaluation except nickel can be considered generally consistent with background.

AOC 7A – The qualitative evaluation of silver and selenium in AOC 7A indicates that the AOC 7A data are distributed evenly throughout the background data set. For silver the highest concentration is found in the AOC 7A data set, but the concentrations of site and background data are generally consistent. For selenium, the maximum background concentration is more than twice the highest AOC 7A concentration, and the concentrations from site and background are generally consistent.

SWMU G – With the exception of selenium, the concentrations of COI within SWMU G are distributed fairly evenly with the background concentrations. In the case of selenium, the background concentrations are all above the SWMU G concentrations. Concentrations of seven COI in SWMU G (chromium, copper, nickel, lead, antimony, selenium, and vanadium) are distributed fully within the range of background concentrations for those COI (i.e., the maximum background concentration is higher than the concentrations within this SWMU). For arsenic, the maximum background concentration and the maximum SWMU G concentration are

the same (101 mg/kg) and the data are similarly distributed with slightly more elevated concentrations found within the SWMU G data set. Although higher concentrations of cadmium, mercury, and zinc are found within the SWMU G data set, the majority of the SWMU G concentrations for these COI are distributed evenly throughout the background concentrations and only one SWMU G sample is higher than the background concentration. All inorganic constituents detected in SWMU G and evaluated in this qualitative evaluation can be considered generally consistent with background.

SWMU H – Within SWMU H, concentrations of nine COI (arsenic, chromium, copper, mercury, lead, tin, thallium, vanadium, and zinc) are distributed fully within the range of the background concentrations for those COI (i.e., the maximum background concentration is higher than the concentrations within this SWMU). The maximum concentrations of cadmium, nickel, and antimony within this SWMU are above the maximum background concentrations for these COI. However, for these three COI, the majority of the SWMU H concentrations are distributed evenly throughout the background concentrations and only one SWMU H sample is higher than the background concentration. All inorganic constituents detected in SWMU H and evaluated in this qualitative evaluation can be considered generally consistent with background.

4.4 Risk Characterization

The ecological risk characterization integrates the results of the exposure and effects phases of work, and presents an integrated approach that uses field data, laboratory data, and theoretical methods to provide estimates of actual or potential risks to ecological receptors.

The following subsections present the selection of COI for soil and groundwater at the Facility. Maximum EPCs were established for all compounds detected in groundwater and soil as previously described. This EPC was then compared to conservative risk-based ESVs for the protection of aquatic or terrestrial life, respectively. Preliminary COI were established as those compounds with maximum EPCs that exceeded the respective ESV, or those compounds for which no ESV was available.

Exposure and potential risk were estimated using the HQ method, as discussed in Section 4.2.4.

4.4.1 Terrestrial Exposure Screening Evaluation

The following subsections present the ecological screening of soil data.

AOC 6 – The soil screening for AOC 6 is presented in Table 4-3. Several metals and organic constituents were detected in AOC 6 surface soil. Lead, mercury, selenium and zinc HQs exceeded 10 (HQs 17.5, 21, 23 and 35.5, respectively). Four organic COIs, all PAHs exceeded ESVs. The naphthalene concentration was the only that exceeded its respective ESV by an order of magnitude (HQ = 12.6). The HQs for benzo(a)anthracene, benzo(a)pyrene and chrysene were all less than 10 (HQs of 2.9, 7.2 and 3.4, respectively).

AOC 7A – The soil screening for AOC 7A is presented in Table 4-4. Twelve of the fifteen metals detected in soil from AOC 7A exceeded ESVs. Lead, mercury, selenium and zinc HQs exceeded 10 (HQs 30.5, 48, 61.6 and 28.7, respectively). However, seven inorganic chemicals that exceeded ESVs were consistent with background (Section 4.3.4).

SWMU G – The soil screening for SWMU G is presented in Table 4-5. Several constituents, including metals, SVOCs, 4,4'-DDT, and Aroclor 1260 were detected in SWMU G soil at concentrations exceeding their respective ESVs. Copper, lead, mercury, selenium and zinc had HQs greater than 10 (HQs 17.6, 21.6, 54.0, 15.9 and 50.6, respectively). With the exception of pentachlorophenol (HQ = 344), SVOC HQs were less than 10. Aroclor-1260 was detected in 22% of the samples at concentrations (up to 1100 ug/kg) that exceeded the soil screening value (0.332 ug/kg).

SWMU H – The soil screening for SWMU H is presented in Table 4-6. Several constituents, including metals, SVOCs, some pesticides, and PCBs were detected in SWMU H/AOC 5 surface soil at concentrations exceeding their respective screening values. Antimony, lead, mercury, thallium, tin and zinc had HQs greater than 10 (HQs 64.1, 17.3, 11.0, 28.1, 15.0 and 24.6, respectively). Of the SVOCs, only naphthalene had an HQ greater than one (HQ = 5.5). No VOCs exceeded ESVs. While several pesticides were detected at concentrations exceeding ESVs, frequency of detect was generally less than 5% (4,4-DDT, dieldrin, endrin aldehyde and endrin ketone), and HQs for these pesticides were less than 10 (HQs 3.4, 5, 1.1 and 1.4, respectively). Beta-BHC was detected in 9% of samples with an HQ of 2.4. Of the PCBs, Aroclor 1254 and Aroclor 1260 were detected at concentrations exceeding the ESV. The concentration of Aroclor 1260 (1700 ug/kg; HQ = 5120) was much greater than Aroclor 1254 (74 ug/kg; HQ = 223).

4.4.2 Aquatic Exposure Screening Evaluation

The Facility-wide groundwater screening is presented in Table 4-7. Of the organic constituents detected in groundwater, six VOCs (acetone, benzene, carbon disulfide, chlorobenzene, ethylbenzene and xylenes) and 16 SVOCs (3-methylphenol, 4-methylphenol, 3&4-methylphenol, anthracene, benzo(a)anthracene, benzo(a)pyrene, bis(2-chloroethyl)ether, bis(2-ethylhexyl)phthalate, carbazole, chrysene, dibenzofuran, fluoranthrene, naphthalene, phenanthrene, phenol and pyrene) exceeded ESVs. The HQs for anthracene, benzo(a)anthracene, benzo(a)pyrene, bis(2-chloroethyl)ether and naphthalene exceeded 100 and the HQs for 3-methylphenol, 4-methylphenol, fluoranthene, pyrene, benzene and chlorobenzene exceeded 10.

Thirteen inorganic constituents were detected at concentrations exceeding screening values. The HQs for mercury (HQ = 14) and vanadium (HQ = 40) exceeded 10. Total cyanide was detected at concentrations several orders of magnitude higher than the screening value (cyanide HQ = 385).

Table 4-8 presents the COIs by well. The majority of maximum detected concentrations were from RFIMW-12 and WHI6-2S (inorganics); WHI6-2S (SVOCs); and, RFIMW-12F and RFIMW-22 (VOCs). The wells identified are spread along the eastern edge of the property: RFIMW-22 is the northernmost; RFIMW-12 is located at the southern edge of the property downgradient of AOC 6 and near SWMU G; WHI6-2S is located in the northern part of the property near AOC 1 and AOC 7B; RFIMW-8I is located in the middle of the property downgradient of SWMU H/AOC 5; and, RFIMW-10F is located in the southern third of the property near AOC6 and SWMU G.

Based on the data used in the SERA (i.e., the last 2 years of data), RFIMW-10F had the highest detected concentration of mercury (10.7 ug/L), an order of magnitude higher than any other SERA well and several orders of magnitude above mercury concentrations in most other wells.

The COIs identified in the aquatic exposure groundwater screen are further evaluated in Section 5 in order to assess the site-specific potential for surface water impacts relative to background locations.

4.5 SERA Conclusions

This section summarizes and evaluates the results of the North Works screening ecological risk characterization and provides an interpretation of the magnitude of potential ecological risk and its significance. The factors leading to uncertainty in the results are also described, as this information provides a context for risk decision-making.

4.5.1 Preliminary Ecological COIs

Based on the results of this SERA, preliminary ecological COIs were identified in soil and groundwater. Preliminary COIs included constituents detected at concentrations that exceeded screening values and site-specific background (Table 4-9) and constituents for which no screening value was available (Table 4-10).

VOCs

No VOCs were detected in surface soils above their respective ESVs. With the exception of chlorobenzene (HQ = 20) in groundwater, VOC COI were not present with an HQ greater than 10.

SVOCs

With the exception of a few PAHs and pentachlorophenol which were retained as COIs at AOC 6, SWMU G and SWMU H, SVOC COIs are generally associated with groundwater.

Inorganics

Lead, mercury, and zinc had HQs greater than 10 at four soil exposure areas (AOC 6, AOC 7A, SWMU G and SWMU H). Selenium had HQs greater than 10 at three soil exposure areas (AOC 6, AOC 7A, and SWMU G). Other COI with HQ > 10 included copper (SWMU G), antimony (SWMU H), thallium (SWMU H) and tin (SWMU H). Most inorganics in AOCs 6 and 7A for which adequate data were available (i.e., n>5) and that were sufficiently detected in Facility background data (i.e., >50%), were found to be consistent with background. The results of the background screening are presented in Table 4-11.

In groundwater, three metals (mercury, cyanide, and vanadium) had HQs greater than 10, but cyanide (HQ = 385) appears to be the primary risk driver in groundwater for ecological receptors.

PCBs and Pesticides

Some pesticides (4,4-DDT, beta-BHC, dieldrin, endrin aldehyde and endrin ketone) were detected in soil from SWMU H at concentrations greater than the screening value (i.e., HQ > 1); 4,4-DDT exceeded the ESV at SWMU G surface soil as well. PCBs were detected at high concentrations from surface soil at SWMUs G and H. None of these constituents were a concern in groundwater or at the other areas of concern evaluated in the SERA. Simple food chain modeling could be used to determine if these concentrations are of potential ecological concern.

Summary

Given the conservative nature of the SERA, additional refinement of the preliminary COIs, identified as those constituents with no screening value or those with HQ > 1, was conducted to provide a focus for additional ecological risk evaluation steps. The background screening (Table 4-11) indicated that several inorganic constituents that are detected in soils at AOC 7A at concentrations above screening values are consistent with background conditions and should not be included as COIs.

As previously noted, the use of maximum site concentrations and conservative screening values is a highly conservative approach. Many constituents retained as COIs are based on comparison of maximum concentrations to conservative screening values, and in several cases, the maximum is only slightly higher than the screening value. The final list of preliminary ecological COIs that warrant further evaluation is presented in Table 4-12. The COIs identified in the aquatic exposure groundwater screen are further evaluated in Section 5 in order to assess the site-specific potential for surface water impacts relative to background locations.

4.5.2 Uncertainty Evaluation

The objective of the uncertainty analysis is to discuss the assumptions of the ERA process that may influence the risk assessment results and conclusions. Uncertainties in the ERA process in this SERA generally tend to overestimate potential ecological risks.

Extrapolation of the potential for community, population, or ecosystem effects from the examination of one or more representative species is a major source of uncertainty in the SERA process. The underlying assumption is that potential effects on one representative species are consistent with the effects on similar species and representative of the potential for effects on the particular ecosystem being investigated. It is difficult to predict how an adverse effect on an individual organism might affect the ecosystem as a whole. If the risk assessment results suggest than an individual may be experiencing adverse effects predicted (i.e., HQ > 1), it does not necessarily mean that the community, population or ecosystem will be similarly affected. Even if one subset of the ecosystem is impacted in a localized area, it may not be perceptible to the overall ecosystem. In addition, there is the potential effect of background concentrations of COIs that arise from other sources and may affect local populations.

A large source of uncertainty is the many constituents for which there was no screening benchmark. If no aquatic or terrestrial screening value was available, that constituent was retained as a preliminary COI (Table 4-10). Although surrogate values were used whenever applicable, further investigation and evaluation may be required to establish whether or not these COIs pose a potential risk.

Use of chronic screening values may overestimate risk. Chronic toxicity screening values assume that ecological receptors experience continuous, chronic exposure. Exposure in the environment is unlikely to be continuous for many species that may be transitory and move in and out of areas of maximum COI concentration.

Use of the maximum detected concentration as the EPC overestimates exposure and risk. With the exception of vegetative communities and certain invertebrate receptors, ecological receptors are generally not sessile, but move in space and time creating an exposure that is typically integrated or averaged over an entire exposure area (on- and off-site). Therefore, while comparison of maxima to screening values provides a conservative and “worst case” screening scenario, an evaluation of average concentration of COIs is a more realistic estimate of potential exposure concentrations. This is particularly true with groundwater, where the maximum concentration in each GSI well was selected to represent the concentration of constituents in each well.

The HQ approach provides a conservative estimate of risk based on a "snapshot" of site conditions; the hazard quotient approach has no predictive capability.

The risk evaluation was for individual organisms and this may overestimate risk. Effects on individual organisms may occur with little population or community level effects. However, as the number of affected individuals increases, the likelihood of population-level effects increases.

4.5.3 SERA Summary and Conclusions

The results of this SERA suggest that certain terrestrial receptors may potentially be at risk from exposure to COIs in soil at several SWMU/AOCs, and that potential risk to ecological receptors from exposure to groundwater as it discharges to the surface water at the Facility cannot be ruled out.

At several terrestrial areas, and in groundwater, heavy metals (e.g., lead, mercury, selenium and zinc) were present at concentrations that are one to two orders of magnitude greater than screening values (i.e., HQ >10 to >100). At SWMUs G and H, total PCBs are more than three orders of magnitude higher than screening values (i.e., HQ > 1000). These metals and PCBs are the primary COIs at the Facility and should be the focus of additional ecological investigation.

4.6 Limited PERA

To help refine potential ecological risks and focus the ecological risk assessment on receptors that may be at risk from the bioaccumulation of heavy metals and PCBs, a limited PERA has been conducted for the Facility.

The PERA, presented in this subsection, includes use of food web modeling. This approach is generally consistent with methods proposed to USEPA in March 20, 2007 conference call.

4.6.1 Food Web Modeling

The process of assessing exposure for wildlife receptors involved estimating the likely dosage for each relevant exposure route, and summing these estimates to derive an expected total body dosage for each receptor type. The extent of exposure depended on various factors, such as the type of food consumed, feeding rates, habitat preference, and exposure duration (i.e., home range or limited exposure due to migration, etc) (Suter et al., 1997). The following is a list of receptors that were used in the limited PERA:

- Omnivores: Raccoon (*Procyon lotor*)
- Insectivores: American Robin (*Turdus migratorius*) and Short-tailed shrew (*Blarina brevicauda*)
- Herbivores: Eastern cottontail (*Sylvilagus floridanus*)

These wildlife receptors were selected as representative species since they occur at or in the vicinity of the site, have home ranges consistent with the size of the AOCs and SWMUs, and they are likely to forage on prey species at several trophic levels in terrestrial upland areas. Exposure parameters for the selected representative species are presented in Appendix F.

Exposure pathways that were considered in the limit PERA included portions of food webs (e.g., soil => primary consumer => secondary consumer => tertiary consumer), as well as other direct and indirect exposures. The process of assessing exposure for the wildlife receptors involved estimating the likely doses for each relevant exposure route, and summing these estimates to derive an estimated total body dose for each receptor type. In general, exposure assumptions (body weights, food ingestion rates, relative consumption of food items, etc.) for each of the representative species were obtained from the USEPA's Wildlife Exposure Factors Handbook, Volumes I and II (USEPA, 1993a,b).

Wildlife species may be exposed to COI from soils by incidental ingestion of these media, or by bioaccumulation of COI from prey items. Potential Daily Exposure (PDE) values were calculated based on the measured concentrations of COI in tissue that wildlife species would consume an estimate of the amount of environmental media that each species would ingest, the relative amount of different food items in its diet, body weight, and food ingestion rates. Maximum EPCs (to the represent worst-case scenario) were used in the food web modeling. Since organisms are exposed to COI spatially, the average EPCs were also considered when the PDE based on the maximum EPC exceeded the relevant thresholds. Average EPCs were calculated using only detected concentrations. This may overestimate the average concentration, but eliminates concerns associated with censored data.

Toxicity reference values (TRVs) were identified that represents a threshold for sublethal effects to wildlife receptors. Sublethal effects are defined as measurement endpoints related to impairment of reproduction, growth, or survival. The TRV relates the dose of a respective chemical from oral exposure with an adverse effect. Separate avian and mammalian TRVs were obtained from studies reported in peer-reviewed primary literature. Secondary literature was also reviewed to supplement the results of the primary literature search. Two avian and mammalian TRVs were derived for each COI. One TRV was based on the No Observed Adverse Effects Level (NOAEL) and the second was based on the Lowest Observed Adverse Effects Level (LOAEL) identified in the literature. Evaluation against a NOAEL-based TRV only identifies levels below which no effect has been seen. However, it is also useful to consider the COI level at which adverse effects start to manifest (i.e., LOAEL-based TRV). These two approaches are considered to constitute the lower bound (i.e., NOAEL-based TRVs) and upper bound (i.e., LOAEL-based TRVs) (U.S. EPA, 1997). The TRVs used in the limited PERA are presented in Appendix F.

Potential risks for the representative wildlife species associated with ingestion of COIs were evaluated using the HQ. Each HQ was calculated by dividing the PDE by the corresponding TRV. When the estimated PDE

was less than the TRV (i.e., the HQ < 1), it was assumed that exposure to a COI would not be associated with adverse effects to single receptors (i.e., inhibited growth, reproduction and survival of the individual organism) or wildlife populations. When the HQ was greater than unity (HQ > 1), there is a potential for adverse effects to a receptor due to COI exposure, and a discussion of the ecological significance of these results was completed.

This hazard ranking scheme evaluates potential ecological effects to individual organisms and does not evaluate potential population-wide effects. Exposure to certain COI may cause population reductions by affecting birth and mortality rates, immigration and emigration (e.g., Eisler, 1986; Eisler and Belisle, 1996). In many circumstances, lethal or sub-lethal effects may occur to individual organisms with little population or community level impacts; however, as the number of individual organisms experiencing toxic effects increases, the probability that population effects will occur also increases. The number of affected individuals in a population presumably increases with increasing HQ values; therefore, the likelihood of population level effects occurring is generally expected to increase with higher HQ values.

Details of the calculation of food chain modeling, including estimation of exposure concentrations, are presented in Appendix F.

4.6.1.1 AOC 6 Food Chain Modeling

The results of the food chain modeling at AOC 6 are presented in Table 4-13. Using the conservative assumptions presented in the food chain and maximum exposure point concentrations, exposure of the raccoon and short-tailed shrew to several SVOCs including benzo(a)anthracene, benzo(a)pyrene, and chrysene had NOAEL-based HQs > 1. In addition, NOAEL-based HQs for the American robin (lead and mercury) and short-tailed shrew (cadmium, lead, and nickel) exceeded 1.

When the LOAEL-based TRVs were used to derive the HQs with the maximum EPC, none of the HQs exceeded 1.

4.6.1.2 AOC 7A Food Chain Modeling

The results of the food chain modeling at AOC 7A are presented in Table 4-14. Using the conservative assumptions presented in the food chain and maximum exposure point concentrations, only exposure of the American robin had HQs > 1. The NOAEL-based HQ for total cyanide exceeded 1 (HQ = 6.6) and both the NOAEL- and LOAEL-based HQs for mercury exceeded 1 (HQ = 19.7 and 1.97, respectively). None of the other receptors had HQs > 1.

Since there was a LOAEL-based HQ above 1 in the maximum EPC evaluation, the average EPC was also considered for this receptor-COI combination. Table 4-17 presents the HQs for the American robin exposed to the average EPC for mercury. In this evaluation, the NOAEL-based HQ exceeds 1 (HQ = 5.2), but the LOAEL-based HQ is well below 1.

4.6.1.3 SWMU G Food Chain Modeling

The results of the food chain modeling at SWMU G are presented in Table 4-15. Using the conservative assumptions presented in the food chain and maximum exposure point concentrations, exposure of three receptors (American robin, raccoon and short-tailed shrew) to pentachlorophenol and 4,4-DDT, and American robin exposure to mercury had NOAEL-based HQs > 10. In addition, short-tailed shrew maximum exposure to cadmium, lead, and nickel and American robin maximum exposure to antimony and lead had NOAEL-based HQs > 1. None of the other COI had HQs > 1.

When the LOAEL-based TRVs were used to derive the HQs with the maximum EPC, the HQs for exposure of receptors to pentachlorophenol (American robin, raccoon, and short-tailed shrew) and 4,4-DDT (short-tailed

shrew) were elevated above 10. In addition, the LOAEL-based HQs for the American robin exposed to lead, mercury, and 4,4-DDT and the raccoon exposed to 4,4-DDT were above 1.

Since there were LOAEL-based HQs above 1 in the maximum EPC evaluation, the average EPCs were also considered for these receptor-COI combinations. Table 4-18 indicates that the NOAEL-based HQs for the American robin exposed to the average EPC for pentachlorophenol and the short-tailed shrew exposed to the average EPC for pentachlorophenol and 4,4-DDT remained above 10 and the associated LOAEL-based HQs were above 1. The NOAEL- and LOAEL-based HQs for the American robin exposed to the average lead EPC were well below 1. The NOAEL-based HQs for mercury and 4,4-DDT for the American robin exceed 1 (HQ = 3.2 and HQ = 2.9, respectively), but the LOAEL-based HQs were well below 1. The NOAEL-based HQs for the raccoon exposed to pentachlorophenol and 4,4-DDT exceed 1 (HQ = 6.5 and HQ = 8.1, respectively). The LOAEL-based HQ for the raccoon exposed to the average EPC for pentachlorophenol was well below 1 and the LOAEL-based HQ for the raccoon exposed to the average EPC for 4,4-DDT was above 1 (HQ = 1.6).

4.6.1.4 SWMU H Food Chain Modeling

The results of the food chain modeling at SWMU H are presented in Table 4-16. Using the conservative assumptions presented in the food chain and maximum exposure point concentrations, exposure of several receptors (American robin, raccoon, and short-tailed shrew) to 4,4-DDT and American robin exposure to antimony had NOAEL-based HQs > 10. In addition, several avian and mammalian receptors' maximum exposure to some metals (antimony, cadmium, lead, mercury, nickel, thallium), pesticides (dieldrin, endrin aldehyde, endrin ketone) and PCBs had HQs > 1. None of the SVOC COI had HQs > 1.

When the LOAEL-based TRVs were used to derive the HQs with the maximum EPC, none of the HQ were above 10. The LOAEL-based HQs for exposure of receptors to antimony (American robin), nickel (short-tailed shrew) and 4,4-DDT (American robin, raccoon, and short-tailed shrew) were above 1.

Since there were LOAEL-based HQs above 1 in the maximum EPC evaluation, the average EPCs were also considered for these receptor-COI combinations. Table 4-19 indicates that the NOAEL-based HQs for the raccoon and the short-tailed shrew exposed to the average EPC for 4,4-DDT remained above 10 and the associated LOAEL-based HQs were above 1. The NOAEL-based HQs for antimony and 4,4-DDT for the American robin and for nickel and the short-tailed shrew exceeded 1 (HQ = 8.1, HQ = 7.1, and HQ = 1.6, respectively), but the LOAEL-based HQs were well below 1.

4.6.2 PERA Summary and Conclusions

To help refine the risks identified in the SERA simple food chain modeling was used in the PERA. In the food chain modeling, most COI identified using comparison of concentrations to conservative screening values did not show a potential for risk to the higher trophic level receptors (i.e., HQ < 1). A few COI appear to be of potential concern to higher trophic level organisms; particularly mammalian receptors exposed to pentachlorophenol in SWMU G, and avian and mammalian receptors exposed to 4,4-DDT in SWMU G and SWMU H. LOAEL-based HQs under the maximum exposure scenario were consistently greater than 1 for these exposure scenarios and several of these HQs exceeded 10.

Based on the results of the limited PERA, certain heavy metals in SWMU G, SWMU H and AOC 7A, and 4,4-DDT in SWMU G and SWMU H should be considered in the CMS at the Wyandotte facility (Table 4-20). Of the heavy metals retained for consideration in the CMS in these areas, the qualitative background evaluation of lead and mercury in SWMU G surface soil, and antimony and nickel in SWMU H surface soil demonstrates that the concentrations of these metals in background are detected at levels not completely inconsistent with concentrations in the SWMUs. The relative concentrations of these metals relative to background should be considered in risk management decisions during the CMS.

5.0 Tier 2 Evaluation of Groundwater Surface Water Interface (GSI) Pathway and Groundwater Contact Protection Criteria (GCPC)

This section presents the Tier 2 risk evaluation of the leaching-based soil criteria exceedances and Groundwater Surface Water Interface (GSI) criteria exceedances identified in the Tier 1 risk screening (ENSR, 2005). There are two objectives of this Tier 2 evaluation:

1. *For soil*: to evaluate on a site-specific basis whether the potential COI identified in the Tier 1 screening as exceeding the generic Part 201 leaching-based criteria (i.e., the Groundwater Surface Water Interface Protection Criteria (GSIPC) and the Groundwater Contact Protection Criteria (GCPC)) are of concern for site groundwater; and
2. *For groundwater:* to evaluate on a site-specific basis the GSI criteria exceedances at the Facility.

Based on the results of this Tier 2 evaluation, certain COI and SWMU/AOCs can be eliminated as of concern for leaching to groundwater and/or migration in groundwater and subsequent discharge to surface water (i.e., the Detroit River).

Sixteen of the 17 soil exposure areas evaluated in the Tier 1 risk screening had exceedances of one or more GSIPC (including soil collected at several monitoring wells and background wells). Three of the 17 areas (AOC 4, AOC 6, and SWMU H) had exceedances of one or more GCPC (which are higher than GSIPC). For the soil areas where one or more COI were identified based on exceedance of the Part 201 generic GSIPC or GCPC, a number of refinements are potentially applicable ranging in level of complexity, including:

- consideration of frequency of detection (e.g., COI with a low frequency of detection can be potentially eliminated);
- incorporation of site-specific background for soil and groundwater (e.g., local background concentrations may exceed generic GSIPC for soil COI and generic GSI for groundwater COI);
- use of alternate EPCs (e.g., mean concentration vs. maximum detected concentration in an area);
- examination of spatially-related soil and groundwater data to determine whether the pathway from soils to groundwater to the receptor(s) is or is not complete (e.g., compare soil GSIPC exceedances to GSI observations at downgradient locations); and
- fate and transport analysis to predict constituent concentrations in groundwater underlying a SWMU/AOC with a GSIPC or GCPC exceedance and/or at downgradient points of exposure in groundwater (where no wells and/or parameter evaluation exist at downgradient wells).

The Tier 2 risk evaluation was performed in a tiered approach, beginning with a simplistic screening level tier followed by subsequent tiers including more complex analyses. This approach allowed for step-wise evaluation of constituents with more complex analyses focused on relatively few constituents. For constituents not eliminated from further consideration in initial tiers, standard fate and transport calculations were performed to estimate downgradient/future groundwater and/or river concentrations at downgradient points of exposure. These points of exposure concentrations are better for comparison to GSI.

5.1 Background Evaluation for Groundwater

A number of inorganic constituents present in groundwater beneath the Facility are also present in groundwater upgradient from the Facility. Metals are naturally-occurring in groundwater, derived from the geologic materials through which the groundwater flows. For this reason, metals that are present in groundwater beneath the Facility but also present in groundwater upgradient from the Facility may not be

associated with operations at the Facility. The existence of this background condition needs to be considered in risk management decisions, and is critical for a number of groundwater COI for which GSI criteria are lower than anticipated background levels in groundwater. Therefore, the purpose of this evaluation is to establish a concentration of each metal that appropriately represents the upgradient groundwater conditions (i.e., the background groundwater concentration). This concentration can then be compared to groundwater concentrations at the Facility and incorporated into consideration of GSI criteria. Thus, instead of evaluating background by comparing groups of data, as was done for soil (see Section 3.1), it was decided to calculate a single number for each constituent that represents background concentrations.

5.1.1 Background Data set for Groundwater

The upgradient data set was approved by USEPA on August 10, 2006 based on a final Well Installation Plan submitted by BASF on August 2, 2006. The final Well Installation Plan incorporated USEPA's June 15, 2006 written comments to BASF's draft Well Installation Plan presented to EPA on May 15, 2006. The final Well Installation Plan also addressed remarks submitted to U.S. EPA via email on June 13, 2006 by Ms. Beth Vens with the MDEQ. BASF's Well Installation Plan identified existing as well as proposed new monitoring wells and the targeted groundwater monitoring interval to assess the quality of groundwater where it enters the North Works Facility (background water quality) and where it leaves the property (at the groundwater to surface water interface). The selected background monitoring wells identified include BG-MW-1, P35N, RFI-MW24, RFI-MW28, WHI2-3S, WHI3-1S, WHI3-3S, and WHI4-2S. Well construction diagrams and completion details for these selected wells were submitted to USEPA in the final Well Installation Plan (ENSR, 2006).

The selected background monitoring wells representing upgradient groundwater conditions are completed in the Native Sand Unit. The thickness of the Native Sand Unit varies from 4.5 to 6 feet in the background wells with the exception of P35N in the southwest corner of the site, where the thickness is less than 2 feet. The Lacustrine Clay lies beneath the Native Sand Unit at depths ranging from 3.5 feet below surface in the south at P35N to 7.5 feet in the north at RFI-MW24. Data collected during the RFI indicates that the Native Sand Unit occurs across the entire site except an area in the southeast near the river where the Lacustrine Clay occurs as a ridge that pinches out the Native Sand.

Across two thirds of the eastern portion of the Facility, the Native Sand Unit lies beneath a Peat layer. The Peat layer increases in thickness from 0 to 4 feet moving eastward toward the river. The anthropogenically-placed Fill Unit occurs from the surface to a depth of 6 to 15 feet bgs above the Peat layer. Groundwater occurs in both the Fill and Native Sand Units; the groundwater flow direction in both the Fill and Sand Units is generally from west to east toward the Detroit River. Groundwater migrating onto the site from the west is solely in the Native Sand Unit; however, the Native Sand and Fill Units are in hydraulic connection (WHI, 2002).

Data from four sampling events serve as the upgradient data set to calculate the representative background groundwater concentration. Sampling events were conducted in August/ September 2006, November 2006, February 2007 and May 2007. Since approval of the final Well Installation Plan with U. S. EPA on August 10, 2006, MDEQ has requested that six additional background wells be installed and sampled quarterly for one year to evaluate background conditions. The wells are scheduled to be installed starting July 30, 2007 and the first quarterly sampling is scheduled to occur in August 2007. Once sampling of the new wells is complete, BASF will evaluate background statistics on these new wells and compare to the results to the background concentrations determined in this Tier II risk assessment.

Calculations have been performed using the available data from the four sampling events (August/September 2006, November 2006, February 2007 and May 2007). Each of the measured concentrations from these sampling events represents a true upgradient concentration (within normal bounds of accuracy in sampling and laboratory methodology). The purpose of this background evaluation is to select a single concentration that appropriately represents the upgradient inorganic groundwater concentrations.

5.1.2 Statistical Method

The statistical methods presented in commonly-used guidance from MDEQ or the USEPA to calculate a single upgradient concentration are limited. Current USEPA guidance relies on comparing full data sets, not comparing values to a single concentration. That is, the methods compare the population of upgradient data to the population of on-site data to determine whether they are statistically different from each other. Or they may use methods that compare the population to an established level. While these methods are quite useful, they do not meet the current objective of providing a specific number for use in planning and decision-making. MDEQ guidance proposes that the value be calculated as the mean plus three standard deviations (S3TM guidance) for normally distributed data. There are no alternatives provided for non-normally distributed data. USEPA Region IV establishes the background level as two times the average site-specific background concentration (USEPA, 2000b) also for normally-distributed data. This and other possible statistical methods are discussed below.

Various statistical methods that are available for selecting an appropriate representative concentration include:

- The maximum value or the second greatest value (if there is some reason to believe the maximum may be biased) may be selected. These values define an upper bound of the observed data. Note that true background concentrations could easily be greater than these values.
- Calculation of a value based on population statistics, such as the mean and standard deviation. These calculations require that the data be normally distributed. The mean plus 2 standard deviations will include about 95% of the population in a normal distribution. The mean plus 3 standard deviations will include approximately 99% of the population.
- Where data are not normally distributed, percentiles or quantiles, for example, the 95th or 99th percentiles, or others such as the 90th percentile, are often used. The 95th percentile indicates that 95% of the available data is below this level; 5% is above. For non-parametric methods, these percentiles are simply calculated from the available data, making no assumptions about underlying distribution. For parametric methods, they are typically calculated from population statistics, the mean and standard deviation.
- Prediction intervals and tolerance intervals are methods of calculating a level that defines a certain percentage of the population with a specified confidence interval. For example, a tolerance interval may be specified to include 95% of the population with a 99% confidence. A value outside this range would be considered different than the population. These methods also typically require data to be normally-distributed.

Examination of the specific upgradient data sets for the Facility indicates that of the 17 metals evaluated: three (barium, mercury, nickel) have a frequency of detection greater than 80%; and ten (antimony, arsenic, beryllium, cadmium, lead, selenium, silver, thallium, tin, and vanadium) have a frequency of detection less than 50%. The greater the number of non-detect values, the more the detection limits may bias any parametric statistical calculations. In addition, when the normality of the data sets is tested (see Table G-1 in Appendix G), nickel is determined to be normally distributed; mercury and barium log-normally. All other metals are neither lognormally or normally distributed. Therefore, using non-parametric methods to select representative background concentrations is more appropriate as it provides a consistent methodology for all parameters.

Use of the maximum value or tolerance intervals will define the upper bound of the data set. While this is an appropriate definition of the upgradient range, it may not be conservative with respect to risk management decision-making. The non-parametric 90th percentile (see, for example, Gilbert, 1987 for details on calculating percentiles) has been selected to define the upgradient concentrations of the metals, for the following reasons:

- Use of non-parametric percentiles relies on the actual data collected and does not make any assumptions about the underlying data distribution. It is not typically sensitive to the presence of large numbers of non-detect values.
- The 90th percentile establishes a level that includes 90% of the data collected. While the 95th or 99th percentiles also appropriately characterize the upgradient data. Based on the available data, there is not sufficient data to distinguish the 99th percentile (it will equal the maximum). However, the 95th percentile has also been calculated and is shown on the tables.

It must be recognized that there are likely to be concentrations in excess of the 90th or 95th percentile (or of the maximum value) that are attributable to upgradient conditions. Use of the 90th or 95th percentile (or any statistic) does not define the maximum possible value for upgradient concentrations. As stated in the objectives, it provides a level that can be used in decision-making processes. In addition, the lowest applicable criteria, the GSI criterion, for each inorganic was considered. In the risk assessment decision process, only analytes where the background concentration is above the lowest applicable criteria is of significance.

The following table provides the results:

Inorganic Analyte	Units	GSI Criteria (1)	Percent Non-detects (2)	90th Percentile	Comments
ANTIMONY	ug/l	2	92.11%	Any detects (3)	Data not appropriate to calculate statistics as half the DL (60U) is greater than the maximum detect and there are only 3 detects. Consider any detects to be above background, although the maximum concentration detected in a background well is 7.8J ug/L, above GSI criteria.
ARSENIC	ug/l	50	55.26%	45.1	Although greater than 50% of the samples are ND, the data is considered to be sufficient to calculate statistics as the DL is low (10U) as compared to the majority of detects.
BARIUM	ug/l	440	0.00%	136.5	-
BERYLLIUM	ug/l	2.4	100.00%	Any detects (3)	The data not appropriate to calculate statistics as beryllium was never detected at a DL of 5U. Consider any detects to be above background.
CADMIUM	ug/l	2.2	84.21%	Any detects (3)	The data not appropriate to calculate statistics as half the DL (5U) is greater than the maximum detect. There are not a sufficient number of detects (6) to calculate background statistics. The maximum concentration in a background well was 1.1J ug/L. Consider any detects to be above background.
CHROMIUM	ug/l	11	28.95%	36.88	Only total chromium samples were collected, not hexavalent. Note, the maximum concentration detected in the background wells was 595 ug/L, while the second highest concentration was 81.2 ug/L.
COBALT	ug/l	100	47.37%	5.76	Did not use ND values as half the DL (50U/2 = 25) was greater than the maximum value (8.1 ug/L).
COPPER	ug/l	9	47.37%	12.5	Used half of ND values; however, percentiles impacted by half the DL (25U/2 = 12.5). Statistics strongly impacted by the maximum (27.5 ug/L) and 2nd maximum value (21.7 ug/L). Percentile concentrations would be higher if half DL results not used.

Inorganic Analyte	Units	GSI Criteria (1)	Percent Non-detects (2)	90th Percentile	Comments
LEAD	ug/l	10	63.16%	34.2	Although greater than 50% of the samples are ND, the data is considered to be sufficient to calculate stats as the DL is low (3U) as compared to the majority of detects and the GSI criteria.
MERCURY2	ng/l	1.3	15.00%	38.7	All analyzed with 1631E and collected using clean hands/dirty hands techniques.
NICKEL	ug/l	52	7.89%	43.63	-
SELENIUM	ug/l	5	68.42%	6.77	Although greater than 50% of the samples are ND, the data is considered to be sufficient to calculate statistics as the DL is low (5U) as compared to the majority of detects and appropriate as compared to the GSI criteria.
SILVER	ug/l	0.2	100.00%	Any detects (3)	The data is not appropriate to calculate statistics as silver was never detected. Consider any detects to be above background.
THALLIUM	ug/l	1.2	81.58%	8.29	Greater than 50% of the samples are ND and the DL is high (5U) as compared to the GSI criteria (1.2 ug/L). Detects ranged from 5.3J to 10.2 ug/L, which are above the GSI criterion. Data suggests background levels are above the GSI criterion and a lower DL would not change statistics, because of this, the statistics calculated are considered appropriate.
TIN	ug/l	No criterion	100.00%	Any detects (3)	The data is not appropriate to calculate statistics as tin was never detected. Consider any detects to be above background.
VANADIUM	ug/l	12	57.89%	12	The maximum value (39.6 ug/L) notably impacts the statistics, resulting is a 90th percentile of 25 ug/L. In addition, greater than 50% of the samples are ND, half of the DL (25U/2 = 12.5) is greater than the GSI criteria and above the majority of detects. Statistics were calculated without ND values and the maximum value resulting in a 90th percentile of 13.91 ug/L. But given the ND and DL issues, this value could be biased high. Thus, the background concentration was set equal to the GSI criteria, although be aware the max detect in a background well was 39.6 ug/L.
ZINC	ug/l	120	42.11%	83.72	-

Notes:

ND = Non-Detect

DL = Detection Limit

(1) The GSI criterion is the lowest applicable criteria for all of the inorganics analyzed.

(2) Percent Non-Detects is the total number of non-detects (inc. duplicates) / total number of samples (inc. duplicates)

(3) A background concentration was not calculated; the data set was inappropriate to determine the 90th percentile. As a result, any detects will be considered and evaluated in the risk assessment process.

For the 17 inorganics in background groundwater, the 90th percentile was calculated for 11 of the inorganics:

- arsenic (45.1 ppb);
- barium (136.5 ppb);
- chromium (36.88 ppb);
- cobalt (5.76 ppb);
- copper (12.5 ppb);
- lead (34.2 ppb);
- mercury (38.7 ppt);
- nickel (43.63 ppb);
- selenium (6.77 ppb);
- thallium (8.29 ppb); and
- zinc (83.72 ppb).

Background concentrations were not calculated for antimony, beryllium, cadmium, silver, and tin as these inorganics were detected in groundwater in less than 20% of samples and/or there were detection limit issues relative to the GSI criterion (e.g., there were numerous detects and half the detection limit was above the GSI criterion). Vanadium was treated uniquely for risk assessment purposes, the background was set to the GSI criterion (12 ppb), although evidence suggests the background concentration could potentially be higher. The vanadium 90th percentile was impacted by both the high detection limit (25U) relative to the GSI criteria (12 ppb) and the max value (39.6 ppb). All other detects ranged from 2.1 to 15.2 ppb. Thus, the data set shows that vanadium is present in upgradient groundwater, but it was concluded there is insufficient evidence to assign a background concentration higher than the GSI criteria. The background calculations indicate only 6 of the 17 inorganics analyzed have background concentrations higher than their respective GSI criteria, they are chromium, copper, lead, mercury, selenium, and thallium. See Appendix G for detailed calculations.

5.2 Groundwater Surface Water Interface Pathway

The general approach to the refined evaluation of Groundwater Surface Water Interface (GSI) Pathway is as follows:

- Initial screening of potential COI in soil and groundwater (Section 5.2.1). Eliminate constituents from further consideration by logically reviewing site-specific data. Methods used include background soil evaluation, frequency of detection evaluation, comparison of constituents listed as potential soil and groundwater COI, and evaluation of the soil to groundwater pathway (for potential soil COI).
- Refined screening of remaining potential COI for complete pathways (Section 5.2.2). All potential soil and groundwater COI not eliminated in the initial screening step were evaluated more thoroughly to identify potential receptor locations and to determine if there is a potentially complete pathway from soil to groundwater and through groundwater to the receptor location.
- Fate and Transport Evaluation (Section 5.2.3). If a complete pathway to a receptor location is confirmed, calculations can be completed to evaluate whether or not the COI would leave the Facility (either across a property line or to the river) at concentrations exceeding the GSI.

The groundwater fate and transport section uses an exact analytical solution, specifically BIOSCREEN-AT developed by Dr. Christopher Neville of S.S. Papadopulus and Associates. MDEQ recently recommended use of this model (MDEQ, July 24, 2007 interoffice communication) in lieu of EPA's version of BIOSCREEN or BIOCHLOR (which use the Domenico solution). The model was used to evaluate whether COI concentrations at the river (or property line) based on groundwater concentrations would exceed the GSI. The predictions of

concentrations were not completed at this time, only whether or not the GSI criterion would ever be exceeded. Details of the process are described below.

The following areas were not included in the refined evaluation of the GSIPC and GCPC pathways.

- The existing remedy (i.e., groundwater extraction) at AOC 6 mitigates migration of groundwater from this AOC to the river (or property line); the pathway to COI migration is, therefore, incomplete while the extraction system is operating. All COI in AOC 6 were, therefore, removed from further consideration and it is assumed that groundwater extraction will continue indefinitely. Alternatives to this assumption in the CMS must consider COI from AOC 6.
- Similarly, AOC 7B is upgradient of a groundwater extraction remedy (TMW-4); groundwater originating from AOC 7B is captured by the extraction system, therefore, the pathway to the river is incomplete and all COIs at AOC 7B are removed from consideration for similar reasons as AOC 6.
- Last, five RFI monitoring wells with soil data that were included in the Tier 1 risk screening have since been identified as background soil locations (RFIMW-24, RFIMW-25, RFIMW-26, RFIMW-27, and RFIMW-28). Although the Tier 1 risk screening identified some exceedances of GSIPC for inorganics in these five locations, they are not evaluated further in this Tier 2 evaluation because these locations are considered background for soil.

5.2.1 Initial Tier 2 Screening

Based on the outcome of the Tier 1 risk screening, potential soil COI are associated with a specific area (SWMU/AOC), whereas potential groundwater COI are identified for individual wells (i.e., not with a specific SWMU/AOC). Therefore, part of the process of the initial groundwater screen was to determine if there were geographic groupings to wells that exceeded applicable criteria.

Initial Screening of Potential Soil Constituents (Soil to Groundwater Pathway)

An initial screening of potential soil COI identified in the Tier 1 risk screening was performed and is summarized in Table 5-1.

Soil COIs were eliminated from further evaluation because one or more of the following conditions exist:

- **Basis 1:** Low frequency of detection (less than 5% assuming a minimum of 20 samples and detection limits are not elevated). Low frequency of detection indicates that any detects are an anomaly (i.e., not representative of overall soil conditions in an area of interest).
- **Basis 2:** No exceedance of GSIPC for soil (based on the mean COI concentration in each area). As the areas of interest are relatively large as compared to a single soil sampling point, if mean concentrations are not above the criteria, it is unlikely that a chemical will exceed GSI criteria (even if several samples were above criteria) in groundwater below the area or at the groundwater/surface water interface boundary.
- **Basis 3:** Exceedance of the GSIPC, but, in the case of inorganics, consistency with background conditions. If soil conditions are consistent with background conditions, no further action is required Section 3.1 provides additional detail on the determination of consistency with background soil concentrations.
- **Basis 4:** Absence of COI in facility-wide groundwater. If a potential COI in soil exceeds the GSIPC, but the COI is not in facility groundwater, the soil to groundwater pathway is considered incomplete. That is, a chemical may be in soil, but there is no evidence it leaches to groundwater.
- **Basis 5:** Absence of GSI exceedance in groundwater at wells underlying or downgradient of the AOC/SWMU. Given the size and nature of groundwater flow at the facility, the potential exists where a

COI is present in facility groundwater but not in an area downgradient of the soil exceedance. In this event, like Basis 4, the soil to groundwater pathway is considered incomplete. That is, a constituent may be in soil, but there is no evidence that it leaches to groundwater.

When one or more of these five conditions was met, "No" was placed in the in the second to last column on Table 5-1 signifying that no further evaluation is required of the soil to groundwater pathway. The basis of the determination is provided in the last column. There are a total of 201 instances[3] that were evaluated in Table 5-1, of these 171 were dropped from further consideration. Specifically, the breakdown of why a potential COI was eliminated from further consideration is summarized below. A shown in Table 5-1, many potential COIs were eliminated because they met several of the bases described above.

- **Low Frequency of Detection (Basis 1):** Benzene, ethylbenzene, toluene and total xylenes all were eliminated at AOC 1 because of low frequency of detection (2 instances). No other instances were eliminated because of low frequency of detection.
- **No exceedance of GSIPC for soil (Basis 2):** 47 instances were eliminated because the mean concentration was lower than the GSIPC. It was a contributing factor in the elimination of another 91 instances. Of the 91, it was a contributing factor in 13 instances because it was not consistent with background conditions (Basis 3), 38 instances because it was not in groundwater (Basis 4) and 32 instances because downgradient groundwater did not exceed GSI criteria (Basis 5). Eight times an instance was eliminated because of Bases 2, 3, and 5.
- **Exceedance of the GSIPC, but consistent with background conditions (inorganics only) (Basis 3)**: Only 2 instances were eliminated due solely to this criterion, chromium in SWMU F and SWMU G.
- **Absence of COI in groundwater facility-wide (Basis 4):** 11 instances were eliminated solely because of this criterion, representing 5 chemicals, cobalt, flourene, styrene, toluene, and total methylphenol.
- **Absence of GSI exceedance in groundwater at wells underlying or downgradient of the AOC/SWMU (Basis 5):** 14 instances were eliminated solely to this criterion.

After establishing which instances could be eliminated for any of the above-listed reasons, 28 instances remain and are identified in Table 5-1. In the second to last column "Yes " signifies that the COI was an exceedance for the soil to groundwater pathway. These remaining soil exceedances were further evaluated as described in Section 5.2.2 and presented in Table 5-4.

Initial Screen for Potential Groundwater Constituents

In Tier 1 risk screening, maximum concentrations in each well were compared to GSI criteria to identify the preliminary groundwater COI for the GSI pathway. For many wells, over three rounds of monitoring data have been collected since the Tier 1 risk screening evaluation, resulting in 4 or 5 sampling rounds for many wells. Therefore, in addition to comparing the maximum detected concentrations, the mean concentrations in each well were compared to the GSI criteria. The mean concentration within a well is more representative than the maximum of the long-term groundwater concentration. As previously noted, the calculated means are conservative in that only detected concentrations were used (non-detect results were excluded).

[3] An instance for soil is a detection of a specific constituent within a specific area. For example, there are 3 instances of antimony, in other words antimony has been detected above GSIPC criteria in 3 areas (SWMU F, G, and H).

By screening maximum and mean concentrations of constituents in groundwater against GSI criteria, a preliminary refined list of groundwater COIs was identified. Table 5-2 shows 374 instances[4] where a constituent was detected in groundwater above GSI criteria. Of these, 43 instances occurred at wells specified as background wells, therefore, these detects were not considered Facility-related and no further action was taken. Of the remaining instances, 134 involved organics, chloride or total cyanide, therefore, these went directly into fate and transport evaluation (as facility-specific background concentrations were not developed for these parameters). The remaining 197 instances were inorganics where background concentrations were developed.

For the 197 inorganic instances, a comparison to background concentrations was performed.[5] The background evaluation for groundwater, including the calculation of background concentrations for 17 inorganics, was presented and discussed in Section 5.1. Based on this background evaluation, background concentrations were compared with the maximum and mean groundwater concentrations where the GSI was exceeded. Where the background concentration was greater than the maximum or mean detected concentration at any given well it was assumed that the measured concentration was consistent with background and the instance was eliminated from further consideration.

This evaluation is shown in Table 5-3 and the analysis indicates that 51 instances were eliminated on the basis of consistency with background, leaving 146 instances of inorganics for further consideration in the fate and transport evaluation. Of the 146 instances for further fate and transport evaluation, 24 instances represent antimony, beryllium and cadmium where background concentrations were not considered appropriate to calculate (See Section 5.1).

In summary, for groundwater there are 59 instances of organics and 221 instances of inorganics (of which 75 instances were either chloride or total cyanide), that advance to the fate and transport evaluation, which is discussed in Section 5.2.3.

5.2.2 Refined Tier 2 Screening

Initial analysis concluded that there were 27 instances where the soil to groundwater pathway existed for constituents detected in soil (Section 5.2.1, Table 5-1). For the GSI criteria, the next question is whether or not a COI could potentially migrate from groundwater underlying the area of interest to the receptor, that is, the facility property line or the river. The objective of the refined screening was to evaluate the spatial occurrence of wells in more detail and to identify a representative groundwater location/concentration (termed a surrogate well) for the 27 COI where a soil to groundwater pathways exists. It was decided that for any location where the soil leaches to groundwater,use of site-specific data (i.e., groundwater data from a nearby or "surrogate" well) would be a more reliable indicator of constituent mobility and concentration than calculating a theoretical soil to groundwater value based on default parameters. In other words, groundwater data collected downgradient of a SWMU/AOC are the best representation of the COI's potential to leach and migrate because there has been ample time at the Facility for COI present in soil to leach to underlying groundwater. Note that it is possible that a COI leaches but is attenuated prior to reaching a groundwater measurement location; in this instance it is assumed that the soil to groundwater pathway is incomplete.

Table 5-4 identifies the wells associated with each AOC or SWMU as "near downgradient" and "far downgradient" (including perimeter wells located adjacent to the river). The groundwater data considered includes sampling rounds from September 2005 through May 2007, except when data was not available and

[4] An instance for groundwater is a detection of a specific constituent at a specific well. For example, there are 14 instances of antimony, in other words antimony has been detected above GSI criteria at 14 wells. Note, it may have been detected in one or more sampling events at the well.

[5] Note that there was no background concentration for chloride or total cyanide was calculated; therefore, all instances of chloride and total cyanide detected above GSI criteria were advanced to the fate and transport evaluation.

then older data was used. Each instance was evaluated to determine a surrogate well and associated concentration to determine if it could potentially migrate to the river.

It was determined that 14 of the 27 instances did not require further evaluation for one of the following reasons:

- **Basis 1**. Even if concentrations at near-downgradient wells were detected above GSI criteria, the concentrations at far downgradient wells were less than the GSI. The concentrations at locations closer to the receptor better approximate characteristics of discharging (to surface water) groundwater. If concentrations at far-downgradient wells, therefore, are below GSI, the concentrations pose no risk to the receptor. It is assumed that either source terms are insufficient or that sufficient attenuation has occurred to reduce concentrations below GSI standards. Thus, the pathway from source soils to receptor is incomplete and requires no additional evaluation.
- **Basis 3**. Concentrations in near downgradient wells are not detected above detection limits. While far downgradient concentrations may exceed detection limits or even GSI criteria, it is not certain what the sources of these concentrations are. Because of the disconnect between near and far downgradient concentrations, it is assume that soil concentrations are not responsible for far downgradient concentrations. Thus, the pathway from source soils to receptor is incomplete and requires no additional evaluation.
- **Basis 4**. Groundwater concentrations are consistent with calculated background concentrations. It is therefore assume that concentrations are not facility-related and do not originate from a soil source. Thus, there is no pathway from soil to groundwater and therefore, requires no additional evaluation.
- **Basis 5**. Concentrations in neither the near nor the far downgradient wells exceed the GSI. Thus, the pathway from source soils to receptor is incomplete and requires no additional evaluation.

The remaining 13 instances required additional evaluation for one of the three reasons:

- **Basis 2**. Concentrations at both near and far downgradient wells were above the GSI suggesting a complete pathway between soil, groundwater, and receptor.
- **Basis 6**. Concentrations at near downgradient wells exceed GSI criteria. No data was available at the far downgradient wells; to be conservative it was assumed that the pathway could be complete.
- **Basis 7**. No data were available for near or far downgradient wells. To be conservative it was assumed that the pathway could be complete.

For these remaining 13 instances, they are evaluated using the same fate and transport methodology for groundwater described in Section 5.2.3. Specifically, if fate and transport calculations show that a COI will migrate to the receptor location above GSI/background, it will remain a COI, while if calculations show it does not migrate to the receptor location above GSI/background it will eliminated from further consideration. The tables in the section (Tables 5-5 and 5-6) have notations so that these surrogate wells can easily be identified.

5.2.3 Fate and Transport Evaluation

The objective of this part of the Tier 2 evaluation was to calculate whether or not constituent concentrations in groundwater would exceed the greater of the GSI criteria for groundwater or background concentrations, as appropriate, at the river or property line. The groundwater fate and transport section uses an exact analytical solution; BIOSCREEN-AT, recommended by MDEQ (2007).

The calculations were based on actual groundwater concentrations and fate and transport parameters: advection, dispersion, and retardation. These parameters are described below. It was conservatively assumed that there is no degradation for the VOCs and SVOCs.

- *Advection* is simply the groundwater flow and is described with a groundwater velocity calculated with the groundwater gradient, hydraulic conductivity, and porosity. The calculated velocity used for these calculations was 33 feet per year. This value is considered representative of the site based on conductivity data, though there may be places where the velocity is greater or less than 33 feet per year. These gradient and conductivity input values were taken from the groundwater modeling report for the facility (Waterloo Hydrogeologic, 2002). Porosity was assumed to be 0.25.
- *Dispersion* describes mechanical mixing of groundwater and molecular diffusion and was estimated using a tool available in the BIOSCREEN-AT program in which dispersion is estimated based on plume length. Plume length was set equal to the distance between the GSI exceedance and the river or property line.
- *Retardation* describes the attenuation of migration due to sorption (and desorption) and is a function of bulk density (default = 1.5 kg/L), and the product of fraction of organic content (default = 0.002) and soil organic carbon-water partitioning coefficient (for organics, chemical specific) or soil-water distribution coefficient (inorganics). The partitioning coefficients were taken from MDEQ's Part 201 Table 4 - Toxicological and Chemical-Physical Data (MDEQ, 2006a). USEPA (1996) recommends 1.5 kg/L as a default value for bulk density in the absence of site-specific data. Site-specific data collected for fraction organic carbon (foc) was the same as the USEPA recommended (1996) default value for this parameter.

These parameters were entered into the BIOSCREEN-AT spreadsheet along with the mean concentration observed at each location where the GSI was exceeded (Table 5-2 and Table 5-3) and the distance to the river or property line. Surrogate wells were highlighted. Because the objective was to evaluate if the GSI or, in the case of inorganics, site-specific background if higher than the GSI, would ever be exceeded at the river or property line, a long simulation time (1000 years) was input to predict future potential. This approach is conservative.

Tables 5-5 and Table 5-6 summarize the results of these calculations for inorganics and organics, respectively. The results are summarized as follows.

- There are a total of 220 instances of inorganics that required a fate and transport evaluation. Of these, 17 instances were surrogates to determine if COI that pass the soil to groundwater pathway have the potential to reach the river or the property line:
  - 27 instances were either upgradient of another SWMU/AOC that will be likely captured by a downgradient remedy.
  - 71 of these instances are predicted to attenuate below GSI criteria before reaching the river
  - The remaining 122 instances are predicted to reach the river at concentrations exceeding the greater of the generic GSI criteria or background groundwater concentration. The inorganic COIs associated with these instances are: antimony, arsenic, barium, cadmium, chloride, chromium, mercury, nickel, selenium, thallium, total cyanide, and zinc.
  - Of the 17 that were surrogate wells, 2 would likely be captured by a downgradient remedy, 4 require no additional consideration, while 11 are predicted to reach the river at concentrations in excess of the greater of the generic GSI criteria or background groundwater concentration.
- There are 59 instances of organics (VOCs or SVOCs) that required a fate and transport evaluation;
  - Four instances were either upgradient of another SWMU/AOC that will be likely captured by a downgradient remedy.
  - Four instances (and chemicals) were predicted to attenuate below generic GSI criteria before reaching the river.

- The remaining 51 are predicted to reach the river with concentrations in excess of the GSI criteria. The organic COIs associated with these 51 instances are: 1,2-dichloroethane, 1,2-dichloropropane, 1,4-dioxane, 3-methyphenol, 4-methylphenol, benzene, bis(2-chloroethyl)ether, bis(2-chloroisopropyl)ether, chlorobenzene, dibenzofuran, ethylbenzene, fluoranthene, naphthalene, pentachlorophenol, phenol, phenanthrene, vinyl chloride, and xylenes.
- All 6 surrogate wells were predicted to reach the river with concentrations in excess of the GSI criteria.

The instances that should be evaluated in the CMS or will be evaluated further are summarized in Table 5-7 for soil and Table 5-8 for groundwater. Note that, in general, conservative assumptions were made in the fate and transport calculations; these are discussed above. Conservative assumptions were made to account for incomplete site-specific information. If site-specific information becomes available (especially degradation), the number of instances of predicted concentrations exceeding the GSI and/or background may be reduced.

5.3 Groundwater Contact Protection Criteria Pathway

The approach to evaluation of the Groundwater Contact Protection Criteria (GCPC) pathway is similar to the soil to groundwater pathway evaluation presented in Section 5.2. The differences is that the initial list of COIs is based on a comparison of soil concentrations to GCPC. The chemicals that exceed groundwater protection criteria are summarized in Table 3-1 and include locations in AOC 4, AOC 6, and SWMU H. As stated in Section 5.2, groundwater associated with AOC 6 is influenced by the existing remedy, so no further evaluation is required. SWMU H/AOC 5 will be addressed in the CMS, so no further evaluation is performed in this Tier 2 evaluation. Therefore, the only chemicals requiring evaluation are those in AOC 4.

Table 5-8 shows which chemicals exceeded the GCPC for soil. Downgradient wells to AOC 4 were identified and the groundwater data for those wells was then evaluated to see if there were detections in both the soil and in the groundwater. If there was no detection in groundwater it was assumed that the pathway from soil to groundwater is incomplete for that chemical. If there was a detection in groundwater, the concentration was compared to the groundwater contact criteria. If the detected concentration was greater than the groundwater contact criteria, the COI would require further evaluation. If the groundwater concentration was less than the groundwater contact criteria, the COI would require no additional evaluation.

Table 5-9 shows this evaluation in detail. Concentrations of benzene and xylenes were not detected above the detection limit. It is therefore assumed that the pathway for these constituents are incomplete and they require no additional evaluation. For the remaining COI, even though they were detected at one or more downgradient wells, the concentration never exceeded the generic Part 201 groundwater contact criteria. Therefore, no additional evaluation for these COI is required.

5.4 Summary

Key findings of the Tier 2 evaluation of the leaching-based soil criteria exceedances and Groundwater Surface Water Interface (GSI) criteria exceedances identified in the Tier 1 risk screening are:

1. Of the initial 201 instances where **soil** concentrations exceeded the GSIPC, 27 were determined to leach to groundwater, based on observations at downgradient monitoring wells. Given the age of the site and source materials, it is conceptually understood that sufficient time has elapsed such that if a COI were to leach and impact groundwater it would have done so by now.
2. The 27 soil instances that were determined to leach to groundwater, 13 were determined to migrate to the receptor location above GSI criteria and/or background.
3. There are 374 instances where **groundwater** concentrations exceeded the generic GSI criteria. These instances represent 37 unique COI. Of the 374 instances, 43 instances were eliminated as they occurred in designated background wells and 51 were eliminated as they were below site-specific

background concentrations. Therefore, 280 instances were evaluated using fate and transport calculations. Of these 280, 59 instances were organics and 221 instances were inorganics (of which 75 instances were either chloride or total cyanide). It should be noted that the fate and transport calculation incorporated a number of conservative assumptions; chiefly, it was assumed that there was no degradation of organic compounds. These assumptions are justified based on the objectives and available data. The level of conservatism in these calculations should be accounted for going forward.

a. Of the 59 organic instances evaluated using fate and transport methods, 51 require additional evaluation and/or will be addressed in the CMS. The 51 instances represent 18 different chemicals.

b. Of the 221 inorganic instances evaluated using fate and transport methods, 122 require additional evaluation and/or will be addressed in the CMS. The 122 instances represent 12 different chemicals.

4. The COI identified as exceeding the soil GCPC were eliminated from further evaluation because none of the corresponding downgradient groundwater concentrations exceeded the groundwater contact criteria (GCC).

6.0 Summary and Conclusions

This section presents the summary and conclusions of the Tier 2 Risk Evaluation performed for the BASF North Works Facility. This Tier 2 evaluation builds on the results of the Tier 1 human health risk screening as documented in Risk Screening Summary Report (ENSR, April 2005). Specifically, this Tier 2 risk evaluation included four critical elements:

1. a Tier 2 evaluation of the Michigan Part 201 default cleanup criteria exceedances for soil, including use of alternate exposure point concentrations (e.g., UCLs), site-specific modeling, and consideration of site-specific background;
2. a redevelopment scenario evaluation that addressed potential cumulative risk to a redevelopment/utility worker from exposure to soil, groundwater, and air;
3. a Screening-Level Ecological Risk Assessment (SERA), which is the most conservative level of ecological risk assessment in the Region 5 guidance (USEPA, 2000; 2005) and limited Preliminary Ecological Risk Assessment (PERA) to help refine potential risks at each AOC/SWMU, and
4. a Tier 2 evaluation of the leaching-based soil criteria exceedances for Groundwater Surface Water Interface Protection Criteria (GSIPC) and Groundwater Contact Protection Criteria (GCPC) and a Tier 2 evaluation of the groundwater GSI exceedances which consisted of a fate and transport evaluation to the river.

Constituents of interest (COI) that were not eliminated in one or more of the above evaluations are identified as constituents of concern or COC). The list of COC by medium for each SWMU/AOC is a key outcome of the Tier 2 risk evaluation as it provides the foundation of future corrective measures planning.

On the basis of the results of this Tier 2 risk evaluation, the following summary of risk findings is presented for each SWMU/AOC, including recommendations concerning the need for further evaluation, if any, and/or the need for inclusion in corrective measures planning in the CMS. Key uncertainties associated with the Tier 2 results, and their potential implications, are also discussed.

6.1 Summary of Area-Specific Findings

Table 6-1 presents a summary of COC for each SWMU/AOC based on the results of this Tier 2 evaluation. A summary of findings for each area is presented below. Results for soil are summarized first, including results of the Tier 2 human health risk evaluation using the state of Michigan DEQ's Part 201 criteria (RRD Operational Memorandum No.1, January 2006), the Tier 2 evaluation of leaching-based criteria, and the ecological risk evaluation. Results from the Tier 2 evaluation of groundwater are summarized next, focusing on the evaluation of GSI exceedances in wells that are downgradient of each SWMU/AOC. Last, results of the Tier 2 redevelopment scenario evaluation are summarized, which addressed cumulative exposures for a future redevelopment/utility worker to soil and groundwater associated with each SWMU/AOC.

AOC 1

Soil. The Tier 1 risk screening identified no exceedances in this area except for benzene exceeding the GSIPC. This single COI exceedance was eliminated in the Tier 2 evaluation of the GSIPC pathway on the basis of low frequency of detection. The SERA identified no complete exposure pathways.

Groundwater. Based on the Tier 2 evaluation, no groundwater assessment was necessary and no groundwater COI are associated with this AOC.

Redevelopment Scenario. The Tier 2 redevelopment scenario evaluation found no unacceptable cumulative risk to a redevelopment/utility worker in AOC 1.

Based on the results of the Tier 2 risk evaluation, no further action is recommended for AOC 1.

AOC 2

Soil. The Tier 1 risk screening identified arsenic as exceeding the direct contact criterion (DCC). However, based on the Tier 2 risk evaluation that demonstrates arsenic in AOC 2 soil is consistent with background and the UCL of arsenic in AOC 2 soil does not exceed the DCC, no further evaluation of arsenic and the DCC pathway is warranted. The Tier 1 risk screening identified several inorganics as exceeding GSIPC. Based on the Tier 2 GSI evaluation, all constituents except mercury were eliminated as soil COI based on consistency with background soil concentrations, no exceedance of the GSIPC using the mean concentration, or absence of a GSI/background exceedance in groundwater at a well downgradient of the AOC.

The SERA identified no complete ecological exposure pathways.

Groundwater. Several wells located downgradient of this AOC have generic GSI exceedances (RFI-MW-5, RFI-MW-6), however, the Tier 2 evaluation concluded that the groundwater to river pathway from this AOC is not complete because intermediary wells are non-detect for the COI.

Redevelopment Scenario. The Tier 2 redevelopment scenario evaluation found no unacceptable cumulative risk to a redevelopment/utility worker in AOC 2.

Based on the results of the Tier 2 risk evaluation, only mercury in AOC 2 soil is identified as a COC that should be evaluated further in the CMS, based on potential leaching to groundwater and GSI impacts. This evaluation should take into consideration the existing groundwater extraction wells in this area, which mitigate migration of potentially impacted groundwater, as well as the placement of one to two feet of engineered fill across much of the eastern half of AOC 2, increasing the vertical distance and creating an additional barrier between the ground surface and the underlying source.

AOC 4

Soil. The Tier 1 risk screening identified benzene, toluene, xylenes, methylphenols and several PAHs as exceeding Part 201 criteria, including DCC, PSIC, SVIIC and VSIC pathways. Because only two soil samples were collected during the RFI and analytical results identified elevated concentrations of these constituents, AOC 4 was not included in the Tier 2 human health evaluation for the DCC, PSIC, SVIIC and VSIC pathways, since a refined analysis would not likely result in substantive changes to the Tier 1 results. Thus, the COC in AOC 4 soil exceeding the Part 201 generic cleanup criteria identified above should be included in corrective measures planning for this AOC.

AOC 4 soil was evaluated in the Tier 2 risk evaluation for GSIPC, GCPC, and C_{sat} exceedances. All of the GCPC criteria exceedances were eliminated in the Tier 2 risk evaluation. However, dibenzofuran, fluoranthene, mercury, and total cyanide could not be eliminated and are identified as COC for the GSI pathway. Groundwater from wells near/adjacent to this AOC suggest that concentrations of dibenzofuran, fluoranthene, mercury and total cyanide in soil may leach to groundwater at concentrations exceeding the GSI (or site-specific background if higher than the GSI). The COI with C_{sat} exceedances in soil (benzene, toluene and xylenes) were not detected in groundwater above generic GSI criteria in far downgradient wells, indicating that concentrations above C_{sat} are not adversely impacting downgradient groundwater. Toluene and xylenes were also not detected in near downgradient wells.

The SERA identified no complete ecological exposure pathways.

Groundwater. Several wells located downgradient of this AOC have exceedances of the lower of GSI/background and fate and transport evaluation indicate that concentrations may exceed the GSI at the receptor (river) in the near future. These wells include P26N, WHI6-2S, WHI6-3F and CMS-MW-4 for six VOCs (benzene, bis(2-chloroethyl)ether, dibenzofuran, fluoranthene, phenanthrene, and 1,4-dioxane) and six metals (antimony, barium, chloride, chromium, total cyanide and zinc).

Redevelopment Scenario. Risk calculations for a redevelopment scenario were not performed for AOC 4 because this AOC will be addressed in the CMS.

Based on the results of the Tier 2 risk evaluation, several COC in soil at AOC 4 should be included in corrective measures planning for this AOC based on potential leaching to groundwater and GSI impacts, as well as potential human health risks (direct contact and volatilization criteria exceedances). This evaluation should take into consideration the uncertainty in the Tier 2 results due to the limited number of soil samples at AOC 4 (n = 2 samples). Groundwater COCs will be addressed as part of a site-wide groundwater remedy.

AOC 5

Redevelopment Scenario. As noted in Section 2.0 (Data Evaluation), AOC 5 had not previously been included in the Tier 1 risk screening, however, it was included in the Tier 2 redevelopment scenario evaluation. Based on the Tier 2 redevelopment scenario evaluation, 1,2-dichloropropane in soil and groundwater, and 1,2-dichloroethane, bis(2-ethylhexyl)phthalate, bis(2-chloroethyl)ether, and bis(2-chloroisopropyl)ether in groundwater were identified as COC in AOC 5, and preliminary remediation goals (PRGs) were derived that are protective of a future redevelopment/utility worker who may come into contact with soil and groundwater in AOC 5. It should be noted that these five COC are all associated with the 1,2-dichloropropane DNAPL area located in the southwestern corner of AOC 5. This area of AOC 5 should be included in corrective measures planning for this AOC. As previously noted, the existing groundwater extraction remedy at AOC 5 and SWMU H mitigates migration of COC in groundwater to the river.

Tier 2 PRGs based on the redevelopment scenario were derived for these COC, as presented in Table 3-22.

It should be noted that there is uncertainty associated with the predicted risk results for AOC 5 due to the limited data sets for soil and groundwater. Given that maximum detected concentrations were used, predicted risks are overestimated and not representative of the entire AOC. In evaluating corrective measures for AOC 5, the uncertainty and conservatism in approach and results need to be taken into consideration.

AOC 6

Soil. The Tier 1 risk screening identified arsenic, benzene and several PAHs (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene and dibenz(ah)anthracene) as exceeding the DCC. The Tier 1 also identified benzene, naphthalene, and phenanthrene as exceeding volatilization-based criteria (VSIC and/or SVIIC). Benzene and xylenes were also identified as exceeding C_{sat}.

Based on the Tier 2 evaluation, benzene, naphthalene, and phenanthrene in AOC 6 soil were eliminated as COI for volatilization-based pathways to indoor and outdoor air (SVIIC and VSIC) as the UCL for these COI in vadose zone soil are below their site-specific criteria. However, arsenic, benzene, and benzo(a)pyrene were not eliminated in the Tier 2 for the soil direct contact pathway and are identified as COC. As discussed in Section 3.2, available site characterization data suggest that the highest concentrations of these COC are present in deeper soils located beneath the water table, to which on-site workers would rarely be exposed. Comparing the deeper soil data to the Part 201 Industrial and Commercial II DCC is very conservative. It should also be noted that the highest concentrations of arsenic, benzene, benzo(a)pyrene and xylenes (which exceeded C_{sat} at one location) were found at two soil locations (SP-61 and SP-62). The lack of specific depth information for over half of the soil samples from AOC 6, including samples where highest COC concentrations

were observed, introduces uncertainty into the predicted risk results. This uncertainty needs to be taken into consideration when evaluating corrective measures at AOC 6.

No soil leaching to groundwater analyses were performed for the GSIPC, GCPC, and C_{sat} exceedances in AOC 6 soil. This is because the existing groundwater extraction system creates a capture zone in the vicinity of this AOC which prevents COI migration downgradient.

The SERA identified several preliminary ecological COI including arsenic, lead, mercury, selenium, several PAHs and benzene. Further investigation in the limited PERA indicated minimal risk to higher trophic level receptors.

In summary, based on the Tier 2 evaluation and the SERA and limited PERA, the following five chemicals are identified as COC for AOC 6 soil and should be evaluated further in the CMS:

- Arsenic
- Benzene
- Xylenes
- Benzo(a)pyrene
- Naphthalene

Groundwater. Several wells located far downgradient of this AOC have generic GSI criteria exceedances (RFI MW 6, 8I, 10I and 10F). Intermediary wells have not been sampled to confirm whether a complete pathway exists between this AOC and the far downgradient wells where GSI exceedances were observed. However, as previously noted, the existing groundwater extraction remedy at AOC 6 mitigates migration of groundwater from the AOC to the river. Therefore, the GSI pathway from AOC 6 to the river is incomplete.

Redevelopment Scenario. Based on the Tier 2 redevelopment scenario, benzene and naphthalene were found to exceed target risk benchmarks and were identified as constituents of concern (COC) in AOC 6 soil. These same soil COC are identified above in the summary of Part 201 soil criteria exceedances. Tier 2 PRGs based on the redevelopment scenario were derived for these COC, as presented in Table 3-22.

Based on the results of the Tier 2 risk evaluation, several COC in soil at AOC 6 should be evaluated further in the CMS. As noted above, uncertainty in the risk results for AOC 6 due to lack of depth information for over half of the soil samples needs to be taken into consideration when evaluating corrective measures at AOC 6.

AOC 7A

Soil. The Tier 1 risk screening identified arsenic as exceeding the DCC. However, based on the Tier 2 risk evaluation that demonstrates arsenic in AOC 7A soil is consistent with background and the UCL of arsenic in AOC 7A soil does not exceed the DCC, no further evaluation of arsenic and the DCC pathway is warranted.

The Tier 1 risk screening identified several inorganics as exceeding GSIPC. Based on the Tier 2 GSI evaluation, all were eliminated as soil COI based on consistency with background soil concentrations, or absence of a GSI/background exceedance in groundwater at one or more wells downgradient of the AOC.

The SERA identified several inorganic chemicals as preliminary ecological COI. Six of these COI were eliminated in the background statistical evaluation. Based on the limited PERA, the remaining COI pose little to no risk to ecological receptors including higher trophic level receptors, and only mercury is identified as a soil COC for AOC 7A.

Groundwater. One well located downgradient of AOC 7A (RFIMW-22) has exceedances of the higher of generic GSI criteria and background for arsenic, chloride, chromium, mercury, and total cyanide. Intermediary wells have not been sampled to confirm whether a complete pathway exists between this AOC and the far downgradient wells where GSI exceedances were observed. Model predictions indicate that all of these inorganics may exceed the higher of GSI/background at the north property boundary.

Redevelopment Scenario. The Tier 2 redevelopment scenario evaluation found no unacceptable cumulative risk to a redevelopment/utility worker in AOC 7A.

Based on the results of the Tier 2 risk evaluation, mercury in AOC 7A soil is identified as a COC that should be evaluated further in the CMS, based on potential ecological risk. This evaluation should take into consideration the small size of AOC 7A (approximately one tenth of an acre) and the fact that part of the area is landscaped grass with the remainder weeds and grassy vegetation. Groundwater COCs will be addressed as part of a site-wide groundwater remedy.

AOC 7B

Soil. The Tier 1 risk screening identified no human health criteria exceedances in this area so it was not evaluated in the Tier 2 evaluation. The Tier 1 risk screening identified chromium, mercury, and zinc as exceeding their GSIPC. These exceedances were not evaluated in the Tier 2 evaluation of the GSI pathway, because AOC 7B is upgradient of the existing groundwater extraction remedy at SWMU H/AOC 5. Therefore, as previously noted, groundwater originating from AOC 7B is captured in the existing extraction system, and the pathway to the river is incomplete.

The SERA identified no complete ecological exposure pathways.

Groundwater. No assessment of groundwater from AOC 7B was performed in the Tier 2 evaluation based on the absence of a complete pathway for groundwater to the river.

Redevelopment Scenario. The Tier 2 redevelopment scenario evaluation found no unacceptable cumulative risk to a redevelopment/utility worker in AOC 7B.

Based on the results of the Tier 2 risk evaluation, no further action is recommended for AOC 7B.

AOC 7C

Soil. A removal action performed at AOC 7C in the fall of 1998 resulted in excavation and off-site disposal of several hundred cubic yards of soil. Thus, the RFI soil data contained in the project database are not expected to represent current conditions at AOC 7C, as these data were collected prior to the removal action. However, due to the absence of post-excavation soil data, the historical RFI data were included in the Tier 1 risk screening and are also considered in this Tier 2 evaluation. The Tier 1 risk screening identified arsenic in AOC 7C soil as exceeding the DCC. However, based on the Tier 2 risk evaluation, the UCL of arsenic in AOC 7C soil does not exceed the DCC and no further evaluation of arsenic and the DCC pathway is warranted.

The SERA identified no complete ecological exposure pathways.

Groundwater. No assessment of groundwater from AOC 7C was performed in the Tier 2 evaluation, because it will be evaluated in the CMS with AOC 5.

Redevelopment Scenario. Based on the Tier 2 redevelopment scenario, the same five organic chemicals identified as COC in AOC 5 groundwater are also COC for AOC 7C groundwater (1,2-dichloroethane, 1,2-dichloropropane, bis(2-ethylhexyl)phthalate, bis(2-chloroethyl)ether, and bis(2-chloroisopropyl)ether). Tier 2 preliminary remedial goals (PRGs) based on the redevelopment scenario were derived for these groundwater

COC as presented in Table 3-22. It should be noted that AOC 7C lies entirely within the footprint of AOC 5, which will be addressed in the CMS.

With the exception of COC in groundwater at AOC 7C that will be included in corrective measures planning along with AOC 5, no further action is warranted for AOC 7C.

SWMU E

As noted in Section 2.0 (Data Evaluation), SWMU E had not previously been included in the Tier 1 risk screening. SWMU E consists of a clay-lined wastewater retention pond that provides surge capacity for NPDES Outfall 1. Accumulated sediment at the bottom of the retention pond is periodically tested, removed and disposed of offsite at a licensed non-hazardous disposal facility. Analytical results of sediment samples collected from the base of the retention pond have indicated that the sediment is not hazardous. There is also no record of any releases from the retention pond. Therefore, no further action is warranted for SWMU E.

SWMU F

Soil. The Tier 1 risk screening identified arsenic and bis(2-chloroisopropyl)ether as exceeding their DCC, 1,2-dichloropropane and bis(2-chloroisopropyl)ether exceeded their VSIC, and 1,2-dichloropropane exceeded its SVIIC. However, based on the Tier 2 risk evaluation, arsenic and bis(2-chloroisopropyl)ether were eliminated as COI for the direct contact pathway, and 1,2-dichloropropane and bis(2-chloroisopropyl)ether were eliminated as COI for the volatilization to ambient air pathway (VSIC) as the UCLs of these constituents in SWMU F soil do not exceed their respective DCC and site-specific VSIC. For the 1,2-dichloropropane exceedance of the SVIIC, additional shallow soil data collected do not exceed the SVIIC. These data indicate that volatilization to indoor air is not a pathway of concern. It should also be noted that as part of ongoing plant expansion activities, one to two feet of engineered fill have been placed across the surface of SWMU F, increasing the vertical distance and creating an additional barrier between the ground surface and the underlying source.

SWMU F soil was evaluated for GSIPC in the Tier 2 risk evaluation. Three metals (mercury, selenium and total cyanide) were detected above the higher of generic GSI criteria and background in far downgradient wells (RFI-MW-6 and RFI-MW-7F) as well as 1,2-dichloropropane (RFI-MW-7I).

The SERA identified no complete ecological exposure pathways.

Groundwater. Several wells located downgradient of this AOC have exceedances of the higher of GSI/background (RFI-MW-6, RFI-MW-7I and 7F). Intermediary wells have not been sampled to confirm whether a complete pathway exists between this SWMU and the far downgradient wells where exceedances were observed. However, it should be noted that a network of groundwater extraction wells mitigates migration of potentially impacted groundwater from this area.

Redevelopment Scenario. The Tier 2 redevelopment scenario evaluation found no unacceptable cumulative risk to a redevelopment/utility worker.

Based on the results of the Tier 2 risk evaluation, mercury, selenium, total cyanide and 1,2-dichloropropane in soil are identified as COC that should be evaluated further in the CMS, based on potential leaching to groundwater and GSI impacts. This evaluation should take into consideration the existing groundwater extraction wells in this area, which mitigate migration of potentially impacted groundwater.

SWMU G

Soil. The Tier 1 risk screening identified arsenic as exceeding the DCC. However, based on the Tier 2 risk evaluation that demonstrates the mean concentration of arsenic in SWMU G soil is less than the DCC and the

mean concentration of arsenic in background soil, no further evaluation of arsenic and the DCC pathway is warranted.

The Tier 1 risk screening identified several inorganics as exceeding their GSIPC. Based on the Tier 2 evaluation, only arsenic and mercury were retained and are identified as soil COC for the GSI pathway. Groundwater data from both near and far downgradient/perimeter wells indicate concentrations above the higher of the generic GSI and background for arsenic and mercury.

The SERA identified several preliminary ecological COI including antimony, copper, lead, mercury, selenium, zinc, pentachlorophenol, and Aroclor 1260. Pentachlorophenol and 4,4-DDT remained as the primary risk drivers following the limited PERA evaluation, and are identified as soil COC based on potential ecological risk. In addition, the lead and mercury are identified as soil COC for SWMU G based on potential ecological risk.

Groundwater. Wells far downgradient of SWMU G have exceedances of the higher of GSI criteria and background for arsenic and mercury. Model predictions indicate that these two inorganics may exceed the higher of GSI/background at the river.

Redevelopment Scenario. The Tier 2 redevelopment scenario evaluation found no unacceptable cumulative risk to a redevelopment/utility worker in SWMU G.

Based on the results of the Tier 2 risk evaluation, several COC in soil at SWMU G should be evaluated further in the CMS, based on potential leaching to groundwater and GSI impacts, and potential ecological risk. This evaluation should take into consideration the conservatism in the approach used, particularly for assessment of ecological risk. Groundwater COCs will be addressed as part of a site-wide groundwater remedy.

SWMU H/AOC 5

Soil. The Tier 1 risk screening identified arsenic, 1,2-dichloropropane and bis(2-chloroisopropyl)ether) as exceeding the DCC, 1,2-dichloropropane and bis(2-chloroisopropyl)ether exceeding their infinite source SVIIC and VSIC, mercury as exceeding its VSIC, and chromium as exceeding its PSIC.

Based on the Tier 2 risk evaluation, no further evaluation is warranted for arsenic and the direct contact pathway, mercury and the VSIC pathway, and chromium and the PSIC pathway as the UCLs for these constituents in SWMU H soil are below their respective risk criteria. The two organic COI in SWMU H soil are associated with AOC 5 and, as such, will be included in the corrective measures planning for this AOC.

SWMU H soil was evaluated for GSIPC exceedances in the Tier 2 risk evaluation. Only mercury in SWMU H soil could not be eliminated in the Tier 2 evaluation. Mercury was detected above the higher of its generic GSI criterion and background in far downgradient well RFI-MW8I. Intermediary wells have not been sampled to confirm whether a complete exposure pathway exists between this SWMU and the far downgradient well where an exceedance was observed.

The SERA identified several preliminary ecological COI including: antimony, lead, mercury, silver, thallium, several pesticides and Aroclors 1248 and 1254. Following the limited PERA evaluation, 4,4-DDT remained as the primary risk driver, and is identified as a soil COC based on potential ecological risk. In addition, antimony and nickel are identified as soil COC for SWMU H based on potential ecological risk.

Groundwater. A well far downgradient of SWMU H has an exceedance of the lower of the GSI criterion and background for mercury. However, as previously noted, the existing groundwater extraction remedy at SWMU H/AOC 5 mitigates migration of COC in groundwater to the river.

Redevelopment Scenario. For the Tier 2 redevelopment scenario evaluation, SWMU H groundwater was separated into three geographic segments: west end, central, and east end. In the SWMU H west end, which

lies entirely within the AOC 5 footprint, the same five groundwater COC identified for AOC 5 are also COC for SWMU H west end (i.e., 1,2-dichloroethane, 1,2-dichloropropane, bis(2-ethylhexyl)phthalate, bis(2-chloroethyl)ether, and bis(2-chloroisopropyl)ether). No groundwater COC were identified in the central and eastern segments of SWMU H. For soil, 1,2-dichloropropane and mercury were identified as COC for soil in SWMU H west end. For SWMU H central and SWMU H east end, only 1,2-dichloropropane was identified as a COC for soil. [Note: the highest concentrations of 1,2-dichloropropane are present in the west and central segments of SWMU H. In the east segment of SWMU H, 1,2-dichloropropane was not detected or was J flagged in one sample with a low concentration (4 ug/kg J).]

Tier 2 PRGs based on the redevelopment scenario were derived for the SWMU H COC, as presented in Table 3-22.

Based on the results of the Tier 2 risk evaluation, several COC in soil at SWMU H should be evaluated further in the CMS. Groundwater COC at SWMU H will be addressed as part of corrective measures planning for AOC 5.

6.2 Conclusions and Recommendations

Based on the results of this Tier 2 evaluation, AOC 2, AOC 4, AOC 5, AOC 6, AOC 7A, SWMU F, SWMU G, and SWMU H contain COC in soil and/or groundwater that need to be evaluated in the CMS. No further action is warranted at SWMU E, AOC 1, AOC 7B, and AOC 7C (AOC 7C will be addressed as part of corrective measures planning for AOC 5). The risk-driving COC for which corrective measures should be formulated are summarized below for each of the SWMU/AOCs. If appropriate, recommendations for any additional sampling that may be warranted are also presented. Conclusions for site-wide groundwater are discussed following the SWMU/AOC-specific discussions.

AOC 2

Based on the Tier 2 risk evaluation, only mercury in AOC 2 soil is identified as a COC that should be evaluated further in the CMS. Mercury is identified as a soil COC for AOC 2 based on exceedance of its GSI protection criterion and its presence in downgradient wells at concentrations above the higher of GSI/background. The evaluation should take into consideration the following:

- the existing groundwater extraction wells, which mitigate migration of potentially impacted groundwater (as well as intermediary wells downgradient of AOC 2 that are non-detect for mercury), and
- the placement of one to two feet of engineered fill across much of the eastern half of AOC 2, increasing the vertical distance and creating an additional barrier between the ground surface and the underlying source.

AOC 4

Based on the Tier 2 risk evaluation, the following organics and inorganics are identified as COC (or group of COC as with PAHs) in AOC 4 that should be evaluated further in the CMS:

- Mercury (soil)
- Cyanide (soil)
- PAHs (soil)
- Methylphenols (soil)
- Benzene (soil)

- Toluene (soil)
- Xylenes (soil)

The evaluation of corrective measures for AOC 4 should take into consideration the uncertainty in the Tier 2 results due to the limited number of soil samples for this AOC (n = 2 samples).

AOC 5

Based on the Tier 2 risk evaluation, the following organics are identified as COC in AOC 5 that should be evaluated further in the CMS:

- 1,2-dichloropropane (soil and groundwater)
- 1,2-dichloroethane (groundwater)
- bis(2-ethylhexyl)phthalate (groundwater)
- bis(2-chloroethyl)ether (groundwater)
- bis(2-chloroisopropyl)ether) (groundwater)

The evaluation of corrective measures should take into consideration the existing groundwater capture system at SWMU H/AOC 5, which mitigates migration of groundwater from AOC 5 to the river, The evaluation for AOC 5 should also take into consideration the limited data sets for soil and groundwater, and the resulting conservatism in risk estimates. The placement of one to two feet of engineered fill in the northeastern part of AOC 5 may also warrant consideration in the CMS, although the area of known subsurface contamination is located in the southwestern part of AOC 5 and is not part of the proposed plant expansion area where engineered fill has been placed.

AOC 6

Based on the Tier 2 risk evaluation, the following organics and inorganics are identified as COC in AOC 6 that should be evaluated further in the CMS:

- Arsenic (soil)
- PAHs (soil)
- Benzene (soil)
- Xylenes (soil)

The evaluation of corrective measures should take into consideration the following:

- the existing groundwater capture system, which mitigates migration of groundwater from AOC 6 to the river, and
- the uncertainty and likely overconservatism in the risk results due to lack of depth information for the majority of soil samples at AOC 6.

AOC 7A

Based on the results of the Tier 2 risk evaluation, only mercury in AOC 7A surface soil should be evaluated further in the CMS. This finding is based on the results of the PERA food web modeling. The evaluation should take into consideration the small size of AOC 7A (approximately one tenth of an acre) and the fact that part of the area is landscaped grass with the remainder weeds and grassy vegetation.

SWMU F

Based on the Tier 2 risk evaluation, the following inorganics and one organic are identified as COC in SWMU F that should be evaluated further in the CMS:

- mercury (soil)
- selenium (soil)
- total cyanide (soil)
- 1,2-dichloropropane (soil)

These four COC exceed their GSI protection criterion and are detected in downgradient wells at concentrations above the higher of GSI/background. The evaluation of corrective measures at SWMU F should take into consideration the following:

- the existing groundwater extraction wells, which mitigate migration of potentially impacted groundwater,
- the potential to sample intermediary wells to confirm whether a complete pathway exists between SWMU F and the far downgradient wells where exceedances were observed, and
- the placement of one to two feet of engineered fill across the surface of SWMU F, increasing the vertical distance and creating an additional barrier between the ground surface and the underlying source.

SWMU G

Based on the Tier 2 risk evaluation, the following organics and inorganics are identified as COC in SWMU G that should be evaluated further in the CMS:

- Arsenic (soil)
- Lead (soil)
- Mercury (soil)
- Pentachlorophenol (soil)
- 4,4'-DDT (soil)

Arsenic and mercury could not be eliminated as potential COI for the GSI pathway; both inorganics are present in both near and far downgradient/perimeter wells at concentrations above GSI and/or background. Based on the SERA/PERA, pentachlorophenol, 4,4-DDT, lead and mercury in surface soil should be evaluated further. The evaluation of corrective measures at SWMU G should take into account the qualitative background soil evaluation which found that detected arsenic, lead, and mercury concentrations in SWMU G soil generally fall within the range of site-specific background concentrations.

SWMU H

Based on the Tier 2 risk evaluation, the following organics and inorganics are identified as COC in SWMU H and should be evaluated further in the CMS:

- Antimony (soil)
- Mercury (soil)
- Nickel (soil)

- 1,2-dichloropropane (soil and groundwater)
- 1,2-dichloroethane (groundwater)
- bis(2-ethylhexyl)phthalate (groundwater)
- bis(2-chloroethyl)ether (groundwater)
- bis(2-chloroisopropyl)ether) (groundwater)
- 4,4'-DDT (soil)

The five organics (1,2-dichloropropane, 1,2-dichloroethane, bis(2-ethylhexyl)phthalate, bis(2-chloroethyl)ether, and bis(2-chlorisopropyl)ether), are present in the western segment of SWMU H that is co-located with AOC 5, and will be addressed in corrective measures planning for AOC 5. Based on the SERA/PERA, antimony, nickel, and 4,4'-DDT in surface soil should be evaluated further. Mercury in SWMU H soil should be evaluated further based on potential human health risk and potential GSI impacts. The evaluation of corrective measures should take into consideration the following:

- the existing groundwater capture system at SWMU H/AOC 5, which mitigates migration of groundwater from SWMU H to the river,
- the lack of soil depth information for approximately half the soil samples at SWMU H,
- the qualitative background soil evaluation which found that detected concentrations of inorganics in SWMU H soil generally fall within the range of site-specific background concentrations, and
- the data distribution in the west, central and east segments of SWMU H. In general, the highest concentrations of soil COC were observed in the west segments of SWMU H. As example, the highest concentrations of mercury and 1,2-dichloropropane in soil were detected in the western segment of SWMU H.

6.2.1 Conclusions for Groundwater

As shown in Table 6-1, a number of organic and inorganic COC are identified for site-wide groundwater based on the results of the Tier 2 GSI evaluation and the SERA/PERA. Some of these COC may be associated with specific SWMU/AOCs. It should be noted that the existing groundwater extraction well fields A, B and C mitigate the migration of COI in groundwater from several SWMU/AOCs, specifically AOC 5 (which includes co-located AOC 7C, the western and central segments of SWMU H, and upgradient AOC 7B), AOC 2, and AOC 6.

Groundwater in the northern portion of the site vents to the river/marina to the north. Based on the Tier 2 risk evaluation, COC in groundwater that exceed Part 201 GSI criteria and, for inorganics, the higher of GSI and site-specific background, are present primarily in the Sand Unit in the northern portion of the site. These COC include arsenic, chromium, cyanide, benzene, bis(2-chloroethyl)ether, chlorobenzene, ethylbenzene, vinyl chloride and xylenes. The only COC in groundwater that exceeds its Part 201 GSI criterion in the Fill Unit along the northern portion of the site is phenanthrene.

COC that exceed Part 201 GSI criteria and, for inorganics, the higher of GSI and site-specific background, in groundwater at GSI monitoring wells located along the Detroit River in the northern portion of the site include:

- antimony, arsenic, zinc, dibenzofuran, fluoranthene, phenanthrene at WHI6-2S;
- arsenic at RFI-MW4;
- barium at RFI-MW-3, RFI-MW-5, RFI-MW-7I, RFI-MW-8, RFI-MW-8I, WHI6-1S, WHI6-4F, WHI6-4S;
- mercury at RFI-MW-5, RFI-MW-6, RFI-MW-7, RFI-MW-8F, RFI-MW-8I;

- cyanide at RFI-MW-4, RFI-MW-6, RFI-MW-7, WHI6-1F, WHI6-1S, WHI6-2F, WHI6-3F, WHI6-3S, WHI6-4F;
- selenium and 1,2-dichloropropane at RFI-MW-6;
- thallium at RFI-MW7I;
- 3- and 4-methylphenol, dibenzofuran at RFI-MW-8I;
- naphthalene, phenanthrene at RFI-MW-8F, RFI-MW-8I;
- 1,4-dioxane, benzene at WHI6-3F;
- bis(2-chloroethyl)ether at WHI6-1F, WHI6-3F;
- pentachlorophenol at RFI-MW-8F; and
- xylenes at RFI-MW-8I.

COC that exceed Part 201 GSI criteria and, for inorganics, the higher of GSI and site-specific background, in groundwater at GSI monitoring wells located along the Detroit River in the southern portion of the site include:

- antimony at RFI-MW-9F, RFI-MW-10F, RFI-MW-10I, RFI-MW-11, RFI-MW-12;
- arsenic at RFI-MW-10F, RFI-MW-10I;
- barium at RFI-MW-10;
- chromium at RFI-MW-12;
- mercury at RFI-MW-9F, RFI-MW-9I, RFI-MW-10F, RFI-MW-10I, RFI-MW-12, RFI-MW-12F;
- nickel at RFI-MW-10I, RFI-MW-12, RFI-MW-12F;
- cyanide at RFI-MW-9, RFI-MW-9F, RFI-MW-9I, RFI-MW-10, RFI-MW-10F, RFI-MW-10I, RFI-MW-11F, RFI-MW-12;
- 1,4-dioxane at RFI-MW-12;
- 3- and 4-methylphenol at RFI-MW-10I, RFI-MW-12;
- naphthalene, phenanthrene at RFI-MW-9I, RFI-MW-10F, RFI-MW-10I; and
- phenol at RFI-MW-10I, RFI-MW-12, RFI-MW-12F.

The above groundwater COC and the groundwater-to-surface water pathway at the North Works site should be evaluated further in the CMS.

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Tables

Table 2-1
Summary Statistics for Constituents Detected in Soil
BASF North Works Facility
Wyandotte, Michigan
Tier 2 Risk Evaluation

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
AOC 1								
	BENZENE	71-43-2	mg/kg	1 : 52	3.80E-01	3.80E-01	3.80E-01	GTI SB-16
	ETHYLBENZENE	100-41-4	mg/kg	1 : 53	3.00E-01	3.00E-01	3.00E-01	GTI SB-14
	TOLUENE	108-88-3	mg/kg	2 : 53	3.40E-02	3.40E-02	3.40E-02	GTI SB-1, GTI SB-4
	TOTAL XYLENES	TOTAL	mg/kg	1 : 53	3.50E-02	3.50E-02	3.50E-02	GTI SB-2
	XYLENES	1330-20-7	mg/kg	1 : 53	3.50E-02	3.50E-02	3.50E-02	GTI SB-2
AOC 2								
	2-METHYLNAPHTHALENE	91-57-6	mg/kg	4 : 8	2.45E-01	3.40E+00	1.19E+00	SG008AOC2-3
	ACENAPHTHYLENE	208-96-8	mg/kg	3 : 8	8.20E-02	1.90E-01	1.44E-01	SG003AOC2-1
	ACETONE	67-64-1	mg/kg	2 : 8	3.00E-02	1.00E-01	6.50E-02	SG005AOC2-7
	ACETOPHENONE	98-86-2	mg/kg	2 : 8	1.80E-01	2.90E-01	2.35E-01	SG008AOC2-3
	ANTHRACENE	120-12-7	mg/kg	5 : 8	5.20E-02	5.90E-01	2.06E-01	SG003AOC2-1
	ARSENIC	7440-38-2	mg/kg	10 : 10	7.30E-01	4.11E+01	1.76E+01	SG001AOC2-6
	BAP-TE	BAP-TE	mg/kg	6 : 8	5.68E-01	2.39E+00	1.07E+00	SG003AOC2-1
	BARIUM	7440-39-3	mg/kg	8 : 8	4.50E+00	7.89E+01	4.37E+01	SG002AOC2-5
	BENZENE	71-43-2	mg/kg	1 : 8	2.70E-02	2.70E-02	2.70E-02	SG005AOC2-7
	BENZO(A)ANTHRACENE	56-55-3	mg/kg	6 : 8	5.80E-02	2.00E+00	5.72E-01	SG003AOC2-1
	BENZO(A)PYRENE	50-32-8	mg/kg	5 : 8	8.50E-02	1.70E+00	5.72E-01	SG003AOC2-1
	BENZO(B)FLUORANTHENE	205-99-2	mg/kg	5 : 8	9.60E-02	2.20E+00	7.51E-01	SG003AOC2-1
	BENZO(GHI)PERYLENE	191-24-2	mg/kg	5 : 8	6.10E-02	6.20E-01	2.73E-01	SG003AOC2-1
	BENZO(K)FLUORANTHENE	207-08-9	mg/kg	4 : 8	1.20E-01	9.80E-01	3.89E-01	SG003AOC2-1
	BIS(2-ETHYLHEXYL) PHTHALATE	117-81-7	mg/kg	4 : 8	8.90E-02	2.70E-01	1.42E-01	SG001AOC2-6
	CADMIUM	7440-43-9	mg/kg	8 : 8	1.40E-01	3.50E+00	7.44E-01	SG002AOC2-4
	CHROMIUM	7440-47-3	mg/kg	8 : 8	5.30E+00	1.01E+02	3.36E+01	SG002AOC2-5
	CHRYSENE	218-01-9	mg/kg	6 : 8	5.70E-02	1.70E+00	5.10E-01	SG003AOC2-1
	COPPER	7440-50-8	mg/kg	8 : 8	3.20E+00	2.44E+01	1.51E+01	SG008AOC2-3
	DIBENZ(A,H)ANTHRACENE	53-70-3	mg/kg	2 : 8	7.20E-02	1.90E-01	1.31E-01	SG003AOC2-1
	DIBENZOFURAN	132-64-9	mg/kg	4 : 8	1.30E-01	7.80E-01	3.23E-01	SG008AOC2-3
	ETHYLBENZENE	100-41-4	mg/kg	1 : 8	4.90E-03	4.90E-03	4.90E-03	SG005AOC2-7

Table 2-1
Summary Statistics for Constituents Detected in Soil
BASF North Works Facility

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
	FLUORANTHENE	206-44-0	mg/kg	6 : 8	9.00E-02	2.70E+00	8.24E-01	SG003AOC2-1
	INDENO(1,2,3-CD)PYRENE	193-39-5	mg/kg	5 : 8	7.00E-02	7.00E-01	2.78E-01	SG003AOC2-1
	LEAD	7439-92-1	mg/kg	8 : 8	2.40E+00	9.00E+01	2.22E+01	SG001AOC2-6
	MERCURY	7439-97-6	mg/kg	5 : 8	1.50E-01	1.71E+01	3.80E+00	SG002AOC2-5
	METHYLENE CHLORIDE	75-09-2	mg/kg	1 : 8	2.70E-02	2.70E-02	2.70E-02	SG005AOC2-7
	M-XYLENE & P-XYLENE	M/P-	mg/kg	1 : 8	2.50E-02	2.50E-02	2.50E-02	SG005AOC2-7
	NAPHTHALENE	91-20-3	mg/kg	4 : 8	4.75E-01	2.50E+00	1.14E+00	SG008AOC2-3
	NICKEL	7440-02-0	mg/kg	8 : 8	4.80E+00	1.33E+01	9.82E+00	SG008AOC2-3
	O-XYLENE	95-47-6	mg/kg	1 : 8	6.10E-03	6.10E-03	6.10E-03	SG005AOC2-7
	PERCENT SOLIDS	SOLIDS	%	10 : 10	6.05E+01	9.68E+01	7.99E+01	SG003AOC2-2
	PHENANTHRENE	85-01-8	mg/kg	6 : 8	9.70E-02	1.20E+00	6.12E-01	SG003AOC2-1,
	PYRENE	129-00-0	mg/kg	6 : 8	8.70E-02	2.60E+00	7.78E-01	SG003AOC2-1
	SELENIUM	7782-49-2	mg/kg	1 : 8	7.60E-01	7.60E-01	7.60E-01	SG008AOC2-3
	TOLUENE	108-88-3	mg/kg	2 : 8	1.15E-02	4.30E-02	2.72E-02	SG005AOC2-7
	Total Carcinogenic PAHs	Total cPAHs	mg/kg	6 : 8	1.37E+00	9.47E+00	3.35E+00	SG003AOC2-1
	TOTAL CYANIDE	57-12-5	mg/kg	6 : 8	7.65E-01	4.60E+01	1.38E+01	SG005AOC2-7
	Total HMW PAHs	Total HMW	mg/kg	6 : 8	1.80E+00	1.54E+01	5.24E+00	SG003AOC2-1
	Total LMW PAHs	Total LMW	mg/kg	6 : 8	1.17E+00	7.35E+00	2.95E+00	SG008AOC2-3
	TOTAL PAHs	Total PAHs	mg/kg	6 : 8	3.50E+00	1.88E+01	8.19E+00	SG003AOC2-1
	TOTAL XYLENES	TOTAL	mg/kg	1 : 8	3.11E-02	3.11E-02	3.11E-02	SG005AOC2-7
	VANADIUM	7440-62-2	mg/kg	7 : 8	1.02E+01	5.34E+01	1.95E+01	SG001AOC2-6
	ZINC	7440-66-6	mg/kg	8 : 8	1.85E+01	9.66E+02	1.80E+02	SG002AOC2-4
AOC 4								
	2-METHYLNAPHTHALENE	91-57-6	mg/kg	2 : 2	9.40E+02	9.00E+03	4.97E+03	SG003AOC4-1
	3-METHYLPHENOL	108-39-4	mg/kg	2 : 2	2.30E+02	2.70E+03	1.47E+03	SG003AOC4-1
	4-METHYLPHENOL	106-44-5	mg/kg	2 : 2	2.30E+02	2.70E+03	1.47E+03	SG003AOC4-1
	ACENAPHTHYLENE	208-96-8	mg/kg	2 : 2	1.00E+03	9.30E+03	5.15E+03	SG003AOC4-1
	ANTHRACENE	120-12-7	mg/kg	2 : 2	8.70E+02	7.10E+03	3.99E+03	SG003AOC4-1
	ARSENIC	7440-38-2	mg/kg	2 : 2	1.45E+01	2.05E+01	1.75E+01	SG003AOC4-1
	BAP-TE	BAP-TE	mg/kg	2 : 2	4.34E+02	5.22E+03	2.83E+03	SG003AOC4-1
	BARIUM	7440-39-3	mg/kg	2 : 2	1.25E+01	3.35E+01	2.30E+01	SG001AOC4-2

Table 2-1
Summary Statistics for Constituents Detected in Soil
BASF North Works Facility

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
	BENZENE	71-43-2	mg/kg	2 : 2	2.50E+02	6.80E+02	4.65E+02	SG003AOC4-1
	BENZO(A)ANTHRACENE	56-55-3	mg/kg	2 : 2	4.90E+02	4.90E+03	2.70E+03	SG003AOC4-1
	BENZO(A)PYRENE	50-32-8	mg/kg	2 : 2	3.30E+02	4.10E+03	2.22E+03	SG003AOC4-1
	BENZO(B)FLUORANTHENE	205-99-2	mg/kg	2 : 2	4.10E+02	4.40E+03	2.41E+03	SG003AOC4-1
	BENZO(GHI)PERYLENE	191-24-2	mg/kg	1 : 2	1.50E+03	1.50E+03	1.50E+03	SG003AOC4-1
	BENZO(K)FLUORANTHENE	207-08-9	mg/kg	2 : 2	1.90E+02	2.50E+03	1.35E+03	SG003AOC4-1
	CADMIUM	7440-43-9	mg/kg	2 : 2	1.40E+00	1.40E+00	1.40E+00	SG001AOC4-2,
	CHROMIUM	7440-47-3	mg/kg	2 : 2	7.30E-01	1.20E+00	9.65E-01	SG001AOC4-2
	CHRYSENE	218-01-9	mg/kg	2 : 2	4.70E+02	5.20E+03	2.84E+03	SG003AOC4-1
	COPPER	7440-50-8	mg/kg	2 : 2	3.40E+00	3.70E+00	3.55E+00	SG003AOC4-1
	DIBENZOFURAN	132-64-9	mg/kg	2 : 2	7.40E+02	5.90E+03	3.32E+03	SG003AOC4-1
	FLUORANTHENE	206-44-0	mg/kg	2 : 2	1.60E+03	1.40E+04	7.80E+03	SG003AOC4-1
	FLUORENE	86-73-7	mg/kg	2 : 2	1.20E+03	9.50E+03	5.35E+03	SG003AOC4-1
	INDENO(1,2,3-CD)PYRENE	193-39-5	mg/kg	2 : 2	1.20E+02	1.60E+03	8.60E+02	SG003AOC4-1
	LEAD	7439-92-1	mg/kg	2 : 2	4.90E+01	8.28E+01	6.59E+01	SG003AOC4-1
	MERCURY	7439-97-6	mg/kg	2 : 2	1.30E-01	6.20E-01	3.75E-01	SG003AOC4-1
	M-XYLENE & P-XYLENE	M/P-	mg/kg	2 : 2	1.70E+02	7.40E+02	4.55E+02	SG003AOC4-1
	NAPHTHALENE	91-20-3	mg/kg	2 : 2	6.00E+03	4.80E+04	2.70E+04	SG003AOC4-1
	O-XYLENE	95-47-6	mg/kg	1 : 2	2.40E+02	2.40E+02	2.40E+02	SG003AOC4-1
	PERCENT SOLIDS	SOLIDS	%	2 : 2	7.30E+01	7.46E+01	7.38E+01	SG001AOC4-2
	PHENANTHRENE	85-01-8	mg/kg	2 : 2	2.70E+03	2.30E+04	1.29E+04	SG003AOC4-1
	PHENOL	108-95-2	mg/kg	1 : 2	2.30E+03	2.30E+03	2.30E+03	SG003AOC4-1
	PYRENE	129-00-0	mg/kg	2 : 2	1.10E+03	9.90E+03	5.50E+03	SG003AOC4-1
	SELENIUM	7782-49-2	mg/kg	2 : 2	2.60E+00	3.60E+00	3.10E+00	SG003AOC4-1
	STYRENE	100-42-5	mg/kg	2 : 2	9.60E+01	2.40E+02	1.68E+02	SG003AOC4-1
	THALLIUM	7440-28-0	mg/kg	2 : 2	7.20E+00	1.40E+01	1.06E+01	SG003AOC4-1
	TOLUENE	108-88-3	mg/kg	2 : 2	1.90E+02	5.90E+02	3.90E+02	SG003AOC4-1
	Total Carcinogenic PAHs	Total cPAHs	mg/kg	2 : 2	2.01E+03	2.27E+04	1.24E+04	SG003AOC4-1
	TOTAL CYANIDE	57-12-5	mg/kg	2 : 2	1.10E+01	1.90E+01	1.50E+01	SG001AOC4-2
	Total HMW PAHs	Total HMW	mg/kg	2 : 2	5.81E+03	4.81E+04	2.70E+04	SG003AOC4-1
	Total LMW PAHs	Total LMW	mg/kg	2 : 2	1.27E+04	1.06E+05	5.93E+04	SG003AOC4-1

Table 2-1
Summary Statistics for Constituents Detected in Soil
BASF North Works Facility

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
	TOTAL METHYLPHENOL	TOTAL	mg/kg	2 : 2	4.60E+02	5.40E+03	2.93E+03	SG003AOC4-1
	TOTAL PAHs	Total PAHs	mg/kg	2 : 2	1.85E+04	1.54E+05	8.63E+04	SG003AOC4-1
	TOTAL XYLENES	TOTAL	mg/kg	2 : 2	3.40E+02	9.80E+02	6.60E+02	SG003AOC4-1
	ZINC	7440-66-6	mg/kg	2 : 2	1.01E+02	1.14E+02	1.08E+02	SG001AOC4-2
AOC 5								
	1,2,3-TRICHLOROPROPANE	96-18-4	mg/kg	2 : 3	2.60E+00	7.20E+01	3.73E+01	AOC5-MIP-06
	1,2,4-TRIMETHYLBENZENE	95-63-6	mg/kg	1 : 3	1.30E+00	1.30E+00	1.30E+00	AOC5-MIP-06
	1,2-DICHLOROETHANE	107-06-2	mg/kg	2 : 3	1.60E+00	1.00E+02	5.08E+01	AOC5-MIP-06
	1,2-DICHLOROPROPANE	78-87-5	mg/kg	3 : 3	1.50E-02	2.90E+03	9.83E+02	AOC5-MIP-06
	1,3,5-TRIMETHYLBENZENE	108-67-8	mg/kg	1 : 3	1.00E+00	1.00E+00	1.00E+00	AOC5-MIP-06
	2-METHYLNAPHTHALENE	91-57-6	mg/kg	2 : 6	1.60E-01	2.85E+00	1.50E+00	AOC5-MIP-06
	ACETONE	67-64-1	mg/kg	1 : 3	6.30E-01	6.30E-01	6.30E-01	AOC5-MIP-06
	BAP-TE	BAP-TE	mg/kg	1 : 3	2.00E-01	2.00E-01	2.00E-01	AOC5-MIP-06
	BENZENE	71-43-2	mg/kg	1 : 3	1.90E-01	1.90E-01	1.90E-01	AOC5-MIP-06
	BENZO(A)ANTHRACENE	56-55-3	mg/kg	1 : 3	1.80E-01	1.80E-01	1.80E-01	AOC5-MIP-06
	BENZO(A)PYRENE	50-32-8	mg/kg	1 : 3	1.60E-01	1.60E-01	1.60E-01	AOC5-MIP-06
	BENZO(B)FLUORANTHENE	205-99-2	mg/kg	1 : 3	2.20E-01	2.20E-01	2.20E-01	AOC5-MIP-06
	BIS(2-CHLOROETHYL) ETHER	111-44-4	mg/kg	2 : 3	1.00E+00	6.40E+00	3.70E+00	AOC5-MIP-06
	BIS(2-CHLOROISOPROPYL) ETHER	108-60-1	mg/kg	3 : 3	4.00E-02	4.00E+01	1.70E+01	AOC5-MIP-06
	CAPROLACTAM	105-60-2	mg/kg	2 : 3	1.00E+00	2.90E+00	1.95E+00	AOC5-MIP-06
	CHLOROFORM	67-66-3	mg/kg	1 : 3	4.00E-01	4.00E-01	4.00E-01	AOC5-MIP-06
	CHRYSENE	218-01-9	mg/kg	1 : 3	2.20E-01	2.20E-01	2.20E-01	AOC5-MIP-06
	DIBENZOFURAN	132-64-9	mg/kg	1 : 3	3.70E-01	3.70E-01	3.70E-01	AOC5-MIP-06
	ETHYLBENZENE	100-41-4	mg/kg	1 : 3	3.30E-01	3.30E-01	3.30E-01	AOC5-MIP-06
	FLUORANTHENE	206-44-0	mg/kg	1 : 3	3.00E-01	3.00E-01	3.00E-01	AOC5-MIP-06
	M-XYLENE & P-XYLENE	M/P-	mg/kg	1 : 3	1.60E+00	1.60E+00	1.60E+00	AOC5-MIP-06
	NAPHTHALENE	91-20-3	mg/kg	1 : 6	1.60E+00	1.60E+00	1.60E+00	AOC5-MIP-06
	N-BUTYLBENZENE	104-51-8	mg/kg	1 : 3	7.40E-02	7.40E-02	7.40E-02	AOC5-MIP-06
	O-XYLENE	95-47-6	mg/kg	1 : 3	1.10E+00	1.10E+00	1.10E+00	AOC5-MIP-06
	PERCENT SOLIDS	SOLIDS	%	12 : 12	7.23E+01	8.90E+01	8.13E+01	AOC5-MIP-06
	PHENANTHRENE	85-01-8	mg/kg	2 : 3	2.30E-02	6.10E-01	3.17E-01	AOC5-MIP-06

Table 2-1
Summary Statistics for Constituents Detected in Soil
BASF North Works Facility

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
	PYRENE	129-00-0	mg/kg	1 : 3	2.70E-01	2.70E-01	2.70E-01	AOC5-MIP-06
	TETRAHYDROFURAN	109-99-9	mg/kg	1 : 3	1.60E-01	1.60E-01	1.60E-01	AOC5-MIP-06
	TOLUENE	108-88-3	mg/kg	1 : 3	1.70E+00	1.70E+00	1.70E+00	AOC5-MIP-06
	Total Carcinogenic PAHs	Total cPAHs	mg/kg	1 : 3	7.80E-01	7.80E-01	7.80E-01	AOC5-MIP-06
	Total HMW PAHs	Total HMW	mg/kg	1 : 3	1.35E+00	1.35E+00	1.35E+00	AOC5-MIP-06
	Total LMW PAHs	Total LMW	mg/kg	2 : 3	4.63E-01	5.06E+00	2.76E+00	AOC5-MIP-06
	TOTAL PAHs	Total PAHs	mg/kg	2 : 3	2.38E+00	6.41E+00	4.40E+00	AOC5-MIP-06
	TOTAL XYLENES	TOTAL	mg/kg	1 : 3	2.70E+00	2.70E+00	2.70E+00	AOC5-MIP-06
AOC 6								
	1,1-BIPHENYL	92-52-4	mg/kg	2 : 10	6.60E-02	6.20E-01	3.43E-01	AOC6-SS-10
	1,2,3-TRICHLOROPROPANE	96-18-4	mg/kg	1 : 19	9.00E-03	9.00E-03	9.00E-03	SP62A-AOC-6
	1,2,4-TRIMETHYLBENZENE	95-63-6	mg/kg	4 : 10	3.50E-02	1.45E-01	8.68E-02	AOC6-SS-6
	1,2-DICHLOROETHANE	107-06-2	mg/kg	4 : 20	2.50E-02	2.60E-01	1.05E-01	AOC6-SS-10
	1,2-DICHLOROPROPANE	78-87-5	mg/kg	8 : 22	5.20E-03	2.50E+00	5.94E-01	AOC6-SS-10
	1,3,5-TRIMETHYLBENZENE	108-67-8	mg/kg	4 : 10	4.90E-02	3.15E-01	1.44E-01	AOC6-SS-6
	2,4-DIMETHYLPHENOL	105-67-9	mg/kg	1 : 22	1.70E-01	1.70E-01	1.70E-01	SP65-AOC-6
	2-METHYLNAPHTHALENE	91-57-6	mg/kg	15 : 32	2.20E-02	9.90E+01	1.27E+01	SP54-AOC-6
	2-METHYLPHENOL	95-48-7	mg/kg	1 : 22	1.40E-01	1.40E-01	1.40E-01	SP65-AOC-6
	4-ISOPROPYLTOLUENE	99-87-6	mg/kg	3 : 10	3.90E-02	3.00E-01	1.30E-01	AOC6-SS-6
	ACENAPHTHENE	83-32-9	mg/kg	8 : 22	4.20E-02	1.20E+01	1.83E+00	SP54-AOC-6
	ACENAPHTHYLENE	208-96-8	mg/kg	17 : 22	1.70E-02	6.00E+01	5.65E+00	SP54-AOC-6
	ACETONE	67-64-1	mg/kg	9 : 22	3.50E-01	6.50E-01	5.21E-01	AOC6-SS-5
	ACETOPHENONE	98-86-2	mg/kg	7 : 22	2.00E-01	5.20E+00	1.30E+00	SP55-AOC-6
	ANTHRACENE	120-12-7	mg/kg	15 : 22	1.40E-02	1.20E+02	1.09E+01	SP54-AOC-6
	ANTIMONY	7440-36-0	mg/kg	5 : 22	4.60E-01	8.00E-01	5.61E-01	AOC6-SS-5
	ARSENIC	7440-38-2	mg/kg	22 : 22	1.80E+00	2.00E+02	2.78E+01	SP61-AOC-6
	BAP-TE	BAP-TE	mg/kg	19 : 22	3.39E-01	1.34E+02	1.57E+01	SP54-AOC-6
	BARIUM	7440-39-3	mg/kg	21 : 22	8.50E+00	1.87E+02	8.68E+01	SP55A-AOC-6
	BENZALDEHYDE	100-52-7	mg/kg	2 : 10	8.80E-02	9.90E-02	9.35E-02	AOC6-SS-5
	BENZENE	71-43-2	mg/kg	12 : 22	3.90E-03	1.40E+03	1.93E+02	SP61-AOC-6
	BENZO(A)ANTHRACENE	56-55-3	mg/kg	19 : 22	4.80E-02	1.30E+02	1.30E+01	SP54-AOC-6

Table 2-1
Summary Statistics for Constituents Detected in Soil
BASF North Works Facility

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
	BENZO(A)PYRENE	50-32-8	mg/kg	19 : 22	4.50E-02	9.40E+01	1.04E+01	SP54-AOC-6
	BENZO(B)FLUORANTHENE	205-99-2	mg/kg	19 : 22	6.10E-02	1.00E+02	1.27E+01	SP54-AOC-6
	BENZO(GHI)PERYLENE	191-24-2	mg/kg	19 : 22	3.10E-02	3.10E+01	4.70E+00	SP54-AOC-6
	BENZO(K)FLUORANTHENE	207-08-9	mg/kg	18 : 22	2.30E-02	5.60E+01	6.70E+00	SP54-AOC-6
	BERYLLIUM	7440-41-7	mg/kg	1 : 22	8.90E-01	8.90E-01	8.90E-01	SP61A-AOC-6
	BIS(2-CHLOROISOPROPYL) ETHER	108-60-1	mg/kg	8 : 22	1.30E-01	5.20E+00	1.72E+00	SP61-AOC-6
	BIS(2-ETHYLHEXYL) PHTHALATE	117-81-7	mg/kg	1 : 22	2.90E-02	2.90E-02	2.90E-02	AOC6-SS-9
	CADMIUM	7440-43-9	mg/kg	19 : 22	8.00E-02	2.00E+00	6.99E-01	SP61A-AOC-6
	CARBAZOLE	86-74-8	mg/kg	4 : 10	5.20E-01	1.12E+00	8.96E-01	AOC6-SS-6
	CARBON TETRACHLORIDE	56-23-5	mg/kg	1 : 22	8.40E-02	8.40E-02	8.40E-02	AOC6-SS-10
	CHLOROFORM	67-66-3	mg/kg	4 : 22	1.00E-02	1.60E-01	5.17E-02	AOC6-SS-10
	CHROMIUM	7440-47-3	mg/kg	22 : 22	2.50E+00	5.32E+01	1.46E+01	SP61A-AOC-6
	CHRYSENE	218-01-9	mg/kg	19 : 22	6.20E-02	1.20E+02	1.21E+01	SP54-AOC-6
	COBALT	7440-48-4	mg/kg	10 : 22	1.20E+00	8.80E+00	4.35E+00	AOC6-SS-9
	COPPER	7440-50-8	mg/kg	22 : 22	2.60E+00	4.94E+01	2.65E+01	SP55A-AOC-6
	DIBENZ(A,H)ANTHRACENE	53-70-3	mg/kg	12 : 22	1.10E-01	1.20E+01	2.56E+00	SP54-AOC-6
	DIBENZOFURAN	132-64-9	mg/kg	14 : 22	5.70E-02	9.90E+01	7.85E+00	SP54-AOC-6
	ETHYLBENZENE	100-41-4	mg/kg	6 : 19	1.00E-02	3.20E+01	5.34E+00	SP62-AOC-6
	FLUORANTHENE	206-44-0	mg/kg	19 : 22	8.80E-02	3.50E+02	2.97E+01	SP54-AOC-6
	FLUORENE	86-73-7	mg/kg	16 : 22	5.40E-02	2.10E+02	2.81E+01	SP62-AOC-6
	INDENO(1,2,3-CD)PYRENE	193-39-5	mg/kg	18 : 22	2.80E-02	4.30E+01	5.76E+00	SP54-AOC-6
	ISOPROPYLBENZENE	98-82-8	mg/kg	6 : 10	1.20E-02	3.15E-01	9.27E-02	AOC6-SS-6
	LEAD	7439-92-1	mg/kg	22 : 22	4.00E+00	3.08E+02	5.67E+01	SP55A-AOC-6
	MERCURY	7439-97-6	mg/kg	17 : 22	2.00E-02	3.30E+00	9.56E-01	SP62A-AOC-6
	METHYLENE CHLORIDE	75-09-2	mg/kg	4 : 22	7.30E-03	1.00E-02	8.95E-03	SP64-AOC-6
	M-XYLENE & P-XYLENE	M/P-	mg/kg	9 : 19	2.00E-02	5.60E+01	6.30E+00	SP62-AOC-6
	NAPHTHALENE	91-20-3	mg/kg	18 : 32	2.35E-02	2.70E+03	1.69E+02	SP62-AOC-6
	NICKEL	7440-02-0	mg/kg	18 : 22	3.20E+00	5.76E+01	1.85E+01	AOC6-SS-7
	N-PROPYLBENZENE	103-65-1	mg/kg	2 : 10	7.50E-03	4.90E-02	2.83E-02	AOC6-SS-10
	O-XYLENE	95-47-6	mg/kg	9 : 19	1.30E-02	1.20E+02	1.34E+01	SP62-AOC-6
	PERCENT SOLIDS	SOLIDS	%	22 : 22	5.16E+01	9.32E+01	7.68E+01	AOC6-SS-8

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
	PHENANTHRENE	85-01-8	mg/kg	19 : 22	4.10E-02	4.90E+02	3.17E+01	SP54-AOC-6
	PYRENE	129-00-0	mg/kg	19 : 22	7.50E-02	2.80E+02	2.19E+01	SP54-AOC-6
	SEC-BUTYLBENZENE	135-98-8	mg/kg	5 : 10	4.70E-02	6.85E-01	2.28E-01	AOC6-SS-6
	SELENIUM	7782-49-2	mg/kg	10 : 22	4.00E-01	2.30E+01	6.06E+00	SP62-AOC-6
	SILVER	7440-22-4	mg/kg	3 : 22	3.70E-01	4.40E-01	3.97E-01	AOC6-SS-10
	TERT-BUTYLBENZENE	98-06-6	mg/kg	6 : 10	9.00E-03	4.65E-01	1.43E-01	AOC6-SS-6
	TETRACHLOROETHENE	127-18-4	mg/kg	1 : 19	6.30E-02	6.30E-02	6.30E-02	AOC6-SS-10
	TOLUENE	108-88-3	mg/kg	9 : 19	2.40E-03	2.10E-01	1.05E-01	AOC6-SS-4
	Total Carcinogenic PAHs	Total cPAHs	mg/kg	19 : 22	5.47E-01	5.55E+02	6.21E+01	SP54-AOC-6
	TOTAL CYANIDE	57-12-5	mg/kg	8 : 12	3.90E-01	2.40E+00	1.08E+00	SP62A-AOC-6
	Total HMW PAHs	Total HMW	mg/kg	19 : 22	7.43E-01	1.22E+03	1.18E+02	SP54-AOC-6
	Total LMW PAHs	Total LMW	mg/kg	22 : 22	7.78E-01	4.51E+03	2.87E+02	SP62-AOC-6
	TOTAL METHYLPHENOL	TOTAL	mg/kg	1 : 22	1.40E-01	1.40E-01	1.40E-01	SP65-AOC-6
	TOTAL PAHs	Total PAHs	mg/kg	22 : 22	1.68E+00	8.31E+03	5.81E+02	SP62-AOC-6
	TOTAL XYLENES	TOTAL	mg/kg	9 : 19	3.30E-02	1.76E+02	1.97E+01	SP62-AOC-6
	TRICHLOROETHENE	79-01-6	mg/kg	1 : 22	1.00E-01	1.00E-01	1.00E-01	AOC6-SS-9
	VANADIUM	7440-62-2	mg/kg	19 : 22	5.60E+00	1.95E+01	1.31E+01	SP55A-AOC-6,
	ZINC	7440-66-6	mg/kg	22 : 22	1.03E+01	2.52E+02	8.35E+01	SP62A-AOC-6
AOC 7A								
	ARSENIC	7440-38-2	mg/kg	14 : 14	2.50E+00	6.24E+01	1.77E+01	SP10A-AOC-7A
	BARIUM	7440-39-3	mg/kg	14 : 14	8.30E+00	1.48E+02	6.59E+01	SP04-AOC-7A
	BERYLLIUM	7440-41-7	mg/kg	2 : 14	7.10E-01	9.30E-01	8.20E-01	SP10A-AOC-7A
	CADMIUM	7440-43-9	mg/kg	12 : 14	1.40E-01	7.50E-01	3.93E-01	SP01-AOC-7A
	CHROMIUM	7440-47-3	mg/kg	14 : 14	7.30E+00	2.91E+01	1.61E+01	SP02-AOC-7A
	COBALT	7440-48-4	mg/kg	2 : 14	6.60E+00	9.70E+00	8.15E+00	SP02-AOC-7A
	COPPER	7440-50-8	mg/kg	14 : 14	2.70E+00	3.70E+01	2.13E+01	SP02-AOC-7A
	LEAD	7439-92-1	mg/kg	14 : 14	2.80E+00	3.35E+02	7.15E+01	SP01-AOC-7A
	MERCURY	7439-97-6	mg/kg	11 : 14	1.30E-01	4.80E+00	1.60E+00	SP01-AOC-7A
	NICKEL	7440-02-0	mg/kg	13 : 14	8.10E+00	3.18E+01	1.53E+01	SP02-AOC-7A
	PERCENT SOLIDS	SOLIDS	%	19 : 19	6.72E+01	9.38E+01	8.01E+01	SP03-AOC-7A
	SELENIUM	7782-49-2	mg/kg	4 : 14	9.70E-01	1.70E+00	1.34E+00	SP02-AOC-7A

Table 2-1
Summary Statistics for Constituents Detected in Soil
BASF North Works Facility

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
	SILVER	7440-22-4	mg/kg	1 : 14	1.94E+01	1.94E+01	1.94E+01	SP10A-AOC-7A
	TOTAL CYANIDE	57-12-5	mg/kg	15 : 19	3.20E-01	5.70E+00	2.08E+00	SP01-AOC-7A
	VANADIUM	7440-62-2	mg/kg	14 : 14	1.10E+01	4.13E+01	2.25E+01	SP02-AOC-7A
	ZINC	7440-66-6	mg/kg	14 : 14	1.26E+01	1.90E+02	6.66E+01	SP01-AOC-7A
AOC 7B								
	ARSENIC	7440-38-2	mg/kg	4 : 4	1.70E+00	1.17E+01	7.45E+00	SP35-AOC-7B
	BARIUM	7440-39-3	mg/kg	4 : 4	1.26E+01	1.08E+02	5.25E+01	AOC-7B
	BERYLLIUM	7440-41-7	mg/kg	1 : 4	7.80E-01	7.80E-01	7.80E-01	SP35-AOC-7B
	CADMIUM	7440-43-9	mg/kg	2 : 4	4.10E-01	5.10E-01	4.60E-01	AOC-7B
	CHROMIUM	7440-47-3	mg/kg	4 : 4	6.40E+00	2.69E+01	1.31E+01	SP34-AOC-7B
	COPPER	7440-50-8	mg/kg	3 : 4	1.24E+01	1.65E+01	1.46E+01	SP36-AOC-7B
	LEAD	7439-92-1	mg/kg	4 : 4	3.40E+00	3.06E+01	1.53E+01	SP36-AOC-7B
	MERCURY	7439-97-6	mg/kg	2 : 4	2.70E-01	5.70E-01	4.20E-01	SP36-AOC-7B
	NICKEL	7440-02-0	mg/kg	4 : 4	6.40E+00	1.38E+01	1.06E+01	SP36-AOC-7B
	PERCENT SOLIDS	SOLIDS	%	4 : 4	7.86E+01	8.92E+01	8.50E+01	SP36-AOC-7B
	VANADIUM	7440-62-2	mg/kg	4 : 4	1.01E+01	1.89E+01	1.42E+01	SP36-AOC-7B
	ZINC	7440-66-6	mg/kg	4 : 4	1.46E+01	1.51E+02	6.45E+01	AOC-7B
AOC 7C								
	ANTIMONY	7440-36-0	mg/kg	1 : 5	7.60E-01	7.60E-01	7.60E-01	AOC-7C-GP-6
	ARSENIC	7440-38-2	mg/kg	11 : 11	9.20E+00	3.45E+01	1.91E+01	SP37-AOC-7C
	BARIUM	7440-39-3	mg/kg	5 : 5	2.07E+01	1.47E+02	6.82E+01	SP39-AOC-7C
	BERYLLIUM	7440-41-7	mg/kg	1 : 5	1.30E+00	1.30E+00	1.30E+00	SP40-AOC-7C
	CADMIUM	7440-43-9	mg/kg	2 : 5	5.90E-01	6.70E-01	6.30E-01	SP39-AOC-7C
	CHROMIUM	7440-47-3	mg/kg	5 : 5	6.00E+00	1.72E+01	9.96E+00	SP39-AOC-7C
	COBALT	7440-48-4	mg/kg	1 : 5	5.10E+00	5.10E+00	5.10E+00	AOC-7C-GP-6
	COPPER	7440-50-8	mg/kg	5 : 5	2.00E+01	3.08E+01	2.39E+01	SP37-AOC-7C
	LEAD	7439-92-1	mg/kg	5 : 5	7.30E+00	1.13E+02	4.75E+01	SP39-AOC-7C
	MERCURY	7439-97-6	mg/kg	3 : 5	1.60E-01	3.60E+00	1.99E+00	AOC-7C-GP-6
	NICKEL	7440-02-0	mg/kg	5 : 5	1.01E+01	8.99E+01	3.13E+01	SP39-AOC-7C
	PERCENT SOLIDS	SOLIDS	%	12 : 12	6.71E+01	9.70E+01	7.95E+01	AOC-7C-GP-2
	SELENIUM	7782-49-2	mg/kg	4 : 5	2.00E+00	2.40E+00	2.22E+00	SP38-AOC-7C

Table 2-1
Summary Statistics for Constituents Detected in Soil
BASF North Works Facility

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
	THALLIUM	7440-28-0	mg/kg	1 : 5	9.50E-01	9.50E-01	9.50E-01	AOC-7C-GP-6
	VANADIUM	7440-62-2	mg/kg	5 : 5	1.19E+01	1.95E+01	1.51E+01	SP40-AOC-7C
	ZINC	7440-66-6	mg/kg	5 : 5	1.83E+01	6.03E+02	1.62E+02	SP39-AOC-7C
SWMU F								
	1,2-DICHLOROPROPANE	78-87-5	mg/kg	9 : 20	4.20E-03	7.00E+01	1.01E+01	SP03-SWMU-F
	2,4-DIMETHYLPHENOL	105-67-9	mg/kg	1 : 10	2.20E+01	2.20E+01	2.20E+01	SP07-SWMU-F
	2-BUTANONE	78-93-3	mg/kg	1 : 10	1.70E-02	1.70E-02	1.70E-02	SP08-SWMU-F
	2-METHYLNAPHTHALENE	91-57-6	mg/kg	3 : 10	1.30E-01	7.30E-01	3.37E-01	SP08-SWMU-F
	2-METHYLPHENOL	95-48-7	mg/kg	1 : 10	4.10E+00	4.10E+00	4.10E+00	SP07-SWMU-F
	3-METHYLPHENOL	108-39-4	mg/kg	4 : 10	2.00E-01	2.00E+01	5.27E+00	SP07-SWMU-F
	4,4-DDE	72-55-9	mg/kg	1 : 8	7.80E-03	7.80E-03	7.80E-03	SP18-SWMU-F
	4-METHYLPHENOL	106-44-5	mg/kg	4 : 10	2.00E-01	2.00E+01	5.27E+00	SP07-SWMU-F
	ACENAPHTHENE	83-32-9	mg/kg	1 : 10	4.40E-01	4.40E-01	4.40E-01	SP08-SWMU-F
	ACENAPHTHYLENE	208-96-8	mg/kg	1 : 10	6.80E-02	6.80E-02	6.80E-02	SP09-SWMU-F
	ACETONE	67-64-1	mg/kg	9 : 10	1.90E-01	1.90E+02	5.03E+01	SP07-SWMU-F
	ANTHRACENE	120-12-7	mg/kg	2 : 10	1.10E-01	1.30E+00	7.05E-01	SP08-SWMU-F
	ANTIMONY	7440-36-0	mg/kg	3 : 10	7.10E-01	1.60E+01	5.83E+00	SP07-SWMU-F
	AROCLOR 1254	11097-69-1	mg/kg	1 : 8	2.80E+00	2.80E+00	2.80E+00	SP07-SWMU-F
	ARSENIC	7440-38-2	mg/kg	10 : 10	4.40E+00	6.39E+01	2.32E+01	SP09-SWMU-F
	BAP-TE	BAP-TE	mg/kg	4 : 10	1.58E-01	2.14E+00	9.81E-01	SP07-SWMU-F
	BARIUM	7440-39-3	mg/kg	10 : 10	1.88E+01	4.91E+02	1.08E+02	SP07-SWMU-F
	BENZENE	71-43-2	mg/kg	1 : 10	2.00E+00	2.00E+00	2.00E+00	SP03-SWMU-F
	BENZO(A)ANTHRACENE	56-55-3	mg/kg	4 : 10	1.20E-01	1.70E+00	8.67E-01	SP07-SWMU-F
	BENZO(A)PYRENE	50-32-8	mg/kg	3 : 10	1.20E-01	1.60E+00	7.83E-01	SP07-SWMU-F
	BENZO(B)FLUORANTHENE	205-99-2	mg/kg	4 : 10	1.50E-01	1.50E+00	7.80E-01	SP07-SWMU-F
	BENZO(GHI)PERYLENE	191-24-2	mg/kg	3 : 10	5.90E-02	8.50E-01	3.53E-01	SP07-SWMU-F
	BENZO(K)FLUORANTHENE	207-08-9	mg/kg	4 : 10	8.20E-02	8.90E-01	3.61E-01	SP07-SWMU-F
	BENZYL ALCOHOL	100-51-6	mg/kg	1 : 10	2.10E+01	2.10E+01	2.10E+01	SP06-SWMU-F
	BIS(2-CHLOROISOPROPYL) ETHER	108-60-1	mg/kg	11 : 20	3.70E-02	2.80E+01	5.02E+00	SP03-SWMU-F
	BUTYL BENZYL PHTHALATE	85-68-7	mg/kg	1 : 10	1.00E+00	1.00E+00	1.00E+00	SP07-SWMU-F
	CADMIUM	7440-43-9	mg/kg	10 : 10	2.70E-01	7.30E+00	1.20E+00	SP07-SWMU-F

Table 2-1
Summary Statistics for Constituents Detected in Soil
BASF North Works Facility

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
	CHROMIUM	7440-47-3	mg/kg	10 : 10	6.40E+00	1.30E+02	2.38E+01	SP07-SWMU-F
	CHRYSENE	218-01-9	mg/kg	4 : 10	1.60E-01	1.70E+00	8.18E-01	SP07-SWMU-F
	COBALT	7440-48-4	mg/kg	1 : 10	4.05E+01	4.05E+01	4.05E+01	SP07-SWMU-F
	COPPER	7440-50-8	mg/kg	10 : 10	1.05E+01	7.71E+03	7.93E+02	SP07-SWMU-F
	DIBENZOFURAN	132-64-9	mg/kg	2 : 10	1.20E-01	3.70E-01	2.45E-01	SP08-SWMU-F
	DI-N-OCTYL PHTHALATE	117-84-0	mg/kg	1 : 10	1.50E+01	1.50E+01	1.50E+01	SP06-SWMU-F
	FLUORANTHENE	206-44-0	mg/kg	5 : 10	6.30E-02	4.50E+00	1.54E+00	SP08-SWMU-F
	FLUORENE	86-73-7	mg/kg	2 : 10	1.70E-01	7.80E-01	4.75E-01	SP08-SWMU-F
	INDENO(1,2,3-CD)PYRENE	193-39-5	mg/kg	1 : 10	1.00E-01	1.00E-01	1.00E-01	SP18-SWMU-F
	LEAD	7439-92-1	mg/kg	10 : 10	1.50E+00	8.76E+02	1.09E+02	SP07-SWMU-F
	MERCURY	7439-97-6	mg/kg	6 : 10	3.30E-01	2.11E+01	4.78E+00	SP07-SWMU-F
	M-XYLENE & P-XYLENE	M/P-	mg/kg	1 : 10	8.10E-03	8.10E-03	8.10E-03	SP02-SWMU-F
	NAPHTHALENE	91-20-3	mg/kg	4 : 10	9.90E-02	4.50E-01	2.57E-01	SP07-SWMU-F
	NICKEL	7440-02-0	mg/kg	9 : 10	6.40E+00	1.70E+02	3.07E+01	SP07-SWMU-F
	PENTACHLOROPHENOL	87-86-5	mg/kg	2 : 20	1.60E-02	6.40E-02	4.00E-02	SP07-SWMU-F
	PERCENT SOLIDS	SOLIDS	%	20 : 20	3.82E+01	9.00E+01	7.07E+01	SWMUF-SS-9
	PHENANTHRENE	85-01-8	mg/kg	4 : 10	2.00E-01	6.00E+00	2.15E+00	SP08-SWMU-F
	PHENOL	108-95-2	mg/kg	2 : 10	1.90E+00	6.40E+00	4.15E+00	SP07-SWMU-F
	PYRENE	129-00-0	mg/kg	4 : 10	4.00E-01	3.40E+00	1.90E+00	SP07-SWMU-F
	SELENIUM	7782-49-2	mg/kg	5 : 10	1.20E+00	6.30E+00	2.80E+00	SP07-SWMU-F
	SILVER	7440-22-4	mg/kg	1 : 10	1.05E+01	1.05E+01	1.05E+01	SP07-SWMU-F
	TIN	7440-31-5	mg/kg	1 : 10	4.24E+02	4.24E+02	4.24E+02	SP07-SWMU-F
	TOLUENE	108-88-3	mg/kg	7 : 10	1.10E-02	1.10E+02	3.43E+01	SP03-SWMU-F
	Total Carcinogenic PAHs	Total cPAHs	mg/kg	4 : 10	7.32E-01	9.49E+00	4.62E+00	SP07-SWMU-F
	TOTAL CYANIDE	57-12-5	mg/kg	8 : 10	1.10E+00	5.10E+00	2.70E+00	SP06-SWMU-F
	Total HMW PAHs	Total HMW	mg/kg	5 : 10	1.48E+00	1.59E+01	8.17E+00	SP07-SWMU-F
	Total LMW PAHs	Total LMW	mg/kg	4 : 10	1.83E+00	1.25E+01	7.11E+00	SP07-SWMU-F
	TOTAL METHYLPHENOL	TOTAL	mg/kg	4 : 10	9.70E-01	4.41E+01	1.19E+01	SP07-SWMU-F
	TOTAL PAHs	Total PAHs	mg/kg	5 : 10	4.25E+00	2.85E+01	1.46E+01	SP07-SWMU-F
	TOTAL PCBs	Total PCBs	mg/kg	1 : 8	2.80E+00	2.80E+00	2.80E+00	SP07-SWMU-F
	TOTAL XYLENES	TOTAL	mg/kg	1 : 10	8.10E-03	8.10E-03	8.10E-03	SP02-SWMU-F

Table 2-1
Summary Statistics for Constituents Detected in Soil
BASF North Works Facility

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
	VANADIUM	7440-62-2	mg/kg	9 : 10	9.30E+00	2.33E+01	1.71E+01	SP07-SWMU-F
	ZINC	7440-66-6	mg/kg	9 : 10	3.47E+01	1.00E+03	1.81E+02	SP07-SWMU-F
SWMU G								
	2,4-DIMETHYLPHENOL	105-67-9	mg/kg	1 : 10	5.70E-02	5.70E-02	5.70E-02	SWMUG-6
	2-METHYLNAPHTHALENE	91-57-6	mg/kg	9 : 10	2.50E-01	1.30E+00	6.03E-01	SWMUG-9
	3-METHYLPHENOL	108-39-4	mg/kg	1 : 10	1.20E-01	1.20E-01	1.20E-01	SWMUG-6
	4,4-DDT	50-29-3	mg/kg	1 : 10	2.20E-02	2.20E-02	2.20E-02	SWMUG-6
	4-METHYLPHENOL	106-44-5	mg/kg	1 : 10	1.30E-01	1.30E-01	1.30E-01	SWMUG-6
	ACENAPHTHENE	83-32-9	mg/kg	2 : 10	3.80E-02	4.30E-02	4.05E-02	SWMUG-3
	ACENAPHTHYLENE	208-96-8	mg/kg	9 : 10	4.40E-02	1.80E+00	3.25E-01	SWMUG-9
	ANTHRACENE	120-12-7	mg/kg	8 : 10	5.10E-02	7.00E-01	1.91E-01	SWMUG-9
	ANTIMONY	7440-36-0	mg/kg	1 : 10	2.60E+00	2.60E+00	2.60E+00	SWMUG-4
	AROCLOR 1260	11096-82-5	mg/kg	5 : 10	3.70E-01	1.10E+00	6.49E-01	SWMUG-4
	ARSENIC	7440-38-2	mg/kg	10 : 10	4.80E+00	1.01E+02	2.67E+01	SWMUG-4
	BAP-TE	BAP-TE	mg/kg	9 : 10	5.74E-01	5.31E+00	1.87E+00	SWMUG-9
	BARIUM	7440-39-3	mg/kg	10 : 10	5.54E+01	1.66E+02	8.97E+01	SWMUG-9
	BENZO(A)ANTHRACENE	56-55-3	mg/kg	9 : 10	3.90E-01	3.20E+00	8.64E-01	SWMUG-9
	BENZO(A)PYRENE	50-32-8	mg/kg	9 : 10	3.10E-01	3.70E+00	8.78E-01	SWMUG-9
	BENZO(B)FLUORANTHENE	205-99-2	mg/kg	9 : 10	6.00E-01	4.50E+00	1.32E+00	SWMUG-9
	BENZO(GHI)PERYLENE	191-24-2	mg/kg	9 : 10	1.40E-01	2.10E+00	5.03E-01	SWMUG-9
	BENZO(K)FLUORANTHENE	207-08-9	mg/kg	9 : 10	1.30E-01	1.60E+00	4.54E-01	SWMUG-9
	BERYLLIUM	7440-41-7	mg/kg	1 : 10	2.00E+00	2.00E+00	2.00E+00	SWMUG-9
	BIS(2-ETHYLHEXYL) PHTHALATE	117-81-7	mg/kg	1 : 10	4.10E-02	4.10E-02	4.10E-02	SWMUG-6
	CADMIUM	7440-43-9	mg/kg	10 : 10	3.00E-01	2.30E+00	7.90E-01	SWMUG-4
	CHROMIUM	7440-47-3	mg/kg	10 : 10	4.80E+00	3.36E+01	1.55E+01	SWMUG-4
	CHRYSENE	218-01-9	mg/kg	9 : 10	3.50E-01	3.60E+00	9.11E-01	SWMUG-9
	COBALT	7440-48-4	mg/kg	1 : 10	1.01E+01	1.01E+01	1.01E+01	SWMUG-10
	COPPER	7440-50-8	mg/kg	10 : 10	1.53E+01	9.53E+01	3.39E+01	SWMUG-4
	DIBENZ(A,H)ANTHRACENE	53-70-3	mg/kg	4 : 10	4.10E-02	6.40E-01	2.16E-01	SWMUG-9
	DIBENZOFURAN	132-64-9	mg/kg	8 : 10	8.60E-02	4.30E-01	1.93E-01	SWMUG-9
	DIETHYL PHTHALATE	84-66-2	mg/kg	1 : 10	1.00E-01	1.00E-01	1.00E-01	SWMUG-10

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
	FLUORANTHENE	206-44-0	mg/kg	9 : 10	1.00E-01	3.80E+00	1.07E+00	SWMUG-9
	FLUORENE	86-73-7	mg/kg	3 : 10	5.00E-02	2.50E-01	1.26E-01	SWMUG-9
	INDENO(1,2,3-CD)PYRENE	193-39-5	mg/kg	8 : 10	1.40E-01	1.80E+00	4.25E-01	SWMUG-9
	LEAD	7439-92-1	mg/kg	10 : 10	1.10E+01	2.38E+02	7.33E+01	SWMUG-4
	MERCURY	7439-97-6	mg/kg	8 : 10	1.40E-01	5.40E+00	9.47E-01	SWMUG-2
	NAPHTHALENE	91-20-3	mg/kg	8 : 10	1.70E-01	8.10E-01	3.71E-01	SWMUG-9
	NICKEL	7440-02-0	mg/kg	10 : 10	7.60E+00	2.56E+01	1.34E+01	SWMUG-10
	PENTACHLOROPHENOL	87-86-5	mg/kg	3 : 20	3.90E-02	6.20E-01	3.76E-01	SWMUG-4
	PERCENT SOLIDS	SOLIDS	%	10 : 10	7.39E+01	9.41E+01	8.45E+01	SWMUG-3
	PHENANTHRENE	85-01-8	mg/kg	10 : 10	8.70E-02	1.90E+00	8.07E-01	SWMUG-9
	PYRENE	129-00-0	mg/kg	10 : 10	8.20E-02	6.10E+00	1.22E+00	SWMUG-9
	SELENIUM	7782-49-2	mg/kg	1 : 10	6.00E-01	6.00E-01	6.00E-01	SWMUG-6
	Total Carcinogenic PAHs	Total cPAHs	mg/kg	9 : 10	2.15E+00	1.90E+01	5.90E+00	SWMUG-9
	TOTAL CYANIDE	57-12-5	mg/kg	1 : 10	6.60E-01	6.60E-01	6.60E-01	SWMUG-1
	Total HMW PAHs	Total HMW	mg/kg	10 : 10	3.33E+00	3.10E+01	8.63E+00	SWMUG-9
	Total LMW PAHs	Total LMW	mg/kg	10 : 10	1.72E+00	1.71E+01	4.42E+00	SWMUG-4
	TOTAL METHYLPHENOL	TOTAL	mg/kg	1 : 10	2.50E-01	2.50E-01	2.50E-01	SWMUG-6
	TOTAL PAHs	Total PAHs	mg/kg	10 : 10	5.42E+00	3.94E+01	1.31E+01	SWMUG-9
	TOTAL PCBs	Total PCBs	mg/kg	5 : 10	3.70E-01	1.10E+00	6.49E-01	SWMUG-4
	VANADIUM	7440-62-2	mg/kg	10 : 10	7.20E+00	2.97E+01	1.30E+01	SWMUG-10
	ZINC	7440-66-6	mg/kg	10 : 10	3.52E+01	3.35E+02	1.09E+02	SWMUG-7
SWMU H								
	1,1-DICHLOROETHANE	75-34-3	mg/kg	1 : 21	4.30E-02	4.30E-02	4.30E-02	SWMUH-SS-8
	1,2,3-TRICHLOROPROPANE	96-18-4	mg/kg	7 : 21	1.80E-02	1.70E+01	3.04E+00	SP08B-SWMU-H
	1,2,4-TRIMETHYLBENZENE	95-63-6	mg/kg	7 : 10	4.10E-02	5.80E-01	1.57E-01	SWMUH-SS-8
	1,2-DICHLOROBENZENE	95-50-1	mg/kg	1 : 21	6.80E-01	6.80E-01	6.80E-01	SP10A-SWMU-H
	1,2-DICHLOROETHANE	107-06-2	mg/kg	7 : 21	2.40E-02	1.30E-01	6.66E-02	SWMUH-SS-7
	1,2-DICHLOROPROPANE	78-87-5	mg/kg	17 : 21	4.00E-03	5.00E+04	2.96E+03	SP09A-SWMU-H
	1,3,5-TRIMETHYLBENZENE	108-67-8	mg/kg	2 : 10	3.40E-02	1.70E-01	1.02E-01	SWMUH-SS-8
	2,4-DIMETHYLPHENOL	105-67-9	mg/kg	1 : 21	8.30E+00	8.30E+00	8.30E+00	SP10A-SWMU-H
	2-BUTANONE	78-93-3	mg/kg	1 : 21	3.10E-02	3.10E-02	3.10E-02	SP02-C-SWMU-H

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
	2-METHYLNAPHTHALENE	91-57-6	mg/kg	11 : 31	3.60E-02	6.40E+00	7.55E-01	SP10A-SWMU-H
	3-METHYLPHENOL	108-39-4	mg/kg	2 : 11	1.40E-01	4.50E+00	2.32E+00	SP10A-SWMU-H
	4,4-DDE	72-55-9	mg/kg	10 : 21	2.10E-03	1.30E-02	6.04E-03	SWMUH-SS-4
	4,4-DDT	50-29-3	mg/kg	4 : 21	3.20E-03	1.20E-02	7.95E-03	SWMUH-SS-3
	4-ISOPROPYLTOLUENE	99-87-6	mg/kg	1 : 10	5.00E-02	5.00E-02	5.00E-02	SWMUH-SS-8
	4-METHYLPHENOL	106-44-5	mg/kg	2 : 11	1.50E-01	4.90E+00	2.53E+00	SP10A-SWMU-H
	ACENAPHTHENE	83-32-9	mg/kg	5 : 21	1.40E-02	6.70E+00	1.36E+00	SP10A-SWMU-H
	ACENAPHTHYLENE	208-96-8	mg/kg	7 : 21	1.80E-02	1.10E-01	5.66E-02	SWMUH-SS-5
	ACETONE	67-64-1	mg/kg	16 : 21	2.00E-02	1.60E+00	4.98E-01	SP10A-SWMU-H
	ALPHA-BHC	319-84-6	mg/kg	1 : 21	1.00E-02	1.00E-02	1.00E-02	SWMUH-SS-4
	ALPHA-CHLORDANE	5103-71-9	mg/kg	2 : 21	3.30E-03	4.00E-02	2.16E-02	SP10A-SWMU-H
	ANTHRACENE	120-12-7	mg/kg	12 : 21	1.60E-02	5.30E+00	5.01E-01	SP10A-SWMU-H
	ANTIMONY	7440-36-0	mg/kg	5 : 21	8.20E-01	1.73E+01	7.14E+00	SWMUH-SS-3
	AROCLOR 1248	12672-29-6	mg/kg	1 : 21	1.60E+00	1.60E+00	1.60E+00	SP10A-SWMU-H
	AROCLOR 1254	11097-69-1	mg/kg	6 : 21	2.50E-02	1.20E+00	2.41E-01	SP10A-SWMU-H
	AROCLOR 1260	11096-82-5	mg/kg	4 : 21	3.10E-02	1.70E+00	4.55E-01	SWMUH-SS-8
	ARSENIC	7440-38-2	mg/kg	21 : 21	1.90E+00	1.16E+02	1.81E+01	SP10A-SWMU-H
	BAP-TE	BAP-TE	mg/kg	13 : 21	1.04E-01	2.51E+01	2.40E+00	SP10A-SWMU-H
	BARIUM	7440-39-3	mg/kg	21 : 21	8.00E+00	2.23E+02	8.63E+01	SP10A-SWMU-H
	BENZENE	71-43-2	mg/kg	7 : 21	9.50E-03	7.80E-01	1.36E-01	SP10A-SWMU-H
	BENZO(A)ANTHRACENE	56-55-3	mg/kg	13 : 21	6.00E-02	4.50E+00	6.28E-01	SP10A-SWMU-H
	BENZO(A)PYRENE	50-32-8	mg/kg	13 : 21	6.90E-02	3.10E+00	5.14E-01	SP10A-SWMU-H
	BENZO(B)FLUORANTHENE	205-99-2	mg/kg	13 : 21	9.15E-02	4.20E+00	6.87E-01	SP10A-SWMU-H
	BENZO(GHI)PERYLENE	191-24-2	mg/kg	12 : 21	6.25E-02	6.20E-01	2.27E-01	SWMUH-SS-2
	BENZO(K)FLUORANTHENE	207-08-9	mg/kg	12 : 21	4.25E-02	4.50E-01	1.83E-01	SWMUH-SS-3
	BERYLLIUM	7440-41-7	mg/kg	3 : 21	1.50E-01	9.10E-01	4.73E-01	SP02-C-SWMU-H
	BETA-BHC	319-85-7	mg/kg	5 : 21	6.40E-03	1.40E-02	9.20E-03	SWMUH-SS-4
	BIS(2-CHLOROETHYL) ETHER	111-44-4	mg/kg	3 : 21	4.10E-02	1.20E+01	4.04E+00	SP10A-SWMU-H
	BIS(2-CHLOROISOPROPYL) ETHER	108-60-1	mg/kg	9 : 21	1.30E-01	1.40E+03	1.74E+02	SP09A-SWMU-H
	BIS(2-ETHYLHEXYL) PHTHALATE	117-81-7	mg/kg	12 : 21	3.10E-02	1.00E+01	1.05E+00	SP10A-SWMU-H
	CADMIUM	7440-43-9	mg/kg	20 : 21	2.60E-01	4.20E+00	8.94E-01	SP10A-SWMU-H

Table 2-1
Summary Statistics for Constituents Detected in Soil
BASF North Works Facility

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
	CARBAZOLE	86-74-8	mg/kg	4 : 10	3.80E-02	5.50E-02	4.55E-02	SWMUH-SS-3
	CHLOROBENZENE	108-90-7	mg/kg	2 : 21	1.10E-02	8.30E-01	4.20E-01	SP10A-SWMU-H
	CHLOROFORM	67-66-3	mg/kg	7 : 21	1.80E-02	1.20E-01	4.60E-02	SWMUH-SS-7
	CHROMIUM	7440-47-3	mg/kg	21 : 21	6.70E+00	1.95E+02	3.90E+01	SP10A-SWMU-H
	CHRYSENE	218-01-9	mg/kg	13 : 21	7.35E-02	4.80E+00	6.64E-01	SP10A-SWMU-H
	COBALT	7440-48-4	mg/kg	16 : 21	3.40E+00	1.37E+01	8.33E+00	SP02-C-SWMU-H
	COPPER	7440-50-8	mg/kg	21 : 21	2.90E+00	2.21E+02	3.41E+01	SP10A-SWMU-H
	DIBENZ(A,H)ANTHRACENE	53-70-3	mg/kg	10 : 21	1.45E-02	1.50E-01	5.36E-02	SWMUH-SS-2
	DIBENZOFURAN	132-64-9	mg/kg	7 : 21	3.60E-02	4.20E+00	6.42E-01	SP10A-SWMU-H
	DIELDRIN	60-57-1	mg/kg	2 : 21	5.80E-03	1.20E-02	8.90E-03	SWMUH-SS-8
	DI-N-OCTYL PHTHALATE	117-84-0	mg/kg	2 : 21	4.20E-02	1.90E-01	1.16E-01	SWMUH-SS-2
	ENDOSULFAN SULFATE	1031-07-8	mg/kg	1 : 21	1.40E-02	1.40E-02	1.40E-02	SWMUH-SS-8
	ENDRIN ALDEHYDE	7421-93-4	mg/kg	1 : 21	1.20E-02	1.20E-02	1.20E-02	SWMUH-SS-8
	ENDRIN KETONE	53494-70-5	mg/kg	1 : 10	1.40E-02	1.40E-02	1.40E-02	SWMUH-SS-2
	ETHYLBENZENE	100-41-4	mg/kg	8 : 21	1.70E-02	4.70E-01	1.05E-01	SP10A-SWMU-H
	FLUORANTHENE	206-44-0	mg/kg	13 : 21	1.03E-01	1.10E+01	1.32E+00	SP10A-SWMU-H
	FLUORENE	86-73-7	mg/kg	4 : 21	2.00E-02	5.40E+00	1.37E+00	SP10A-SWMU-H
	INDENO(1,2,3-CD)PYRENE	193-39-5	mg/kg	12 : 21	5.15E-02	5.80E-01	2.05E-01	SWMUH-SS-2
	ISOPROPYLBENZENE	98-82-8	mg/kg	7 : 10	7.20E-03	9.30E-02	2.80E-02	SWMUH-SS-8
	LEAD	7439-92-1	mg/kg	21 : 21	2.70E+00	4.33E+02	5.59E+01	SP10A-SWMU-H
	MERCURY	7439-97-6	mg/kg	15 : 21	3.60E-02	5.29E+01	4.04E+00	SP10A-SWMU-H
	METHOXYCHLOR	72-43-5	mg/kg	7 : 21	4.90E-03	8.70E-03	6.40E-03	SWMUH-SS-3
	M-XYLENE & P-XYLENE	M/P-	mg/kg	8 : 20	8.40E-02	1.50E+00	4.26E-01	SP10A-SWMU-H
	NAPHTHALENE	91-20-3	mg/kg	12 : 31	1.60E-02	1.60E+01	1.46E+00	SP10A-SWMU-H
	N-BUTYLBENZENE	104-51-8	mg/kg	2 : 10	1.50E-02	6.00E-02	3.75E-02	SWMUH-SS-8
	NICKEL	7440-02-0	mg/kg	21 : 21	5.70E+00	9.34E+01	2.75E+01	SP10A-SWMU-H
	N-PROPYLBENZENE	103-65-1	mg/kg	7 : 10	8.60E-03	9.90E-02	3.01E-02	SWMUH-SS-8
	O-XYLENE	95-47-6	mg/kg	10 : 21	7.90E-03	7.40E-01	1.99E-01	SWMUH-SS-8
	PENTACHLOROPHENOL	87-86-5	mg/kg	4 : 32	1.00E-02	3.00E-01	1.32E-01	SP10A-SWMU-H
	PERCENT SOLIDS	SOLIDS	%	21 : 21	5.64E+01	9.08E+01	7.49E+01	SWMUH-SS-8
	PHENANTHRENE	85-01-8	mg/kg	13 : 21	4.55E-02	2.00E+01	1.77E+00	SP10A-SWMU-H

Table 2-1
Summary Statistics for Constituents Detected in Soil
BASF North Works Facility

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
	PHENOL	108-95-2	mg/kg	2 : 21	2.70E-01	2.70E-01	2.70E-01	SP01-A-SWMU-H,
	PYRENE	129-00-0	mg/kg	13 : 21	8.70E-02	8.60E+00	1.05E+00	SP10A-SWMU-H
	SEC-BUTYLBENZENE	135-98-8	mg/kg	1 : 10	2.80E-02	2.80E-02	2.80E-02	SWMUH-SS-8
	SELENIUM	7782-49-2	mg/kg	2 : 21	1.10E+00	1.40E+00	1.25E+00	SP10A-SWMU-H
	SILVER	7440-22-4	mg/kg	2 : 21	3.90E-01	2.17E+01	1.10E+01	SP10A-SWMU-H
	TETRACHLOROETHENE	127-18-4	mg/kg	3 : 21	1.40E-02	4.10E-02	2.40E-02	SWMUH-SS-9
	THALLIUM	7440-28-0	mg/kg	4 : 21	7.80E-01	1.60E+00	1.20E+00	SWMUH-SS-3
	TIN	7440-31-5	mg/kg	1 : 21	1.14E+02	1.14E+02	1.14E+02	SWMUH-SS-3
	TOLUENE	108-88-3	mg/kg	10 : 21	1.20E-02	5.80E+00	6.81E-01	SP10A-SWMU-H
	Total Carcinogenic PAHs	Total cPAHs	mg/kg	13 : 21	4.02E-01	7.36E+01	7.35E+00	SP10A-SWMU-H
	TOTAL CYANIDE	57-12-5	mg/kg	4 : 11	6.00E-01	1.60E+01	6.13E+00	SP10A-SWMU-H
	Total HMW PAHs	Total HMW	mg/kg	13 : 21	6.55E-01	1.12E+02	1.14E+01	SP10A-SWMU-H
	Total LMW PAHs	Total LMW	mg/kg	13 : 21	4.91E-01	7.88E+01	7.36E+00	SP10A-SWMU-H
	TOTAL METHYLPHENOL	TOTAL	mg/kg	2 : 21	2.90E-01	9.40E+00	4.85E+00	SP10A-SWMU-H
	TOTAL PAHs	Total PAHs	mg/kg	13 : 21	2.19E+00	1.91E+02	1.88E+01	SP10A-SWMU-H
	TOTAL PCBs	Total PCBs	mg/kg	10 : 21	6.54E-01	4.70E+00	1.38E+00	SWMUH-SS-8
	TOTAL XYLENES	TOTAL	mg/kg	10 : 21	1.02E-01	2.07E+00	5.59E-01	SP10A-SWMU-H
	VANADIUM	7440-62-2	mg/kg	21 : 21	8.70E+00	5.09E+01	2.62E+01	SP02-C-SWMU-H
	ZINC	7440-66-6	mg/kg	21 : 21	1.32E+01	6.28E+02	1.12E+02	SP10A-SWMU-H

Notes:

CAS - Chemical Abstract Service.
(a) Only chemicals with at least one positively detected result are reported.
(b) Frequency of detection - Number of detected samples: Number of total samples.
(c) Minimum detected concentration for each chemical, after duplicates have been averaged.
(d) Maximum detected concentration for each chemical, after duplicates have been averaged.
(e) Arithmetic mean concentration for each chemical, after duplicates have been averaged. Only detected results included.

Table 2-2
Summary Statistics for Constituents Detected in Groundwater (GSI Wells)
BASF North Works Facility
Wyandotte, Michigan
Tier 2 Risk Evaluation

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)
CMS-MW-2							
	1,1-DICHLOROETHENE	75-35-4	ug/l	2 : 4	2.70E-01	5.05E-01	3.88E-01
	1,2-DICHLOROPROPANE	78-87-5	ug/l	1 : 4	1.60E-01	1.60E-01	1.60E-01
	2-BUTANONE	78-93-3	ug/l	4 : 4	1.50E+00	1.10E+01	6.05E+00
	2-METHYLNAPHTHALENE	91-57-6	ug/l	4 : 5	6.90E-01	1.00E+00	8.11E-01
	3-METHYLPHENOL	108-39-4	ug/l	1 : 2	3.40E+00	3.40E+00	3.40E+00
	3-METHYLPHENOL & 4-METHYLPHENOL	65794-96-9	ug/l	3 : 3	1.60E+00	2.30E+00	1.87E+00
	4-METHYLPHENOL	106-44-5	ug/l	1 : 2	3.40E+00	3.40E+00	3.40E+00
	ACETONE	67-64-1	ug/l	4 : 4	7.00E+00	4.60E+01	3.20E+01
	ACETOPHENONE	98-86-2	ug/l	4 : 5	5.60E-01	9.90E-01	6.99E-01
	ANTHRACENE	120-12-7	ug/l	3 : 5	2.20E-01	4.10E-01	3.33E-01
	BARIUM	7440-39-3	ug/l	4 : 4	3.42E+02	6.19E+02	5.01E+02
	BENZALDEHYDE	100-52-7	ug/l	1 : 5	7.60E-01	7.60E-01	7.60E-01
	BENZENE	71-43-2	ug/l	4 : 4	2.70E+00	1.30E+01	7.05E+00
	BERYLLIUM	7440-41-7	ug/l	1 : 4	3.00E-01	3.00E-01	3.00E-01
	BIS(2-CHLOROISOPROPYL) ETHER	108-60-1	ug/l	1 : 5	1.20E+00	1.20E+00	1.20E+00
	BIS(2-ETHYLHEXYL) PHTHALATE	117-81-7	ug/l	1 : 5	2.19E+00	2.19E+00	2.19E+00
	CAPROLACTAM	105-60-2	ug/l	2 : 5	1.60E+00	2.00E+00	1.80E+00
	CHLORIDE	16887-00-6	ug/L	2 : 2	3.11E+05	5.38E+05	4.25E+05
	CHLOROBENZENE	108-90-7	ug/l	4 : 4	7.00E-01	2.20E+00	1.38E+00
	CHLOROMETHANE	74-87-3	ug/l	1 : 4	1.75E-01	1.75E-01	1.75E-01
	CHROMIUM	7440-47-3	ug/l	3 : 4	1.70E+00	6.60E+00	3.70E+00
	COPPER	7440-50-8	ug/l	1 : 4	6.80E+00	6.80E+00	6.80E+00
	CYCLOHEXANE	110-82-7	ug/l	1 : 4	1.45E-01	1.45E-01	1.45E-01
	DIBENZOFURAN	132-64-9	ug/l	4 : 5	9.10E-01	1.40E+00	1.15E+00
	DISSOLVED ORGANIC CARBON	DOC	ug/L	2 : 2	9.00E+03	1.30E+04	1.10E+04
	FLUORANTHENE	206-44-0	ug/l	2 : 5	2.00E-01	2.00E-01	2.00E-01
	FLUORENE	86-73-7	ug/l	3 : 5	3.90E-01	6.10E-01	4.65E-01
	LEAD	7439-92-1	ug/l	2 : 4	2.70E+00	7.10E+00	4.90E+00

Table 2-2
Summary Statistics for Constituents Detected in Groundwater (GSI Wells)
BASF North Works Facility

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)
	NAPHTHALENE	91-20-3	ug/l	4 : 5	3.00E+00	4.50E+00	3.52E+00
	NICKEL	7440-02-0	ug/l	4 : 4	6.80E+00	6.71E+01	2.33E+01
	PHENANTHRENE	85-01-8	ug/l	4 : 5	1.80E+00	4.50E+00	3.15E+00
	PHENOL	108-95-2	ug/l	4 : 5	1.85E+01	3.00E+01	2.39E+01
	SELENIUM	7782-49-2	ug/l	2 : 4	2.55E+00	5.50E+00	4.03E+00
	SULFATE	14808-79-8	ug/L	2 : 2	2.34E+04	1.06E+05	6.47E+04
	TOLUENE	108-88-3	ug/l	4 : 4	4.80E-01	2.10E+00	1.21E+00
	TOTAL CYANIDE	57-12-5	ug/L	1 : 1	1.50E+01	1.50E+01	1.50E+01
	Total HMW PAHs	Total HMW	ug/l	2 : 4	2.00E-01	2.00E-01	2.00E-01
	Total LMW PAHs	Total LMW	ug/l	4 : 4	8.31E+00	1.93E+01	1.36E+01
	TOTAL METHYLPHENOL	TOTAL	ug/l	4 : 4	1.60E+00	6.80E+00	3.10E+00
	TOTAL PAHs	Total PAHs	ug/l	4 : 4	1.12E+01	3.13E+01	1.92E+01
	VANADIUM	7440-62-2	ug/l	3 : 4	2.10E+00	4.50E+00	3.13E+00
	VINYL CHLORIDE	75-01-4	ug/l	2 : 4	5.30E-01	7.70E-01	6.50E-01
	ZINC	7440-66-6	ug/l	2 : 4	2.11E+01	3.38E+01	2.74E+01
RFI-MW10							
	ACETONE	67-64-1	ug/l	1 : 4	1.50E+00	1.50E+00	1.50E+00
	ARSENIC	7440-38-2	ug/l	4 : 4	8.30E+00	1.50E+01	1.16E+01
	BARIUM	7440-39-3	ug/l	4 : 4	8.61E+02	1.06E+03	9.83E+02
	BIS(2-ETHYLHEXYL) PHTHALATE	117-81-7	ug/l	2 : 4	9.80E-01	1.10E+00	1.04E+00
	CAPROLACTAM	105-60-2	ug/l	1 : 4	1.30E+00	1.30E+00	1.30E+00
	CHLORIDE	16887-00-6	ug/L	2 : 2	8.65E+05	9.27E+05	8.96E+05
	DISSOLVED ORGANIC CARBON	DOC	ug/L	1 : 1	1.55E+04	1.55E+04	1.55E+04
	METHYLENE CHLORIDE	75-09-2	ug/l	1 : 4	4.40E-01	4.40E-01	4.40E-01
	NICKEL	7440-02-0	ug/l	1 : 4	4.30E+00	4.30E+00	4.30E+00
	PHENANTHRENE	85-01-8	ug/l	1 : 4	5.10E-01	5.10E-01	5.10E-01
	SELENIUM	7782-49-2	ug/l	1 : 4	2.45E+00	2.45E+00	2.45E+00
	SULFATE	14808-79-8	ug/L	2 : 2	6.10E+03	6.60E+03	6.35E+03
	THALLIUM	7440-28-0	ug/l	1 : 4	8.20E+00	8.20E+00	8.20E+00
	TOTAL CYANIDE	57-12-5	ug/L	1 : 1	1.36E+01	1.36E+01	1.36E+01
	Total LMW PAHs	Total LMW	ug/l	1 : 4	5.10E-01	5.10E-01	5.10E-01

Table 2-2
Summary Statistics for Constituents Detected in Groundwater (GSI Wells)
BASF North Works Facility

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)
	TOTAL PAHs	Total PAHs	ug/l	1 : 4	5.10E-01	5.10E-01	5.10E-01
RFI-MW10F							
	2-BUTANONE	78-93-3	ug/l	3 : 4	2.90E+00	3.80E+00	3.30E+00
	2-METHYLNAPHTHALENE	91-57-6	ug/l	2 : 4	6.60E+00	1.10E+01	8.80E+00
	ACETONE	67-64-1	ug/l	1 : 4	5.10E+01	5.10E+01	5.10E+01
	ANTIMONY	7440-36-0	ug/l	2 : 4	6.10E+00	6.60E+00	6.35E+00
	ARSENIC	7440-38-2	ug/l	4 : 4	7.80E+00	8.22E+01	5.74E+01
	BARIUM	7440-39-3	ug/l	4 : 4	6.87E+01	1.79E+02	1.28E+02
	BENZENE	71-43-2	ug/l	4 : 4	9.90E+00	2.30E+01	1.52E+01
	CAPROLACTAM	105-60-2	ug/l	1 : 4	2.40E+01	2.40E+01	2.40E+01
	CARBON DISULFIDE	75-15-0	ug/l	3 : 4	1.50E+00	3.20E+00	2.57E+00
	CHLORIDE	16887-00-6	ug/L	2 : 2	4.77E+05	5.92E+05	5.35E+05
	CHLOROMETHANE	74-87-3	ug/l	1 : 4	1.70E-01	1.70E-01	1.70E-01
	CHROMIUM	7440-47-3	ug/l	2 : 4	3.00E+00	4.10E+00	3.55E+00
	COPPER	7440-50-8	ug/l	2 : 4	9.40E+00	1.04E+01	9.90E+00
	CYCLOHEXANE	110-82-7	ug/l	2 : 4	4.80E-01	4.80E-01	4.80E-01
	DISSOLVED ORGANIC CARBON	DOC	ug/L	1 : 1	2.50E+04	2.50E+04	2.50E+04
	ETHYLBENZENE	100-41-4	ug/l	1 : 4	3.00E-01	3.00E-01	3.00E-01
	LEAD	7439-92-1	ug/l	3 : 3	2.00E+00	5.10E+00	3.27E+00
	METHYLCYCLOHEXANE	108-87-2	ug/l	1 : 4	5.60E-01	5.60E-01	5.60E-01
	METHYLENE CHLORIDE	75-09-2	ug/l	1 : 4	2.70E+01	2.70E+01	2.70E+01
	NAPHTHALENE	91-20-3	ug/l	4 : 4	5.90E+02	1.60E+03	1.06E+03
	NICKEL	7440-02-0	ug/l	3 : 4	6.70E+00	1.39E+01	9.60E+00
	PHENANTHRENE	85-01-8	ug/l	1 : 4	1.20E+01	1.20E+01	1.20E+01
	PHENOL	108-95-2	ug/l	1 : 4	2.00E+01	2.00E+01	2.00E+01
	SELENIUM	7782-49-2	ug/l	1 : 3	4.60E+00	4.60E+00	4.60E+00
	STYRENE	100-42-5	ug/l	3 : 4	7.10E-01	2.10E+00	1.23E+00
	SULFATE	14808-79-8	ug/L	2 : 2	2.97E+05	3.09E+05	3.03E+05
	THALLIUM	7440-28-0	ug/l	1 : 3	6.30E+00	6.30E+00	6.30E+00
	TOLUENE	108-88-3	ug/l	4 : 4	4.70E+00	9.30E+00	6.35E+00
	TOTAL CYANIDE	57-12-5	ug/L	1 : 1	4.80E+02	4.80E+02	4.80E+02

Table 2-2
Summary Statistics for Constituents Detected in Groundwater (GSI Wells)
BASF North Works Facility

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)
	Total LMW PAHs	Total LMW	ug/l	4 : 4	5.93E+02	2.11E+03	1.31E+03
	TOTAL PAHs	Total PAHs	ug/l	4 : 4	5.93E+02	2.11E+03	1.31E+03
	TOTAL XYLENES	TOTAL	ug/l	3 : 4	3.00E+00	7.10E+00	4.57E+00
	VANADIUM	7440-62-2	ug/l	4 : 4	1.73E+01	7.29E+01	5.12E+01
	XYLENES	1330-20-7	ug/l	3 : 4	3.00E+00	7.10E+00	4.57E+00
	ZINC	7440-66-6	ug/l	3 : 4	9.40E+00	1.47E+01	1.21E+01
RFI-MW10I							
	2-BUTANONE	78-93-3	ug/l	4 : 4	3.40E+00	3.90E+01	1.40E+01
	2-METHYLNAPHTHALENE	91-57-6	ug/l	1 : 4	5.50E+00	5.50E+00	5.50E+00
	2-METHYLPHENOL	95-48-7	ug/l	1 : 4	5.90E+00	5.90E+00	5.90E+00
	3-METHYLPHENOL	108-39-4	ug/l	1 : 1	8.10E+02	8.10E+02	8.10E+02
	3-METHYLPHENOL & 4-METHYLPHENOL	65794-96-9	ug/l	3 : 3	1.90E+02	2.50E+02	2.23E+02
	4-METHYL-2-PENTANONE (MIBK)	108-10-1	ug/l	4 : 4	7.70E+00	1.60E+01	1.29E+01
	4-METHYLPHENOL	106-44-5	ug/l	1 : 1	8.10E+02	8.10E+02	8.10E+02
	ACETONE	67-64-1	ug/l	2 : 4	8.80E+00	1.40E+02	7.44E+01
	ANTIMONY	7440-36-0	ug/l	2 : 4	4.70E+00	7.40E+00	6.05E+00
	ARSENIC	7440-38-2	ug/l	4 : 4	1.42E+02	3.14E+02	2.03E+02
	BARIUM	7440-39-3	ug/l	4 : 4	1.17E+01	6.59E+01	2.60E+01
	BENZENE	71-43-2	ug/l	4 : 4	3.00E+00	4.90E+00	3.73E+00
	CADMIUM	7440-43-9	ug/l	2 : 4	4.70E-01	1.20E+00	8.35E-01
	CARBON DISULFIDE	75-15-0	ug/l	3 : 4	1.20E+01	2.30E+01	1.90E+01
	CHLORIDE	16887-00-6	ug/L	2 : 2	1.99E+06	2.51E+06	2.25E+06
	CHROMIUM	7440-47-3	ug/l	3 : 4	9.70E+00	5.92E+01	2.66E+01
	COBALT	7440-48-4	ug/l	2 : 4	2.00E+00	8.30E+00	5.15E+00
	COPPER	7440-50-8	ug/l	3 : 4	1.90E+00	3.03E+01	1.22E+01
	DISSOLVED ORGANIC CARBON	DOC	ug/L	1 : 1	2.50E+05	2.50E+05	2.50E+05
	ETHYLBENZENE	100-41-4	ug/l	1 : 4	5.10E-01	5.10E-01	5.10E-01
	LEAD	7439-92-1	ug/l	1 : 4	1.47E+01	1.47E+01	1.47E+01
	METHYLENE CHLORIDE	75-09-2	ug/l	2 : 4	4.00E+00	1.70E+01	1.05E+01
	NAPHTHALENE	91-20-3	ug/l	4 : 4	8.70E+00	3.60E+01	2.12E+01
	NICKEL	7440-02-0	ug/l	4 : 4	6.06E+01	1.97E+02	1.02E+02

Table 2-2
Summary Statistics for Constituents Detected in Groundwater (GSI Wells)
BASF North Works Facility

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)
	PHENANTHRENE	85-01-8	ug/l	1 : 4	1.50E+01	1.50E+01	1.50E+01
	PHENOL	108-95-2	ug/l	4 : 4	2.00E+02	8.70E+02	5.13E+02
	SELENIUM	7782-49-2	ug/l	2 : 4	4.40E+00	8.30E+00	6.35E+00
	SULFATE	14808-79-8	ug/L	2 : 2	7.36E+05	8.75E+05	8.06E+05
	TOLUENE	108-88-3	ug/l	3 : 4	5.70E+00	8.60E+00	7.03E+00
	TOTAL CYANIDE	57-12-5	ug/L	1 : 1	2.00E+03	2.00E+03	2.00E+03
	Total LMW PAHs	Total LMW	ug/l	4 : 4	2.07E+01	3.01E+02	1.70E+02
	TOTAL METHYLPHENOL	TOTAL	ug/l	4 : 4	2.36E+02	1.63E+03	6.70E+02
	TOTAL PAHs	Total PAHs	ug/l	4 : 4	2.07E+01	3.01E+02	1.70E+02
	TOTAL XYLENES	TOTAL	ug/l	1 : 4	2.50E+00	2.50E+00	2.50E+00
	VANADIUM	7440-62-2	ug/l	4 : 4	6.19E+01	2.30E+02	1.08E+02
	XYLENES	1330-20-7	ug/l	1 : 4	2.50E+00	2.50E+00	2.50E+00
	ZINC	7440-66-6	ug/l	3 : 4	2.55E+01	1.26E+02	5.90E+01
RFI-MW11							
	1,2-DICHLOROPROPANE	78-87-5	ug/l	1 : 4	1.90E-01	1.90E-01	1.90E-01
	ANTIMONY	7440-36-0	ug/l	1 : 4	4.20E+00	4.20E+00	4.20E+00
	ARSENIC	7440-38-2	ug/l	1 : 4	6.00E+00	6.00E+00	6.00E+00
	BARIUM	7440-39-3	ug/l	4 : 4	1.65E+02	1.98E+02	1.80E+02
	BIS(2-ETHYLHEXYL) PHTHALATE	117-81-7	ug/l	2 : 4	1.20E+00	2.50E+00	1.85E+00
	CHLORIDE	16887-00-6	ug/L	2 : 2	1.46E+05	1.68E+05	1.57E+05
	CHLOROMETHANE	74-87-3	ug/l	1 : 4	1.50E-01	1.50E-01	1.50E-01
	CHROMIUM	7440-47-3	ug/l	1 : 4	3.30E+00	3.30E+00	3.30E+00
	COBALT	7440-48-4	ug/l	1 : 4	1.20E+00	1.20E+00	1.20E+00
	DISSOLVED ORGANIC CARBON	DOC	ug/L	1 : 1	1.30E+04	1.30E+04	1.30E+04
	NICKEL	7440-02-0	ug/l	1 : 4	3.35E+00	3.35E+00	3.35E+00
	SULFATE	14808-79-8	ug/L	2 : 2	3.43E+04	3.99E+04	3.71E+04
	THALLIUM	7440-28-0	ug/l	1 : 4	1.18E+01	1.18E+01	1.18E+01
RFI-MW11F							
	ARSENIC	7440-38-2	ug/l	4 : 4	2.00E+01	2.97E+01	2.49E+01
	BARIUM	7440-39-3	ug/l	4 : 4	2.56E+01	3.93E+01	3.33E+01
	BENZENE	71-43-2	ug/l	2 : 4	4.50E-01	9.50E-01	7.00E-01

Table 2-2
Summary Statistics for Constituents Detected in Groundwater (GSI Wells)
BASF North Works Facility

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)
	BIS(2-ETHYLHEXYL) PHTHALATE	117-81-7	ug/l	2 : 4	1.00E+00	1.70E+00	1.35E+00
	CAPROLACTAM	105-60-2	ug/l	1 : 4	2.30E+00	2.30E+00	2.30E+00
	CARBAZOLE	86-74-8	ug/l	1 : 4	6.00E-01	6.00E-01	6.00E-01
	CARBON DISULFIDE	75-15-0	ug/l	1 : 4	5.20E-01	5.20E-01	5.20E-01
	CHLORIDE	16887-00-6	ug/L	2 : 2	4.91E+05	5.58E+05	5.25E+05
	CYCLOHEXANE	110-82-7	ug/l	1 : 4	5.10E-01	5.10E-01	5.10E-01
	DI-N-BUTYL PHTHALATE	84-74-2	ug/l	1 : 4	6.30E-01	6.30E-01	6.30E-01
	DISSOLVED ORGANIC CARBON	DOC	ug/L	1 : 1	1.20E+04	1.20E+04	1.20E+04
	FLUORANTHENE	206-44-0	ug/l	1 : 4	6.90E-01	6.90E-01	6.90E-01
	FLUORENE	86-73-7	ug/l	1 : 4	7.30E-01	7.30E-01	7.30E-01
	LEAD	7439-92-1	ug/l	1 : 4	1.90E+00	1.90E+00	1.90E+00
	METHYLCYCLOHEXANE	108-87-2	ug/l	1 : 4	5.60E-01	5.60E-01	5.60E-01
	NAPHTHALENE	91-20-3	ug/l	1 : 4	6.10E+00	6.10E+00	6.10E+00
	NICKEL	7440-02-0	ug/l	4 : 4	2.00E+00	5.00E+00	3.30E+00
	PHENANTHRENE	85-01-8	ug/l	2 : 4	4.50E-01	6.00E-01	5.25E-01
	PYRENE	129-00-0	ug/l	1 : 4	5.10E-01	5.10E-01	5.10E-01
	SULFATE	14808-79-8	ug/L	2 : 2	3.34E+05	3.65E+05	3.50E+05
	THALLIUM	7440-28-0	ug/l	2 : 4	5.20E+00	5.30E+00	5.25E+00
	TOLUENE	108-88-3	ug/l	1 : 4	2.10E-01	2.10E-01	2.10E-01
	TOTAL CYANIDE	57-12-5	ug/L	1 : 1	2.00E+02	2.00E+02	2.00E+02
	Total HMW PAHs	Total HMW	ug/l	1 : 4	1.20E+00	1.20E+00	1.20E+00
	Total LMW PAHs	Total LMW	ug/l	2 : 4	1.13E+01	1.66E+01	1.39E+01
	TOTAL PAHs	Total PAHs	ug/l	2 : 4	1.25E+01	3.65E+01	2.45E+01
	VANADIUM	7440-62-2	ug/l	1 : 4	3.10E+00	3.10E+00	3.10E+00
	ZINC	7440-66-6	ug/l	1 : 4	1.23E+01	1.23E+01	1.23E+01
RFI-MW12							
	1,4-DIOXANE	123-91-1	ug/l	1 : 4	1.80E+02	1.80E+02	1.80E+02
	2-BUTANONE	78-93-3	ug/l	4 : 4	5.60E+00	1.90E+01	1.24E+01
	3-METHYLPHENOL	108-39-4	ug/l	1 : 1	1.00E+02	1.00E+02	1.00E+02
	3-METHYLPHENOL & 4-METHYLPHENOL	65794-96-9	ug/l	2 : 3	1.10E+02	1.30E+02	1.20E+02
	4-METHYL-2-PENTANONE (MIBK)	108-10-1	ug/l	1 : 4	4.00E-01	4.00E-01	4.00E-01

Table 2-2
Summary Statistics for Constituents Detected in Groundwater (GSI Wells)
BASF North Works Facility

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)
	4-METHYLPHENOL	106-44-5	ug/l	1 : 1	1.00E+02	1.00E+02	1.00E+02
	ACETONE	67-64-1	ug/l	4 : 4	3.50E+01	1.20E+02	6.80E+01
	ANTIMONY	7440-36-0	ug/l	3 : 4	4.40E+00	6.90E+00	5.90E+00
	ARSENIC	7440-38-2	ug/l	4 : 4	2.68E+02	3.97E+02	3.49E+02
	BARIUM	7440-39-3	ug/l	4 : 4	9.36E+01	1.17E+02	1.08E+02
	CADMIUM	7440-43-9	ug/l	1 : 4	5.90E-01	5.90E-01	5.90E-01
	CAPROLACTAM	105-60-2	ug/l	1 : 4	1.20E+01	1.20E+01	1.20E+01
	CARBON DISULFIDE	75-15-0	ug/l	2 : 4	3.40E+00	1.60E+01	9.70E+00
	CHLORIDE	16887-00-6	ug/L	2 : 2	9.24E+06	1.16E+07	1.04E+07
	CHROMIUM	7440-47-3	ug/l	4 : 4	6.28E+01	9.04E+01	7.77E+01
	COBALT	7440-48-4	ug/l	3 : 4	3.30E+00	4.90E+00	4.33E+00
	COPPER	7440-50-8	ug/l	2 : 4	4.90E+00	6.10E+00	5.50E+00
	DISSOLVED ORGANIC CARBON	DOC	ug/L	1 : 1	2.20E+05	2.20E+05	2.20E+05
	METHYLENE CHLORIDE	75-09-2	ug/l	1 : 4	1.20E+01	1.20E+01	1.20E+01
	NICKEL	7440-02-0	ug/l	4 : 4	2.06E+02	3.07E+02	2.60E+02
	PHENOL	108-95-2	ug/l	4 : 4	3.70E+02	8.80E+02	6.45E+02
	SELENIUM	7782-49-2	ug/l	2 : 4	5.60E+00	8.70E+00	7.15E+00
	SULFATE	14808-79-8	ug/L	2 : 2	1.88E+05	3.32E+05	2.60E+05
	THALLIUM	7440-28-0	ug/l	1 : 4	4.80E+00	4.80E+00	4.80E+00
	TOLUENE	108-88-3	ug/l	1 : 4	2.30E-01	2.30E-01	2.30E-01
	TOTAL CYANIDE	57-12-5	ug/L	1 : 1	1.00E+03	1.00E+03	1.00E+03
	TOTAL METHYLPHENOL	TOTAL	ug/l	3 : 4	1.10E+02	2.00E+02	1.47E+02
	VANADIUM	7440-62-2	ug/l	4 : 4	2.71E+02	3.94E+02	3.55E+02
	ZINC	7440-66-6	ug/l	2 : 4	8.50E+00	1.00E+01	9.25E+00
RFI-MW12F							
	2-BUTANONE	78-93-3	ug/l	4 : 4	9.40E+00	3.00E+01	1.89E+01
	3-METHYLPHENOL	108-39-4	ug/l	1 : 1	1.90E+01	1.90E+01	1.90E+01
	3-METHYLPHENOL & 4-METHYLPHENOL	65794-96-9	ug/l	3 : 3	4.90E+01	6.70E+01	5.83E+01
	4-METHYL-2-PENTANONE (MIBK)	108-10-1	ug/l	4 : 4	8.10E-01	3.40E+00	2.08E+00
	4-METHYLPHENOL	106-44-5	ug/l	1 : 1	1.90E+01	1.90E+01	1.90E+01
	ACETONE	67-64-1	ug/l	4 : 4	7.90E+01	3.30E+02	1.70E+02

Table 2-2
Summary Statistics for Constituents Detected in Groundwater (GSI Wells)
BASF North Works Facility

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)
	ARSENIC	7440-38-2	ug/l	1 : 3	6.10E+00	6.10E+00	6.10E+00
	BARIUM	7440-39-3	ug/l	4 : 4	3.10E+02	4.35E+02	3.78E+02
	BENZENE	71-43-2	ug/l	1 : 4	9.60E-01	9.60E-01	9.60E-01
	BIS(2-ETHYLHEXYL) PHTHALATE	117-81-7	ug/l	1 : 4	3.60E+00	3.60E+00	3.60E+00
	CAPROLACTAM	105-60-2	ug/l	1 : 4	3.60E+01	3.60E+01	3.60E+01
	CARBON DISULFIDE	75-15-0	ug/l	1 : 4	1.30E+00	1.30E+00	1.30E+00
	CHLORIDE	16887-00-6	ug/L	2 : 2	7.47E+05	9.41E+05	8.44E+05
	COPPER	7440-50-8	ug/l	2 : 4	3.08E+01	3.75E+01	3.41E+01
	CYCLOHEXANE	110-82-7	ug/l	3 : 4	1.40E+00	2.80E+00	2.17E+00
	DISSOLVED ORGANIC CARBON	DOC	ug/L	1 : 1	7.30E+04	7.30E+04	7.30E+04
	LEAD	7439-92-1	ug/l	3 : 4	6.80E+00	1.80E+01	1.20E+01
	METHYL ACETATE	79-20-9	ug/l	1 : 4	5.40E+00	5.40E+00	5.40E+00
	METHYLCYCLOHEXANE	108-87-2	ug/l	2 : 4	2.10E+00	2.30E+00	2.20E+00
	METHYLENE CHLORIDE	75-09-2	ug/l	1 : 4	3.70E+00	3.70E+00	3.70E+00
	NICKEL	7440-02-0	ug/l	4 : 4	4.51E+01	1.67E+02	1.12E+02
	PHENOL	108-95-2	ug/l	4 : 4	1.10E+02	4.10E+02	2.78E+02
	SELENIUM	7782-49-2	ug/l	2 : 3	6.00E+00	7.20E+00	6.60E+00
	SULFATE	14808-79-8	ug/L	2 : 2	1.83E+04	3.07E+04	2.45E+04
	THALLIUM	7440-28-0	ug/l	1 : 3	4.90E+00	4.90E+00	4.90E+00
	TOLUENE	108-88-3	ug/l	4 : 4	8.90E-01	2.10E+00	1.60E+00
	TOTAL CYANIDE	57-12-5	ug/L	1 : 1	3.40E+00	3.40E+00	3.40E+00
	TOTAL METHYLPHENOL	TOTAL	ug/l	4 : 4	3.80E+01	6.70E+01	5.33E+01
	TOTAL XYLENES	TOTAL	ug/l	1 : 4	2.00E+00	2.00E+00	2.00E+00
	XYLENES	1330-20-7	ug/l	1 : 4	2.00E+00	2.00E+00	2.00E+00
	ZINC	7440-66-6	ug/l	2 : 4	7.80E+00	8.00E+00	7.90E+00
RFI-MW22							
	2-BUTANONE	78-93-3	ug/l	3 : 4	3.20E+01	4.60E+01	4.00E+01
	3-METHYLPHENOL	108-39-4	ug/l	1 : 2	3.40E+01	3.40E+01	3.40E+01
	3-METHYLPHENOL & 4-METHYLPHENOL	65794-96-9	ug/l	3 : 3	3.00E+01	3.40E+01	3.23E+01
	4-METHYLPHENOL	106-44-5	ug/l	1 : 2	3.40E+01	3.40E+01	3.40E+01
	ACETONE	67-64-1	ug/l	4 : 4	1.00E+03	2.20E+03	1.48E+03

Table 2-2
Summary Statistics for Constituents Detected in Groundwater (GSI Wells)
BASF North Works Facility

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)
	ARSENIC	7440-38-2	ug/l	4 : 4	1.01E+02	1.10E+02	1.05E+02
	BARIUM	7440-39-3	ug/l	4 : 4	1.09E+02	1.37E+02	1.24E+02
	BENZENE	71-43-2	ug/l	4 : 4	1.60E+03	2.00E+03	1.88E+03
	BERYLLIUM	7440-41-7	ug/l	2 : 4	1.70E+00	1.70E+00	1.70E+00
	BIS(2-CHLOROETHYL) ETHER	111-44-4	ug/l	4 : 5	7.70E+01	9.20E+01	8.60E+01
	CADMIUM	7440-43-9	ug/l	1 : 4	5.80E-01	5.80E-01	5.80E-01
	CHLORIDE	16887-00-6	ug/L	2 : 2	3.49E+06	3.72E+06	3.61E+06
	CHLOROBENZENE	108-90-7	ug/l	4 : 4	8.00E+02	9.30E+02	8.78E+02
	CHROMIUM	7440-47-3	ug/l	4 : 4	6.33E+01	7.09E+01	6.76E+01
	CIS-1,2-DICHLOROETHENE	156-59-2	ug/l	1 : 4	1.20E+01	1.20E+01	1.20E+01
	COBALT	7440-48-4	ug/l	4 : 4	4.10E+00	6.20E+00	4.85E+00
	COPPER	7440-50-8	ug/l	4 : 4	2.70E+01	3.54E+01	3.11E+01
	DISSOLVED ORGANIC CARBON	DOC	ug/L	2 : 2	2.60E+05	3.60E+05	3.10E+05
	ETHYLBENZENE	100-41-4	ug/l	4 : 4	9.40E+01	1.20E+02	1.09E+02
	LEAD	7439-92-1	ug/l	4 : 4	5.50E+00	1.47E+01	8.38E+00
	METHYLENE CHLORIDE	75-09-2	ug/l	2 : 4	2.10E+01	3.80E+01	2.95E+01
	NICKEL	7440-02-0	ug/l	4 : 4	1.83E+01	2.34E+01	2.10E+01
	PHENOL	108-95-2	ug/l	4 : 5	3.30E+01	3.50E+01	3.43E+01
	SELENIUM	7782-49-2	ug/l	2 : 4	4.30E+00	4.40E+00	4.35E+00
	SULFATE	14808-79-8	ug/L	2 : 2	3.25E+05	3.83E+05	3.54E+05
	TOLUENE	108-88-3	ug/l	4 : 4	6.90E+01	7.60E+01	7.35E+01
	TOTAL CYANIDE	57-12-5	ug/L	1 : 1	1.50E+03	1.50E+03	1.50E+03
	TOTAL METHYLPHENOL	TOTAL	ug/l	4 : 4	3.00E+01	6.80E+01	4.13E+01
	TOTAL XYLENES	TOTAL	ug/l	4 : 4	3.70E+01	5.30E+01	4.48E+01
	VANADIUM	7440-62-2	ug/l	4 : 4	4.27E+02	4.77E+02	4.47E+02
	VINYL CHLORIDE	75-01-4	ug/l	4 : 4	1.00E+02	1.40E+02	1.23E+02
	XYLENES	1330-20-7	ug/l	4 : 4	3.70E+01	5.30E+01	4.48E+01
	ZINC	7440-66-6	ug/l	2 : 4	2.86E+01	5.04E+01	3.95E+01
RFI-MW4							
	1,4-DIOXANE	123-91-1	ug/l	3 : 4	5.00E+00	1.35E+01	8.83E+00
	ACENAPHTHENE	83-32-9	ug/l	1 : 4	6.10E-01	6.10E-01	6.10E-01

Table 2-2
Summary Statistics for Constituents Detected in Groundwater (GSI Wells)
BASF North Works Facility

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)
	ARSENIC	7440-38-2	ug/l	3 : 4	8.33E+01	1.06E+02	9.21E+01
	BARIUM	7440-39-3	ug/l	4 : 4	2.18E+02	3.11E+02	2.55E+02
	BIS(2-ETHYLHEXYL) PHTHALATE	117-81-7	ug/l	1 : 4	9.80E-01	9.80E-01	9.80E-01
	CARBON DISULFIDE	75-15-0	ug/l	2 : 4	2.90E-01	3.90E-01	3.40E-01
	CHLORIDE	16887-00-6	ug/L	2 : 2	2.39E+06	2.40E+06	2.40E+06
	DISSOLVED ORGANIC CARBON	DOC	ug/L	1 : 1	2.20E+04	2.20E+04	2.20E+04
	FLUORENE	86-73-7	ug/l	1 : 4	1.40E-01	1.40E-01	1.40E-01
	SULFATE	14808-79-8	ug/L	2 : 2	7.88E+04	8.58E+04	8.23E+04
	TOTAL CYANIDE	57-12-5	ug/L	1 : 1	6.90E+01	6.90E+01	6.90E+01
	Total LMW PAHs	Total LMW	ug/l	2 : 4	1.94E-01	1.06E+01	5.40E+00
	TOTAL PAHs	Total PAHs	ug/l	2 : 4	1.94E-01	1.06E+01	5.40E+00
RFI-MW5							
	1,2-DICHLOROPROPANE	78-87-5	ug/l	3 : 4	2.00E-01	2.40E-01	2.20E-01
	2,4-DIMETHYLPHENOL	105-67-9	ug/l	3 : 4	8.35E-01	1.40E+00	1.18E+00
	2-BUTANONE	78-93-3	ug/l	4 : 4	5.95E+00	7.10E+00	6.41E+00
	2-METHYLNAPHTHALENE	91-57-6	ug/l	4 : 4	8.00E-01	1.40E+00	1.03E+00
	2-METHYLPHENOL	95-48-7	ug/l	4 : 4	2.30E+00	3.00E+00	2.52E+00
	3-METHYLPHENOL	108-39-4	ug/l	1 : 1	2.30E+01	2.30E+01	2.30E+01
	3-METHYLPHENOL & 4-METHYLPHENOL	65794-96-9	ug/l	3 : 3	2.40E+01	3.40E+01	2.77E+01
	4-METHYLPHENOL	106-44-5	ug/l	1 : 1	2.30E+01	2.30E+01	2.30E+01
	ACENAPHTHENE	83-32-9	ug/l	4 : 4	2.80E-01	5.10E-01	3.60E-01
	ACENAPHTHYLENE	208-96-8	ug/l	3 : 4	4.50E-01	5.10E-01	4.80E-01
	ACETONE	67-64-1	ug/l	4 : 4	4.30E+01	7.40E+01	6.08E+01
	ANTHRACENE	120-12-7	ug/l	1 : 4	1.00E-01	1.00E-01	1.00E-01
	BARIUM	7440-39-3	ug/l	4 : 4	8.52E+02	1.08E+03	9.92E+02
	BENZENE	71-43-2	ug/l	3 : 4	6.80E-01	9.10E-01	7.62E-01
	BERYLLIUM	7440-41-7	ug/l	1 : 4	4.75E-01	4.75E-01	4.75E-01
	BIS(2-CHLOROISOPROPYL) ETHER	108-60-1	ug/l	2 : 4	2.50E+00	2.70E+00	2.60E+00
	BIS(2-ETHYLHEXYL) PHTHALATE	117-81-7	ug/l	1 : 4	1.10E+00	1.10E+00	1.10E+00
	CAPROLACTAM	105-60-2	ug/l	3 : 4	1.10E+00	3.45E+01	1.26E+01
	CHLORIDE	16887-00-6	ug/L	2 : 2	4.66E+06	8.05E+06	6.36E+06

Table 2-2
Summary Statistics for Constituents Detected in Groundwater (GSI Wells)
BASF North Works Facility

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)
	CHLOROMETHANE	74-87-3	ug/l	2 : 4	1.50E-01	2.30E-01	1.90E-01
	CHROMIUM	7440-47-3	ug/l	1 : 4	1.80E+00	1.80E+00	1.80E+00
	CYCLOHEXANE	110-82-7	ug/l	3 : 4	1.30E-01	2.40E-01	1.73E-01
	DISSOLVED ORGANIC CARBON	DOC	ug/L	2 : 2	8.00E+03	8.00E+03	8.00E+03
	FLUORENE	86-73-7	ug/l	2 : 4	2.60E-01	3.20E-01	2.90E-01
	NAPHTHALENE	91-20-3	ug/l	4 : 4	5.60E+00	7.35E+00	6.06E+00
	NICKEL	7440-02-0	ug/l	4 : 4	6.70E+00	8.10E+00	7.58E+00
	PHENANTHRENE	85-01-8	ug/l	4 : 4	4.90E-01	5.30E-01	5.11E-01
	PHENOL	108-95-2	ug/l	4 : 4	1.20E+01	3.10E+01	2.36E+01
	PYRENE	129-00-0	ug/l	1 : 4	2.20E-01	2.20E-01	2.20E-01
	SELENIUM	7782-49-2	ug/l	2 : 4	4.60E+00	5.85E+00	5.22E+00
	SULFATE	14808-79-8	ug/L	2 : 2	1.10E+03	2.40E+03	1.75E+03
	TOLUENE	108-88-3	ug/l	3 : 4	3.45E-01	3.90E-01	3.62E-01
	TOTAL CYANIDE	57-12-5	ug/L	1 : 1	4.45E+00	4.45E+00	4.45E+00
	Total HMW PAHs	Total HMW	ug/l	1 : 4	2.20E-01	2.20E-01	2.20E-01
	Total LMW PAHs	Total LMW	ug/l	4 : 4	8.01E+00	3.73E+01	2.45E+01
	TOTAL METHYLPHENOL	TOTAL	ug/l	4 : 4	2.64E+01	4.84E+01	3.48E+01
	TOTAL PAHs	Total PAHs	ug/l	4 : 4	8.06E+00	4.73E+01	2.96E+01
RFI-MW6							
	1,2-DICHLOROETHANE	107-06-2	ug/l	4 : 4	2.90E-01	3.20E-01	3.10E-01
	1,2-DICHLOROPROPANE	78-87-5	ug/l	4 : 4	9.10E+00	9.95E+00	9.46E+00
	2-BUTANONE	78-93-3	ug/l	3 : 4	7.05E-01	9.20E-01	8.18E-01
	2-METHYLNAPHTHALENE	91-57-6	ug/l	2 : 4	2.90E-01	3.70E-01	3.30E-01
	2-METHYLPHENOL	95-48-7	ug/l	1 : 4	6.30E-01	6.30E-01	6.30E-01
	3-METHYLPHENOL	108-39-4	ug/l	1 : 1	9.60E+00	9.60E+00	9.60E+00
	3-METHYLPHENOL & 4-METHYLPHENOL	65794-96-9	ug/l	3 : 3	9.10E+00	1.50E+01	1.27E+01
	4-METHYLPHENOL	106-44-5	ug/l	1 : 1	9.60E+00	9.60E+00	9.60E+00
	ACETONE	67-64-1	ug/l	2 : 4	1.50E+00	1.70E+00	1.60E+00
	BARIUM	7440-39-3	ug/l	4 : 4	1.93E+02	2.17E+02	2.02E+02
	BERYLLIUM	7440-41-7	ug/l	1 : 4	3.50E-01	3.50E-01	3.50E-01
	BIS(2-CHLOROISOPROPYL) ETHER	108-60-1	ug/l	3 : 4	4.30E+00	5.30E+00	4.77E+00

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)
	CAPROLACTAM	105-60-2	ug/l	2 : 4	8.60E-01	2.10E+00	1.48E+00
	CARBON DISULFIDE	75-15-0	ug/l	2 : 4	2.90E-01	7.50E-01	5.20E-01
	CHLORIDE	16887-00-6	ug/L	2 : 2	3.07E+06	3.11E+06	3.09E+06
	DISSOLVED ORGANIC CARBON	DOC	ug/L	2 : 2	6.00E+03	7.00E+03	6.50E+03
	NAPHTHALENE	91-20-3	ug/l	4 : 4	9.50E-01	1.20E+00	1.04E+00
	NICKEL	7440-02-0	ug/l	4 : 4	4.50E+00	6.60E+00	5.67E+00
	PHENANTHRENE	85-01-8	ug/l	3 : 4	3.90E-01	4.80E-01	4.23E-01
	PHENOL	108-95-2	ug/l	4 : 4	6.30E+00	1.70E+01	1.16E+01
	SELENIUM	7782-49-2	ug/l	3 : 4	5.80E+00	8.50E+00	6.83E+00
	SULFATE	14808-79-8	ug/L	2 : 2	1.98E+05	2.15E+05	2.06E+05
	TOLUENE	108-88-3	ug/l	3 : 4	1.80E-01	2.00E-01	1.93E-01
	TOTAL CYANIDE	57-12-5	ug/L	1 : 1	1.80E+01	1.80E+01	1.80E+01
	Total LMW PAHs	Total LMW	ug/l	4 : 4	1.64E+00	2.30E+01	9.53E+00
	TOTAL METHYLPHENOL	TOTAL	ug/l	4 : 4	1.46E+01	2.60E+01	1.99E+01
	TOTAL PAHs	Total PAHs	ug/l	4 : 4	1.64E+00	2.30E+01	9.53E+00
RFI-MW7F							
	1,2-DICHLOROETHANE	107-06-2	ug/l	1 : 4	3.00E-01	3.00E-01	3.00E-01
	1,2-DICHLOROPROPANE	78-87-5	ug/l	4 : 4	9.20E-01	1.30E+01	5.23E+00
	2-BUTANONE	78-93-3	ug/l	3 : 4	1.30E+00	7.10E+00	3.37E+00
	3-METHYLPHENOL & 4-METHYLPHENOL	65794-96-9	ug/l	1 : 3	1.00E+00	1.00E+00	1.00E+00
	ACETONE	67-64-1	ug/l	2 : 4	2.60E+01	6.70E+01	4.65E+01
	BARIUM	7440-39-3	ug/l	4 : 4	4.09E+02	6.04E+02	4.92E+02
	BERYLLIUM	7440-41-7	ug/l	1 : 3	3.10E-01	3.10E-01	3.10E-01
	BIS(2-CHLOROISOPROPYL) ETHER	108-60-1	ug/l	4 : 4	1.90E+00	9.40E+00	4.67E+00
	CAPROLACTAM	105-60-2	ug/l	3 : 4	1.20E+00	4.00E+01	1.43E+01
	CHLORIDE	16887-00-6	ug/L	2 : 2	7.02E+05	9.93E+05	8.48E+05
	CHROMIUM	7440-47-3	ug/l	4 : 4	9.70E+00	3.29E+01	2.02E+01
	COBALT	7440-48-4	ug/l	2 : 3	1.20E+00	1.90E+00	1.55E+00
	COPPER	7440-50-8	ug/l	2 : 3	8.20E+00	4.34E+01	2.58E+01
	CYCLOHEXANE	110-82-7	ug/l	1 : 4	1.30E-01	1.30E-01	1.30E-01
	DISSOLVED ORGANIC CARBON	DOC	ug/L	1 : 1	4.00E+03	4.00E+03	4.00E+03

Table 2-2
Summary Statistics for Constituents Detected in Groundwater (GSI Wells)
BASF North Works Facility

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)
	LEAD	7439-92-1	ug/l	2 : 3	2.20E+00	3.00E+00	2.60E+00
	NICKEL	7440-02-0	ug/l	4 : 4	2.10E+00	1.28E+01	5.73E+00
	PHENANTHRENE	85-01-8	ug/l	3 : 4	3.40E-01	1.20E+00	7.77E-01
	SELENIUM	7782-49-2	ug/l	3 : 4	5.20E+00	8.70E+00	7.33E+00
	SULFATE	14808-79-8	ug/L	2 : 2	2.24E+04	3.33E+04	2.79E+04
	TOLUENE	108-88-3	ug/l	1 : 4	2.20E-01	2.20E-01	2.20E-01
	TOTAL CYANIDE	57-12-5	ug/L	1 : 1	3.80E+00	3.80E+00	3.80E+00
	Total LMW PAHs	Total LMW	ug/l	3 : 4	3.40E-01	1.20E+00	7.77E-01
	TOTAL METHYLPHENOL	TOTAL	ug/l	1 : 4	1.00E+00	1.00E+00	1.00E+00
	TOTAL PAHs	Total PAHs	ug/l	3 : 4	3.40E-01	1.20E+00	7.77E-01
RFI-MW7I							
	ACENAPHTHENE	83-32-9	ug/l	3 : 4	3.10E-01	4.60E-01	4.03E-01
	ARSENIC	7440-38-2	ug/l	1 : 4	7.10E+00	7.10E+00	7.10E+00
	BARIUM	7440-39-3	ug/l	4 : 4	1.76E+03	3.70E+03	2.61E+03
	BERYLLIUM	7440-41-7	ug/l	1 : 4	4.20E-01	4.20E-01	4.20E-01
	CADMIUM	7440-43-9	ug/l	3 : 4	4.30E-01	5.90E-01	4.87E-01
	CAPROLACTAM	105-60-2	ug/l	1 : 4	1.10E+00	1.10E+00	1.10E+00
	CARBON DISULFIDE	75-15-0	ug/l	3 : 4	3.70E-01	1.10E+00	6.70E-01
	CHLORIDE	16887-00-6	ug/L	2 : 2	2.49E+07	2.82E+07	2.66E+07
	CHROMIUM	7440-47-3	ug/l	1 : 4	7.40E+00	7.40E+00	7.40E+00
	CYCLOHEXANE	110-82-7	ug/l	1 : 4	1.30E-01	1.30E-01	1.30E-01
	DISSOLVED ORGANIC CARBON	DOC	ug/L	1 : 1	3.00E+03	3.00E+03	3.00E+03
	NICKEL	7440-02-0	ug/l	1 : 4	1.50E+00	1.50E+00	1.50E+00
	PHENANTHRENE	85-01-8	ug/l	3 : 4	2.90E-01	4.30E-01	3.73E-01
	SULFATE	14808-79-8	ug/L	2 : 2	3.10E+05	4.51E+05	3.81E+05
	THALLIUM	7440-28-0	ug/l	2 : 4	1.05E+01	4.61E+01	2.83E+01
	TOTAL CYANIDE	57-12-5	ug/L	1 : 1	2.10E+02	2.10E+02	2.10E+02
	Total LMW PAHs	Total LMW	ug/l	3 : 4	6.00E-01	8.90E-01	7.77E-01
	TOTAL PAHs	Total PAHs	ug/l	3 : 4	6.00E-01	8.90E-01	7.77E-01
RFI-MW8							
	ARSENIC	7440-38-2	ug/l	3 : 4	5.30E+00	7.70E+00	6.28E+00

Table 2-2
Summary Statistics for Constituents Detected in Groundwater (GSI Wells)
BASF North Works Facility

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)
	BARIUM	7440-39-3	ug/l	4 : 4	1.03E+03	1.09E+03	1.07E+03
	CADMIUM	7440-43-9	ug/l	2 : 4	7.80E-01	9.10E-01	8.45E-01
	CHLORIDE	16887-00-6	ug/L	2 : 2	2.90E+06	3.05E+06	2.97E+06
	CHROMIUM	7440-47-3	ug/l	1 : 4	5.90E+00	5.90E+00	5.90E+00
	DISSOLVED ORGANIC CARBON	DOC	ug/L	1 : 1	1.20E+04	1.20E+04	1.20E+04
	NICKEL	7440-02-0	ug/l	1 : 4	7.10E+00	7.10E+00	7.10E+00
	THALLIUM	7440-28-0	ug/l	3 : 4	4.80E+00	6.20E+00	5.27E+00
	VANADIUM	7440-62-2	ug/l	1 : 4	2.40E+00	2.40E+00	2.40E+00
	ZINC	7440-66-6	ug/l	1 : 4	1.99E+01	1.99E+01	1.99E+01
RFI-MW8F							
	1,1-DICHLOROETHANE	75-34-3	ug/l	1 : 5	3.90E+01	3.90E+01	3.90E+01
	1,1-DICHLOROETHENE	75-35-4	ug/l	1 : 5	4.90E+00	4.90E+00	4.90E+00
	1,4-DIOXANE	123-91-1	ug/l	1 : 5	1.20E+01	1.20E+01	1.20E+01
	2-BUTANONE	78-93-3	ug/l	3 : 5	4.90E-01	1.50E+01	5.66E+00
	2-METHYLNAPHTHALENE	91-57-6	ug/l	1 : 5	2.30E+01	2.30E+01	2.30E+01
	3-METHYLPHENOL & 4-METHYLPHENOL	65794-96-9	ug/l	1 : 4	3.90E+01	3.90E+01	3.90E+01
	4-METHYL-2-PENTANONE (MIBK)	108-10-1	ug/l	1 : 5	2.20E+00	2.20E+00	2.20E+00
	ACENAPHTHENE	83-32-9	ug/l	1 : 5	2.10E+00	2.10E+00	2.10E+00
	ACENAPHTHYLENE	208-96-8	ug/l	1 : 5	6.10E+00	6.10E+00	6.10E+00
	ACETONE	67-64-1	ug/l	2 : 5	6.00E+00	8.80E+01	4.70E+01
	ANTHRACENE	120-12-7	ug/l	1 : 5	2.00E+00	2.00E+00	2.00E+00
	BARIUM	7440-39-3	ug/l	5 : 5	1.11E+01	6.73E+02	2.63E+02
	BENZENE	71-43-2	ug/l	1 : 5	2.80E+00	2.80E+00	2.80E+00
	BIS(2-ETHYLHEXYL) PHTHALATE	117-81-7	ug/l	1 : 5	2.30E+00	2.30E+00	2.30E+00
	CARBAZOLE	86-74-8	ug/l	1 : 5	3.60E+00	3.60E+00	3.60E+00
	CARBON DISULFIDE	75-15-0	ug/l	2 : 5	3.40E-01	3.20E+00	1.77E+00
	CHLORIDE	16887-00-6	ug/L	3 : 3	5.05E+04	4.55E+05	1.94E+05
	CHLOROETHANE	75-00-3	ug/l	1 : 5	8.90E-01	8.90E-01	8.90E-01
	COPPER	7440-50-8	ug/l	2 : 4	2.80E+00	6.50E+00	4.65E+00
	CYCLOHEXANE	110-82-7	ug/l	2 : 5	1.70E-01	1.30E+00	7.35E-01
	DIBENZOFURAN	132-64-9	ug/l	1 : 5	3.70E+00	3.70E+00	3.70E+00

Table 2-2
Summary Statistics for Constituents Detected in Groundwater (GSI Wells)
BASF North Works Facility

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)
	ETHYLBENZENE	100-41-4	ug/l	1 : 5	1.70E+01	1.70E+01	1.70E+01
	FLUORANTHENE	206-44-0	ug/l	1 : 5	1.80E+00	1.80E+00	1.80E+00
	FLUORENE	86-73-7	ug/l	1 : 5	5.00E+00	5.00E+00	5.00E+00
	ISOPROPYLBENZENE	98-82-8	ug/l	1 : 5	6.00E+00	6.00E+00	6.00E+00
	LEAD	7439-92-1	ug/l	1 : 4	2.50E+00	2.50E+00	2.50E+00
	NAPHTHALENE	91-20-3	ug/l	2 : 5	2.90E-01	9.70E+01	4.86E+01
	NICKEL	7440-02-0	ug/l	4 : 5	1.40E+00	2.21E+01	7.38E+00
	PENTACHLOROPHENOL	87-86-5	ug/l	3 : 5	1.80E+00	3.00E+00	2.37E+00
	PHENANTHRENE	85-01-8	ug/l	2 : 5	2.10E-01	7.80E+00	4.00E+00
	PHENOL	108-95-2	ug/l	2 : 5	1.00E+00	2.00E+02	1.01E+02
	PYRENE	129-00-0	ug/l	1 : 5	1.30E+00	1.30E+00	1.30E+00
	SELENIUM	7782-49-2	ug/l	2 : 5	3.60E+00	3.80E+00	3.70E+00
	SULFATE	14808-79-8	ug/L	3 : 3	4.80E+03	1.70E+05	1.09E+05
	TOLUENE	108-88-3	ug/l	3 : 5	3.20E-01	2.40E+01	8.30E+00
	Total HMW PAHs	Total HMW	ug/l	1 : 5	3.10E+00	3.10E+00	3.10E+00
	Total LMW PAHs	Total LMW	ug/l	2 : 5	7.66E-01	1.43E+02	7.19E+01
	TOTAL METHYLPHENOL	TOTAL	ug/l	1 : 5	3.90E+01	3.90E+01	3.90E+01
	TOTAL PAHs	Total PAHs	ug/l	2 : 5	8.50E-01	1.46E+02	7.35E+01
	TOTAL XYLENES	TOTAL	ug/l	1 : 5	7.70E+01	7.70E+01	7.70E+01
	VANADIUM	7440-62-2	ug/l	3 : 5	3.00E+00	4.00E+00	3.63E+00
	XYLENES	1330-20-7	ug/l	1 : 5	7.70E+01	7.70E+01	7.70E+01
	ZINC	7440-66-6	ug/l	1 : 4	1.12E+01	1.12E+01	1.12E+01
RFI-MW8I							
	1,1-BIPHENYL	92-52-4	ug/l	1 : 3	2.20E+00	2.20E+00	2.20E+00
	1,1-DICHLOROETHANE	75-34-3	ug/l	3 : 3	1.20E+01	3.10E+01	2.43E+01
	1,1-DICHLOROETHENE	75-35-4	ug/l	3 : 3	9.80E-01	4.60E+00	3.03E+00
	1,4-DIOXANE	123-91-1	ug/l	1 : 3	1.20E+01	1.20E+01	1.20E+01
	2,4-DIMETHYLPHENOL	105-67-9	ug/l	1 : 3	3.80E+00	3.80E+00	3.80E+00
	2-BUTANONE	78-93-3	ug/l	3 : 3	2.70E+00	1.30E+01	8.33E+00
	2-HEXANONE	591-78-6	ug/l	1 : 3	8.90E-01	8.90E-01	8.90E-01
	2-METHYLNAPHTHALENE	91-57-6	ug/l	3 : 3	1.40E+01	2.50E+01	1.80E+01

Table 2-2
Summary Statistics for Constituents Detected in Groundwater (GSI Wells)
BASF North Works Facility

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)
	3-METHYLPHENOL	108-39-4	ug/l	1 : 1	1.20E+02	1.20E+02	1.20E+02
	3-METHYLPHENOL & 4-METHYLPHENOL	65794-96-9	ug/l	2 : 2	2.00E+01	2.00E+01	2.00E+01
	4-METHYL-2-PENTANONE (MIBK)	108-10-1	ug/l	3 : 3	1.40E+00	2.20E+00	1.77E+00
	4-METHYLPHENOL	106-44-5	ug/l	1 : 1	1.20E+02	1.20E+02	1.20E+02
	ACENAPHTHENE	83-32-9	ug/l	2 : 3	1.90E+00	2.40E+00	2.15E+00
	ACENAPHTHYLENE	208-96-8	ug/l	3 : 3	3.60E+00	9.70E+00	5.83E+00
	ACETONE	67-64-1	ug/l	2 : 3	3.20E+01	3.80E+01	3.50E+01
	ANTHRACENE	120-12-7	ug/l	1 : 3	2.60E+00	2.60E+00	2.60E+00
	BARIUM	7440-39-3	ug/l	3 : 3	4.17E+02	7.42E+02	6.16E+02
	BENZENE	71-43-2	ug/l	3 : 3	2.10E+00	2.30E+00	2.20E+00
	CADMIUM	7440-43-9	ug/l	1 : 3	5.70E-01	5.70E-01	5.70E-01
	CAPROLACTAM	105-60-2	ug/l	1 : 3	8.40E+00	8.40E+00	8.40E+00
	CARBAZOLE	86-74-8	ug/l	2 : 3	3.40E+00	6.70E+00	5.05E+00
	CARBON DISULFIDE	75-15-0	ug/l	3 : 3	2.50E+00	6.20E+00	4.63E+00
	CHLORIDE	16887-00-6	ug/L	1 : 1	4.15E+05	4.15E+05	4.15E+05
	CHLOROETHANE	75-00-3	ug/l	1 : 3	6.10E-01	6.10E-01	6.10E-01
	CHLOROMETHANE	74-87-3	ug/l	1 : 3	2.50E-01	2.50E-01	2.50E-01
	CHROMIUM	7440-47-3	ug/l	1 : 3	7.60E+00	7.60E+00	7.60E+00
	COPPER	7440-50-8	ug/l	2 : 3	2.00E+00	3.03E+01	1.61E+01
	CYCLOHEXANE	110-82-7	ug/l	3 : 3	2.70E-01	1.00E+00	6.47E-01
	DIBENZOFURAN	132-64-9	ug/l	2 : 3	4.10E+00	5.30E+00	4.70E+00
	DISSOLVED ORGANIC CARBON	DOC	ug/L	1 : 1	3.50E+04	3.50E+04	3.50E+04
	ETHYLBENZENE	100-41-4	ug/l	3 : 3	2.90E+00	2.00E+01	1.30E+01
	FLUORANTHENE	206-44-0	ug/l	2 : 3	1.40E+00	2.60E+00	2.00E+00
	FLUORENE	86-73-7	ug/l	2 : 3	3.00E+00	6.60E+00	4.80E+00
	ISOPROPYLBENZENE	98-82-8	ug/l	3 : 3	8.70E-01	6.30E+00	3.99E+00
	LEAD	7439-92-1	ug/l	1 : 3	2.92E+01	2.92E+01	2.92E+01
	METHYL ACETATE	79-20-9	ug/l	1 : 3	3.10E+00	3.10E+00	3.10E+00
	METHYLCYCLOHEXANE	108-87-2	ug/l	2 : 3	9.50E-01	1.40E+00	1.17E+00
	METHYLENE CHLORIDE	75-09-2	ug/l	1 : 3	1.70E+00	1.70E+00	1.70E+00
	NAPHTHALENE	91-20-3	ug/l	3 : 3	6.80E+01	1.00E+02	8.87E+01

Table 2-2
Summary Statistics for Constituents Detected in Groundwater (GSI Wells)
BASF North Works Facility

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)
	NICKEL	7440-02-0	ug/l	2 : 3	2.27E+01	3.06E+01	2.66E+01
	PHENANTHRENE	85-01-8	ug/l	3 : 3	4.90E+00	9.10E+00	6.67E+00
	PHENOL	108-95-2	ug/l	3 : 3	3.90E+01	2.50E+02	1.30E+02
	PYRENE	129-00-0	ug/l	2 : 3	1.00E+00	2.10E+00	1.55E+00
	SULFATE	14808-79-8	ug/L	1 : 1	3.60E+03	3.60E+03	3.60E+03
	TOLUENE	108-88-3	ug/l	3 : 3	8.70E+00	2.70E+01	1.99E+01
	Total HMW PAHs	Total HMW	ug/l	2 : 3	2.40E+00	4.70E+00	3.55E+00
	Total LMW PAHs	Total LMW	ug/l	3 : 3	1.44E+02	2.15E+02	1.85E+02
	TOTAL METHYLPHENOL	TOTAL	ug/l	3 : 3	2.00E+01	2.40E+02	9.33E+01
	TOTAL PAHs	Total PAHs	ug/l	3 : 3	1.49E+02	2.95E+02	2.20E+02
	TOTAL XYLENES	TOTAL	ug/l	3 : 3	1.50E+01	8.40E+01	5.67E+01
	VINYL CHLORIDE	75-01-4	ug/l	1 : 3	3.60E-01	3.60E-01	3.60E-01
	XYLENES	1330-20-7	ug/l	3 : 3	1.50E+01	8.40E+01	5.67E+01
	ZINC	7440-66-6	ug/l	2 : 3	7.00E+00	8.64E+01	4.67E+01
RFI-MW9							
	1,4-DIOXANE	123-91-1	ug/l	2 : 4	1.50E+00	1.50E+00	1.50E+00
	ACETONE	67-64-1	ug/l	1 : 4	1.80E+00	1.80E+00	1.80E+00
	ARSENIC	7440-38-2	ug/l	4 : 4	1.81E+01	2.15E+01	2.01E+01
	BARIUM	7440-39-3	ug/l	4 : 4	1.36E+02	1.49E+02	1.43E+02
	BENZALDEHYDE	100-52-7	ug/l	1 : 4	9.10E-01	9.10E-01	9.10E-01
	BIS(2-ETHYLHEXYL) PHTHALATE	117-81-7	ug/l	3 : 4	1.40E+00	1.70E+00	1.57E+00
	CADMIUM	7440-43-9	ug/l	1 : 4	4.50E-01	4.50E-01	4.50E-01
	CAPROLACTAM	105-60-2	ug/l	2 : 4	7.20E-01	1.50E+00	1.11E+00
	CHLORIDE	16887-00-6	ug/L	2 : 2	5.85E+06	6.59E+06	6.22E+06
	CHLOROMETHANE	74-87-3	ug/l	1 : 4	2.20E-01	2.20E-01	2.20E-01
	CHROMIUM	7440-47-3	ug/l	1 : 4	4.10E+00	4.10E+00	4.10E+00
	DISSOLVED ORGANIC CARBON	DOC	ug/L	1 : 1	6.00E+03	6.00E+03	6.00E+03
	METHYLENE CHLORIDE	75-09-2	ug/l	1 : 4	6.70E-01	6.70E-01	6.70E-01
	NICKEL	7440-02-0	ug/l	2 : 4	1.60E+00	2.40E+00	2.00E+00
	SULFATE	14808-79-8	ug/L	2 : 2	4.41E+05	4.89E+05	4.65E+05
	THALLIUM	7440-28-0	ug/l	1 : 4	5.60E+00	5.60E+00	5.60E+00

Table 2-2
Summary Statistics for Constituents Detected in Groundwater (GSI Wells)
BASF North Works Facility

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)
	TOTAL CYANIDE	57-12-5	ug/L	1 : 1	6.30E+00	6.30E+00	6.30E+00
RFI-MW9F							
	2-BUTANONE	78-93-3	ug/l	1 : 4	7.10E-01	7.10E-01	7.10E-01
	2-METHYLNAPHTHALENE	91-57-6	ug/l	1 : 4	2.35E-01	2.35E-01	2.35E-01
	4-METHYL-2-PENTANONE (MIBK)	108-10-1	ug/l	1 : 4	6.20E-01	6.20E-01	6.20E-01
	ACETONE	67-64-1	ug/l	1 : 4	2.50E+00	2.50E+00	2.50E+00
	ARSENIC	7440-38-2	ug/l	3 : 4	8.40E+00	1.22E+01	9.73E+00
	BARIUM	7440-39-3	ug/l	3 : 4	3.90E+00	9.20E+00	5.90E+00
	BIS(2-ETHYLHEXYL) PHTHALATE	117-81-7	ug/l	2 : 4	1.95E+00	2.30E+00	2.13E+00
	CAPROLACTAM	105-60-2	ug/l	3 : 4	1.02E+00	2.50E+01	9.07E+00
	CHLORIDE	16887-00-6	ug/L	1 : 1	1.40E+05	1.40E+05	1.40E+05
	CHLOROFORM	67-66-3	ug/l	4 : 4	1.70E-01	5.85E-01	3.16E-01
	CHROMIUM	7440-47-3	ug/l	3 : 4	1.70E+00	2.70E+00	2.07E+00
	DISSOLVED ORGANIC CARBON	DOC	ug/L	1 : 1	4.00E+03	4.00E+03	4.00E+03
	FLUORANTHENE	206-44-0	ug/l	2 : 4	1.90E-01	2.15E-01	2.03E-01
	NAPHTHALENE	91-20-3	ug/l	1 : 4	1.50E+00	1.50E+00	1.50E+00
	NICKEL	7440-02-0	ug/l	2 : 4	1.80E+00	2.90E+00	2.35E+00
	PENTACHLOROPHENOL	87-86-5	ug/l	1 : 4	9.20E-01	9.20E-01	9.20E-01
	PHENANTHRENE	85-01-8	ug/l	3 : 4	2.50E-01	4.75E-01	3.68E-01
	PHENOL	108-95-2	ug/l	2 : 4	1.80E+00	2.00E+00	1.90E+00
	PYRENE	129-00-0	ug/l	2 : 4	2.10E-01	2.30E-01	2.20E-01
	SELENIUM	7782-49-2	ug/l	1 : 4	4.40E+00	4.40E+00	4.40E+00
	SULFATE	14808-79-8	ug/L	1 : 1	7.87E+04	7.87E+04	7.87E+04
	TETRACHLOROETHENE	127-18-4	ug/l	4 : 4	1.65E+00	2.50E+00	2.11E+00
	TOLUENE	108-88-3	ug/l	2 : 4	1.80E-01	6.10E-01	3.95E-01
	TOTAL CYANIDE	57-12-5	ug/L	1 : 1	6.90E+00	6.90E+00	6.90E+00
	Total HMW PAHs	Total HMW	ug/l	2 : 4	4.20E-01	4.25E-01	4.22E-01
	Total LMW PAHs	Total LMW	ug/l	3 : 4	2.21E+00	2.04E+01	1.43E+01
	TOTAL PAHs	Total PAHs	ug/l	3 : 4	2.63E+00	4.04E+01	2.12E+01
	TRICHLOROETHENE	79-01-6	ug/l	1 : 4	3.40E-01	3.40E-01	3.40E-01
	VANADIUM	7440-62-2	ug/l	3 : 4	1.54E+01	1.73E+01	1.63E+01

Table 2-2
Summary Statistics for Constituents Detected in Groundwater (GSI Wells)
BASF North Works Facility

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)
RFI-MW9I							
	2-BUTANONE	78-93-3	ug/l	2 : 4	1.40E+00	3.10E+00	2.25E+00
	2-HEXANONE	591-78-6	ug/l	2 : 4	4.30E-01	4.70E-01	4.50E-01
	2-METHYLNAPHTHALENE	91-57-6	ug/l	3 : 4	1.90E+00	1.60E+01	7.60E+00
	3-METHYLPHENOL	108-39-4	ug/l	1 : 1	3.70E+01	3.70E+01	3.70E+01
	3-METHYLPHENOL & 4-METHYLPHENOL	65794-96-9	ug/l	3 : 3	2.00E+01	3.40E+01	2.52E+01
	4-METHYL-2-PENTANONE (MIBK)	108-10-1	ug/l	2 : 4	9.50E-01	1.40E+00	1.17E+00
	4-METHYLPHENOL	106-44-5	ug/l	1 : 1	3.70E+01	3.70E+01	3.70E+01
	ACENAPHTHENE	83-32-9	ug/l	2 : 4	2.50E+00	3.00E+00	2.75E+00
	ACENAPHTHYLENE	208-96-8	ug/l	2 : 4	1.20E+00	1.10E+01	6.10E+00
	ACETONE	67-64-1	ug/l	1 : 4	1.90E+01	1.90E+01	1.90E+01
	ANTHRACENE	120-12-7	ug/l	3 : 4	2.15E+00	4.60E+00	3.02E+00
	ARSENIC	7440-38-2	ug/l	3 : 4	5.60E+00	1.41E+01	9.55E+00
	BARIUM	7440-39-3	ug/l	4 : 4	6.35E+01	1.07E+02	8.60E+01
	BENZENE	71-43-2	ug/l	4 : 4	7.00E-01	1.60E+00	9.91E-01
	BERYLLIUM	7440-41-7	ug/l	1 : 3	3.60E-01	3.60E-01	3.60E-01
	CARBON DISULFIDE	75-15-0	ug/l	4 : 4	1.10E+00	2.90E+00	1.66E+00
	CHLORIDE	16887-00-6	ug/L	2 : 2	3.17E+06	3.36E+06	3.27E+06
	CHROMIUM	7440-47-3	ug/l	1 : 3	2.30E+00	2.30E+00	2.30E+00
	CYCLOHEXANE	110-82-7	ug/l	3 : 4	3.20E-01	3.70E-01	3.43E-01
	DIBENZOFURAN	132-64-9	ug/l	2 : 4	2.80E+00	4.90E+00	3.85E+00
	DISSOLVED ORGANIC CARBON	DOC	ug/L	1 : 1	3.70E+04	3.70E+04	3.70E+04
	ETHYLBENZENE	100-41-4	ug/l	1 : 4	2.20E-01	2.20E-01	2.20E-01
	FLUORANTHENE	206-44-0	ug/l	2 : 4	1.60E+00	4.60E+00	3.10E+00
	FLUORENE	86-73-7	ug/l	3 : 4	2.50E+00	7.70E+00	5.17E+00
	ISOPROPYLBENZENE	98-82-8	ug/l	2 : 4	2.20E-01	8.90E-01	5.55E-01
	LEAD	7439-92-1	ug/l	1 : 4	1.80E+00	1.80E+00	1.80E+00
	METHYL ACETATE	79-20-9	ug/l	1 : 4	9.60E-01	9.60E-01	9.60E-01
	METHYLCYCLOHEXANE	108-87-2	ug/l	1 : 4	5.70E-01	5.70E-01	5.70E-01
	METHYLENE CHLORIDE	75-09-2	ug/l	3 : 4	2.05E+00	9.60E+00	4.68E+00
	NAPHTHALENE	91-20-3	ug/l	4 : 4	6.30E+00	9.90E+01	3.16E+01

Table 2-2
Summary Statistics for Constituents Detected in Groundwater (GSI Wells)
BASF North Works Facility

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)
	NICKEL	7440-02-0	ug/l	4 : 4	1.41E+01	2.44E+01	2.00E+01
	PHENANTHRENE	85-01-8	ug/l	4 : 4	6.70E+00	8.60E+00	7.88E+00
	PHENOL	108-95-2	ug/l	4 : 4	7.65E+01	2.70E+02	1.79E+02
	PYRENE	129-00-0	ug/l	2 : 4	1.50E+00	3.50E+00	2.50E+00
	SELENIUM	7782-49-2	ug/l	1 : 3	3.10E+00	3.10E+00	3.10E+00
	SULFATE	14808-79-8	ug/L	2 : 2	1.97E+05	2.03E+05	2.00E+05
	THALLIUM	7440-28-0	ug/l	1 : 3	5.30E+00	5.30E+00	5.30E+00
	TOLUENE	108-88-3	ug/l	4 : 4	2.70E+00	3.90E+00	3.24E+00
	TOTAL CYANIDE	57-12-5	ug/L	1 : 1	3.40E+01	3.40E+01	3.40E+01
	Total HMW PAHs	Total HMW	ug/l	2 : 4	3.10E+00	8.10E+00	5.60E+00
	Total LMW PAHs	Total LMW	ug/l	4 : 4	7.09E+01	2.89E+02	1.45E+02
	TOTAL METHYLPHENOL	TOTAL	ug/l	4 : 4	2.00E+01	7.40E+01	3.74E+01
	TOTAL PAHs	Total PAHs	ug/l	4 : 4	7.40E+01	2.97E+02	1.68E+02
	TOTAL XYLENES	TOTAL	ug/l	4 : 4	8.20E-01	1.50E+01	4.70E+00
	VANADIUM	7440-62-2	ug/l	4 : 4	6.80E+00	2.55E+01	1.44E+01
	XYLENES	1330-20-7	ug/l	4 : 4	8.20E-01	1.50E+01	4.70E+00
	ZINC	7440-66-6	ug/l	1 : 4	9.20E+00	9.20E+00	9.20E+00
WHI6-1F							
	1,1-DICHLOROETHANE	75-34-3	ug/l	1 : 4	2.70E-01	2.70E-01	2.70E-01
	1,4-DIOXANE	123-91-1	ug/l	4 : 4	4.10E+00	4.20E+01	2.04E+01
	ACENAPHTHENE	83-32-9	ug/l	3 : 4	3.60E-01	6.30E-01	4.80E-01
	ACENAPHTHYLENE	208-96-8	ug/l	2 : 4	2.60E-01	4.10E-01	3.35E-01
	ARSENIC	7440-38-2	ug/l	3 : 4	1.19E+01	1.87E+01	1.42E+01
	BARIUM	7440-39-3	ug/l	4 : 4	6.04E+01	5.49E+02	1.85E+02
	BIS(2-CHLOROETHYL) ETHER	111-44-4	ug/l	4 : 4	4.00E+00	3.00E+01	1.68E+01
	BIS(2-ETHYLHEXYL) PHTHALATE	117-81-7	ug/l	1 : 4	4.00E+00	4.00E+00	4.00E+00
	CARBON DISULFIDE	75-15-0	ug/l	2 : 4	3.10E-01	7.10E-01	5.10E-01
	CHLORIDE	16887-00-6	ug/L	2 : 2	1.08E+06	9.51E+06	5.30E+06
	CHLOROMETHANE	74-87-3	ug/l	1 : 4	2.20E-01	2.20E-01	2.20E-01
	CIS-1,2-DICHLOROETHENE	156-59-2	ug/l	1 : 4	5.00E-01	5.00E-01	5.00E-01
	COPPER	7440-50-8	ug/l	1 : 4	2.30E+00	2.30E+00	2.30E+00

Table 2-2
Summary Statistics for Constituents Detected in Groundwater (GSI Wells)
BASF North Works Facility

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)
	DISSOLVED ORGANIC CARBON	DOC	ug/L	1 : 1	1.20E+04	1.20E+04	1.20E+04
	NICKEL	7440-02-0	ug/l	1 : 4	1.60E+00	1.60E+00	1.60E+00
	SELENIUM	7782-49-2	ug/l	1 : 4	2.70E+00	2.70E+00	2.70E+00
	SULFATE	14808-79-8	ug/L	2 : 2	2.05E+05	2.99E+05	2.52E+05
	THALLIUM	7440-28-0	ug/l	2 : 4	5.50E+00	6.20E+00	5.85E+00
	TOTAL CYANIDE	57-12-5	ug/L	1 : 1	3.60E+01	3.60E+01	3.60E+01
	Total LMW PAHs	Total LMW	ug/l	3 : 4	7.10E-01	1.04E+01	4.04E+00
	TOTAL PAHs	Total PAHs	ug/l	3 : 4	7.10E-01	1.04E+01	4.04E+00
	ZINC	7440-66-6	ug/l	2 : 4	7.40E+00	2.43E+01	1.59E+01
WHI6-1S							
	1,4-DIOXANE	123-91-1	ug/l	2 : 4	2.80E+00	4.40E+00	3.60E+00
	ACENAPHTHENE	83-32-9	ug/l	1 : 4	5.30E-01	5.30E-01	5.30E-01
	ARSENIC	7440-38-2	ug/l	2 : 4	5.50E+00	1.02E+01	7.85E+00
	BARIUM	7440-39-3	ug/l	4 : 4	3.29E+02	6.77E+02	5.51E+02
	BIS(2-CHLOROETHYL) ETHER	111-44-4	ug/l	4 : 4	3.40E+00	5.50E+00	4.28E+00
	BIS(2-ETHYLHEXYL) PHTHALATE	117-81-7	ug/l	2 : 4	1.70E+00	5.55E+00	3.63E+00
	CARBON DISULFIDE	75-15-0	ug/l	2 : 4	3.90E-01	7.60E-01	5.75E-01
	CHLORIDE	16887-00-6	ug/L	2 : 2	5.21E+06	1.48E+07	1.00E+07
	CHROMIUM	7440-47-3	ug/l	1 : 4	2.20E+00	2.20E+00	2.20E+00
	COBALT	7440-48-4	ug/l	1 : 4	1.20E+00	1.20E+00	1.20E+00
	COPPER	7440-50-8	ug/l	1 : 4	8.50E+00	8.50E+00	8.50E+00
	DISSOLVED ORGANIC CARBON	DOC	ug/L	2 : 2	5.00E+03	1.65E+04	1.08E+04
	LEAD	7439-92-1	ug/l	1 : 4	5.90E+00	5.90E+00	5.90E+00
	NAPHTHALENE	91-20-3	ug/l	1 : 4	3.80E-01	3.80E-01	3.80E-01
	NICKEL	7440-02-0	ug/l	1 : 4	7.40E+00	7.40E+00	7.40E+00
	SELENIUM	7782-49-2	ug/l	1 : 3	2.50E+00	2.50E+00	2.50E+00
	SULFATE	14808-79-8	ug/L	2 : 2	1.76E+05	3.26E+05	2.51E+05
	THALLIUM	7440-28-0	ug/l	3 : 4	5.20E+00	7.20E+00	6.13E+00
	TOTAL CYANIDE	57-12-5	ug/L	1 : 1	2.33E+01	2.33E+01	2.33E+01
	Total LMW PAHs	Total LMW	ug/l	1 : 4	9.10E-01	9.10E-01	9.10E-01
	TOTAL PAHs	Total PAHs	ug/l	1 : 4	9.10E-01	9.10E-01	9.10E-01

Table 2-2
Summary Statistics for Constituents Detected in Groundwater (GSI Wells)
BASF North Works Facility

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)
	VANADIUM	7440-62-2	ug/l	1 : 4	3.60E+00	3.60E+00	3.60E+00
	ZINC	7440-66-6	ug/l	3 : 4	1.31E+01	1.04E+02	6.46E+01
WHI6-2F							
	1,4-DIOXANE	123-91-1	ug/l	2 : 4	2.20E+00	2.20E+00	2.20E+00
	2-BUTANONE	78-93-3	ug/l	3 : 4	6.30E-01	3.40E+00	1.60E+00
	3-METHYLPHENOL & 4-METHYLPHENOL	65794-96-9	ug/l	1 : 3	1.00E+00	1.00E+00	1.00E+00
	ACETONE	67-64-1	ug/l	2 : 4	2.50E+00	5.00E+01	2.63E+01
	ARSENIC	7440-38-2	ug/l	4 : 4	1.50E+01	4.52E+01	3.63E+01
	BARIUM	7440-39-3	ug/l	4 : 4	8.41E+01	2.05E+02	1.17E+02
	BIS(2-CHLOROETHYL) ETHER	111-44-4	ug/l	4 : 4	7.40E+00	1.60E+01	1.29E+01
	BIS(2-CHLOROISOPROPYL) ETHER	108-60-1	ug/l	4 : 4	1.10E+00	1.70E+00	1.50E+00
	BIS(2-ETHYLHEXYL) PHTHALATE	117-81-7	ug/l	1 : 4	8.80E-01	8.80E-01	8.80E-01
	CARBON DISULFIDE	75-15-0	ug/l	1 : 4	5.70E-01	5.70E-01	5.70E-01
	CHLORIDE	16887-00-6	ug/L	2 : 2	5.04E+05	5.98E+05	5.51E+05
	CHLOROMETHANE	74-87-3	ug/l	1 : 4	3.00E-01	3.00E-01	3.00E-01
	CYCLOHEXANE	110-82-7	ug/l	2 : 4	1.40E-01	5.00E-01	3.20E-01
	DISSOLVED ORGANIC CARBON	DOC	ug/L	2 : 2	1.40E+04	1.60E+04	1.50E+04
	METHYLCYCLOHEXANE	108-87-2	ug/l	1 : 4	5.60E-01	5.60E-01	5.60E-01
	NICKEL	7440-02-0	ug/l	2 : 4	1.70E+00	1.80E+00	1.75E+00
	PHENOL	108-95-2	ug/l	2 : 4	9.70E+00	1.70E+01	1.34E+01
	SULFATE	14808-79-8	ug/L	2 : 2	1.03E+05	1.53E+05	1.28E+05
	THALLIUM	7440-28-0	ug/l	1 : 4	5.60E+00	5.60E+00	5.60E+00
	TOTAL CYANIDE	57-12-5	ug/L	1 : 1	3.40E+01	3.40E+01	3.40E+01
	TOTAL METHYLPHENOL	TOTAL	ug/l	1 : 4	1.00E+00	1.00E+00	1.00E+00
	VANADIUM	7440-62-2	ug/l	1 : 4	2.70E+00	2.70E+00	2.70E+00
	ZINC	7440-66-6	ug/l	1 : 4	6.70E+00	6.70E+00	6.70E+00
WHI6-2S							
	2-BUTANONE	78-93-3	ug/l	2 : 4	7.40E-01	1.60E+00	1.17E+00
	2-METHYLNAPHTHALENE	91-57-6	ug/l	1 : 4	6.10E+00	6.10E+00	6.10E+00
	3-METHYLPHENOL	108-39-4	ug/l	1 : 1	2.90E+00	2.90E+00	2.90E+00
	4-METHYLPHENOL	106-44-5	ug/l	1 : 1	2.90E+00	2.90E+00	2.90E+00

Table 2-2
Summary Statistics for Constituents Detected in Groundwater (GSI Wells)
BASF North Works Facility

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)
	ACENAPHTHENE	83-32-9	ug/l	1 : 4	1.10E+00	1.10E+00	1.10E+00
	ACENAPHTHYLENE	208-96-8	ug/l	1 : 4	1.50E+00	1.50E+00	1.50E+00
	ACETONE	67-64-1	ug/l	1 : 4	5.40E+00	5.40E+00	5.40E+00
	ANTHRACENE	120-12-7	ug/l	1 : 4	6.30E+00	6.30E+00	6.30E+00
	ARSENIC	7440-38-2	ug/l	4 : 4	4.70E+00	2.46E+01	1.01E+01
	BAP-TE	BAP-TE	ug/l	2 : 4	7.56E+00	1.12E+01	9.36E+00
	BARIUM	7440-39-3	ug/l	4 : 4	2.95E+02	3.96E+02	3.55E+02
	BENZO(A)ANTHRACENE	56-55-3	ug/l	2 : 4	2.70E-01	7.80E+00	4.04E+00
	BENZO(A)PYRENE	50-32-8	ug/l	1 : 4	5.60E+00	5.60E+00	5.60E+00
	BENZO(B)FLUORANTHENE	205-99-2	ug/l	2 : 4	2.50E-01	8.00E+00	4.13E+00
	BENZO(GHI)PERYLENE	191-24-2	ug/l	1 : 4	4.10E+00	4.10E+00	4.10E+00
	BENZO(K)FLUORANTHENE	207-08-9	ug/l	1 : 4	2.40E+00	2.40E+00	2.40E+00
	BERYLLIUM	7440-41-7	ug/l	1 : 4	1.60E+00	1.60E+00	1.60E+00
	BIS(2-CHLOROETHYL) ETHER	111-44-4	ug/l	1 : 4	1.50E+01	1.50E+01	1.50E+01
	BIS(2-ETHYLHEXYL) PHTHALATE	117-81-7	ug/l	2 : 4	2.00E+00	6.00E+00	4.00E+00
	CADMIUM	7440-43-9	ug/l	2 : 4	4.60E-01	7.80E-01	6.20E-01
	CARBAZOLE	86-74-8	ug/l	1 : 4	2.80E+00	2.80E+00	2.80E+00
	CARBON DISULFIDE	75-15-0	ug/l	1 : 4	3.30E-01	3.30E-01	3.30E-01
	CHLORIDE	16887-00-6	ug/L	2 : 2	4.68E+05	5.00E+05	4.84E+05
	CHROMIUM	7440-47-3	ug/l	4 : 4	1.49E+01	7.70E+01	3.41E+01
	CHRYSENE	218-01-9	ug/l	2 : 4	2.40E-01	9.10E+00	4.67E+00
	COBALT	7440-48-4	ug/l	3 : 4	4.60E+00	2.26E+01	1.08E+01
	COPPER	7440-50-8	ug/l	4 : 4	1.09E+01	7.50E+01	2.97E+01
	DIBENZOFURAN	132-64-9	ug/l	1 : 4	5.80E+00	5.80E+00	5.80E+00
	DI-N-OCTYL PHTHALATE	117-84-0	ug/l	1 : 4	1.30E+00	1.30E+00	1.30E+00
	DISSOLVED ORGANIC CARBON	DOC	ug/L	2 : 2	7.00E+03	1.50E+04	1.10E+04
	FLUORANTHENE	206-44-0	ug/l	3 : 4	4.50E-01	2.70E+01	9.39E+00
	FLUORENE	86-73-7	ug/l	1 : 4	3.70E+00	3.70E+00	3.70E+00
	INDENO(1,2,3-CD)PYRENE	193-39-5	ug/l	1 : 4	3.50E+00	3.50E+00	3.50E+00
	LEAD	7439-92-1	ug/l	4 : 4	4.60E+00	4.16E+01	1.61E+01
	NAPHTHALENE	91-20-3	ug/l	1 : 4	6.90E+00	6.90E+00	6.90E+00

Table 2-2
Summary Statistics for Constituents Detected in Groundwater (GSI Wells)
BASF North Works Facility

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)
	NICKEL	7440-02-0	ug/l	3 : 4	1.72E+01	8.23E+01	3.95E+01
	PHENANTHRENE	85-01-8	ug/l	2 : 4	2.90E-01	2.20E+01	1.11E+01
	PYRENE	129-00-0	ug/l	3 : 4	3.70E-01	2.30E+01	7.99E+00
	SELENIUM	7782-49-2	ug/l	1 : 4	2.70E+00	2.70E+00	2.70E+00
	SULFATE	14808-79-8	ug/L	2 : 2	1.73E+04	3.89E+04	2.81E+04
	THALLIUM	7440-28-0	ug/l	1 : 4	4.70E+00	4.70E+00	4.70E+00
	TOLUENE	108-88-3	ug/l	1 : 4	4.40E-01	4.40E-01	4.40E-01
	Total Carcinogenic PAHs	Total cPAHs	ug/l	2 : 4	3.08E+01	3.64E+01	3.36E+01
	Total HMW PAHs	Total HMW	ug/l	3 : 4	4.21E+01	9.05E+01	6.78E+01
	Total LMW PAHs	Total LMW	ug/l	2 : 4	4.76E+01	6.03E+01	5.39E+01
	TOTAL METHYLPHENOL	TOTAL	ug/l	1 : 4	5.80E+00	5.80E+00	5.80E+00
	TOTAL PAHs	Total PAHs	ug/l	3 : 4	1.02E+02	1.41E+02	1.27E+02
	VANADIUM	7440-62-2	ug/l	4 : 4	1.81E+01	1.06E+02	4.57E+01
	ZINC	7440-66-6	ug/l	4 : 4	5.11E+01	5.52E+02	1.98E+02
WHI6-4F							
	ARSENIC	7440-38-2	ug/l	3 : 4	4.58E+01	9.30E+01	6.27E+01
	BARIUM	7440-39-3	ug/l	4 : 4	6.70E+01	2.65E+03	7.35E+02
	BIS(2-CHLOROETHYL) ETHER	111-44-4	ug/l	4 : 4	6.40E-01	6.80E+00	3.91E+00
	BIS(2-CHLOROISOPROPYL) ETHER	108-60-1	ug/l	3 : 4	8.20E-01	9.50E-01	8.77E-01
	CADMIUM	7440-43-9	ug/l	1 : 4	6.10E-01	6.10E-01	6.10E-01
	CHLORIDE	16887-00-6	ug/L	2 : 2	4.72E+05	7.65E+05	6.19E+05
	DISSOLVED ORGANIC CARBON	DOC	ug/L	2 : 2	1.20E+04	1.20E+04	1.20E+04
	NICKEL	7440-02-0	ug/l	1 : 4	2.10E+00	2.10E+00	2.10E+00
	SULFATE	14808-79-8	ug/L	2 : 2	1.05E+05	1.68E+05	1.37E+05
	THALLIUM	7440-28-0	ug/l	1 : 4	6.70E+00	6.70E+00	6.70E+00
	TOTAL CYANIDE	57-12-5	ug/L	1 : 1	2.00E+01	2.00E+01	2.00E+01
WHI6-4S							
	1,4-DIOXANE	123-91-1	ug/l	2 : 4	1.40E+00	1.80E+00	1.60E+00
	ACENAPHTHENE	83-32-9	ug/l	3 : 4	5.00E-01	1.30E+00	9.33E-01
	ARSENIC	7440-38-2	ug/l	1 : 4	2.34E+01	2.34E+01	2.34E+01
	BAP-TE	BAP-TE	ug/l	1 : 4	7.80E-02	7.80E-02	7.80E-02

Table 2-2
Summary Statistics for Constituents Detected in Groundwater (GSI Wells)
BASF North Works Facility

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)
	BARIUM	7440-39-3	ug/l	4 : 4	1.14E+02	2.67E+03	1.70E+03
	BENZO(B)FLUORANTHENE	205-99-2	ug/l	1 : 4	7.80E-01	7.80E-01	7.80E-01
	BIS(2-CHLOROETHYL) ETHER	111-44-4	ug/l	4 : 4	1.20E+00	6.60E+00	3.53E+00
	BIS(2-ETHYLHEXYL) PHTHALATE	117-81-7	ug/l	1 : 4	3.50E+00	3.50E+00	3.50E+00
	BUTYL BENZYL PHTHALATE	85-68-7	ug/l	1 : 4	1.20E+00	1.20E+00	1.20E+00
	CADMIUM	7440-43-9	ug/l	2 : 4	5.00E-01	5.10E-01	5.05E-01
	CARBON DISULFIDE	75-15-0	ug/l	1 : 4	3.10E-01	3.10E-01	3.10E-01
	CHLORIDE	16887-00-6	ug/L	2 : 2	3.57E+06	3.78E+06	3.68E+06
	CHLOROFORM	67-66-3	ug/l	1 : 4	1.80E-01	1.80E-01	1.80E-01
	CHLOROMETHANE	74-87-3	ug/l	1 : 4	2.10E-01	2.10E-01	2.10E-01
	DI-N-OCTYL PHTHALATE	117-84-0	ug/l	1 : 4	1.60E+00	1.60E+00	1.60E+00
	DISSOLVED ORGANIC CARBON	DOC	ug/L	2 : 2	3.00E+03	1.20E+04	7.50E+03
	NICKEL	7440-02-0	ug/l	2 : 4	3.00E+00	1.92E+01	1.11E+01
	SULFATE	14808-79-8	ug/L	2 : 2	5.70E+02	1.10E+03	8.35E+02
	THALLIUM	7440-28-0	ug/l	3 : 4	6.30E+00	8.00E+00	6.90E+00
	Total Carcinogenic PAHs	Total cPAHs	ug/l	1 : 4	7.80E-01	7.80E-01	7.80E-01
	Total HMW PAHs	Total HMW	ug/l	1 : 4	7.80E-01	7.80E-01	7.80E-01
	Total LMW PAHs	Total LMW	ug/l	3 : 4	5.00E-01	1.30E+00	9.33E-01
	TOTAL PAHs	Total PAHs	ug/l	3 : 4	2.08E+00	1.10E+01	7.86E+00

Notes:

CAS - Chemical Abstract Service.
(a) Only chemicals with at least one positively detected result are reported.
(b) Frequency of detection - Number of detected samples: Number of total samples.
(c) Minimum detected concentration for each chemical, after duplicates have been averaged.
(d) Maximum detected concentration for each chemical, after duplicates have been averaged.
(e) Arithmetic mean concentration for each chemical, after duplicates have been averaged. Only detected results included.

Table 2-3
GSI Monitoring Wells
BASF North Works Facility
Wyandotte, Michigan
Tier 2 Risk Evaluation

CMS-MW-2
RFI-MW-22
WHI-6-1S
WHI-6-1F
WHI-6-2S
WHI-6-2F
WHI-6-4S
WHI-6-4F
RFI-MW-4
RFI-MW-5
RFI-MW-6
RFI-MW-7F
RFI-MW-7I
RFI-MW-8
RFI-MW-8F
RFI-MW-8I
RFI-MW-9
RFI-MW-9F
RFI-MW-9I
RFI-MW-10
RFI-MW-10F
RFI-MW-10I
RFI-MW-11
RFI-MW-11F
RFI-MW-12
RFI-MW-12F

Table 2-4
Summary of Soil Samples by SWMU/AOC
BASF North Works Facility
Wyandotte, Michigan

Area	Location Code	Sample Code	Sample Date	Duplicate?	Sample Depth (ft)
AOC 1	GTI SB-1	SG005SB-1 5/1/1992	5/1/1992	N	NA
AOC 1	GTI SB-1	SG015SB-1 5/1/1992	5/1/1992	N	NA
AOC 1	GTI SB-1	SG019SB-1 5/1/1992	5/1/1992	N	NA
AOC 1	GTI SB-10	SG005SB-10 5/1/1992	5/1/1992	N	NA
AOC 1	GTI SB-10	SG011SB-10 5/1/1992	5/1/1992	N	NA
AOC 1	GTI SB-10	SG023SB-10 5/1/1992	5/1/1992	N	NA
AOC 1	GTI SB-11	SG003SB-11 5/1/1992	5/1/1992	N	NA
AOC 1	GTI SB-11	SG013SB-11 5/1/1992	5/1/1992	N	NA
AOC 1	GTI SB-11	SG017SB-11 5/1/1992	5/1/1992	N	NA
AOC 1	GTI SB-12	SG007SB-12 5/1/1992	5/1/1992	N	NA
AOC 1	GTI SB-12	SG015SB-12 5/1/1992	5/1/1992	N	NA
AOC 1	GTI SB-12	SG021SB-12 5/1/1992	5/1/1992	N	NA
AOC 1	GTI SB-13	SG005SB-13 5/1/1992	5/1/1992	N	NA
AOC 1	GTI SB-13	SG011SB-13 5/1/1992	5/1/1992	N	NA
AOC 1	GTI SB-13	SG025SB-13 5/1/1992	5/1/1992	N	NA
AOC 1	GTI SB-14	SG005SB-14 5/1/1992	5/1/1992	N	NA
AOC 1	GTI SB-14	SG009SB-14 5/1/1992	5/1/1992	N	NA
AOC 1	GTI SB-14	SG025SB-14 5/1/1992	5/1/1992	N	NA
AOC 1	GTI SB-15	SG005SB-15 5/1/1992	5/1/1992	N	NA
AOC 1	GTI SB-15	SG007SB-15 5/1/1992	5/1/1992	N	NA
AOC 1	GTI SB-15	SG015SB-15 5/1/1992	5/1/1992	N	NA
AOC 1	GTI SB-16	SG003SB-16 5/1/1992	5/1/1992	N	NA
AOC 1	GTI SB-16	SG007SB-16 5/1/1992	5/1/1992	N	NA
AOC 1	GTI SB-16	SG013SB-16 5/1/1992	5/1/1992	N	NA
AOC 1	GTI SB-17	SG011SB-17 5/1/1992	5/1/1992	N	NA
AOC 1	GTI SB-17	SG017SB-17 5/1/1992	5/1/1992	N	NA
AOC 1	GTI SB-17	SG023SB-17 5/1/1992	5/1/1992	N	NA
AOC 1	GTI SB-18	SG009SB-18 5/1/1992	5/1/1992	N	NA
AOC 1	GTI SB-18	SG019SB-18 5/1/1992	5/1/1992	N	NA
AOC 1	GTI SB-18	SG025SB-18 5/1/1992	5/1/1992	N	NA
AOC 1	GTI SB-2	SG001SB-2 5/1/1992	5/1/1992	N	NA
AOC 1	GTI SB-2	SG005SB-2 5/1/1992	5/1/1992	N	NA
AOC 1	GTI SB-2	SG015SB-2 5/1/1992	5/1/1992	N	NA
AOC 1	GTI SB-3	SG001SB-3 5/1/1992	5/1/1992	N	NA
AOC 1	GTI SB-3	SG011SB-3 5/1/1992	5/1/1992	N	NA
AOC 1	GTI SB-4	SG001SB-4 5/1/1992	5/1/1992	N	NA
AOC 1	GTI SB-4	SG005SB-4 5/1/1992	5/1/1992	N	NA
AOC 1	GTI SB-4	SG011SB-4 5/1/1992	5/1/1992	N	NA
AOC 1	GTI SB-5	SG001SB-5 5/1/1992	5/1/1992	N	NA
AOC 1	GTI SB-5	SG005SB-5 5/1/1992	5/1/1992	N	NA
AOC 1	GTI SB-5	SG009SB-5 5/1/1992	5/1/1992	N	NA
AOC 1	GTI SB-6	SG001SB-6 5/1/1992	5/1/1992	N	NA
AOC 1	GTI SB-6	SG003SB-6 5/1/1992	5/1/1992	N	NA
AOC 1	GTI SB-6	SG021SB-6 5/1/1992	5/1/1992	N	NA
AOC 1	GTI SB-7	SG003SB-7 5/1/1992	5/1/1992	N	NA
AOC 1	GTI SB-7	SG009SB-7 5/1/1992	5/1/1992	N	NA
AOC 1	GTI SB-7	SG013SB-7 5/1/1992	5/1/1992	N	NA
AOC 1	GTI SB-8	SG003SB-8 5/1/1992	5/1/1992	N	NA
AOC 1	GTI SB-8	SG011SB-8 5/1/1992	5/1/1992	N	NA
AOC 1	GTI SB-8	SG017SB-8 5/1/1992	5/1/1992	N	NA
AOC 1	GTI SB-9	SG003SB-9 5/1/1992	5/1/1992	N	NA
AOC 1	GTI SB-9	SG017SB-9 5/1/1992	5/1/1992	N	NA
AOC 1	GTI SB-9	SG021SB-9 5/1/1992	5/1/1992	N	NA
AOC 2	AOC-2-GP-1	AOC2-GP-1(2)	7/26/2006	N	0-2
AOC 2	AOC-2-GP-2	AOC2-GP-2(2)	7/26/2006	N	0-2
AOC 2	SG001AOC2-6	SG001AOC2-6 8/21/1996	8/21/1996	N	NA
AOC 2	SG001AOC2-6	SG001AOC2-6 DUP 8/21/1996	8/21/1996	FD	NA
AOC 2	SG001AOC2-8	SG001AOC2-8 8/21/1996	8/21/1996	N	NA

Area	Location Code	Sample Code	Sample Date	Duplicate?	Sample Depth (ft)
AOC 2	SG002AOC2-4	SG-002-AOC2-4 8/20/1996	8/20/1996	N	NA
AOC 2	SG002AOC2-5	SG002AOC2-5 8/21/1996	8/21/1996	N	NA
AOC 2	SG003AOC2-1	SG-003-AOC2-1 8/20/1996	8/20/1996	N	NA
AOC 2	SG003AOC2-2	SG-003-AOC2-2 8/20/1996	8/20/1996	N	NA
AOC 2	SG005AOC2-7	SG005AOC2-7 (MS/MSD) 8/21/1996	8/21/1996	N	NA
AOC 2	SG008AOC2-3	SG-008-AOC2-3 8/20/1996	8/20/1996	N	NA
AOC 4	SG001AOC4-2	SG-001-AOC4-2 8/20/1996	8/20/1996	N	NA
AOC 4	SG003AOC4-1	SG-003-AOC4-1 8/20/1996	8/20/1996	N	NA
AOC 5	AOC5-MIP-06	AOC5-MIP-6 (19-20)	9/21/2006	N	19-20
AOC 5	AOC5-MIP-06	AOC5-MIP-6 (21-22)	9/21/2006	N	21-22
AOC 5	AOC5-MIP-06	AOC5-MIP-6 (2-3)	9/21/2006	N	2-3
AOC 6	AOC6-SS-1	AOC6-SS-1	5/9/2007	N	0-0.5
AOC 6	AOC6-SS-10	AOC6-SS-10	5/9/2007	N	0-1
AOC 6	AOC6-SS-2	AOC6-SS-2	5/9/2007	N	0-1
AOC 6	AOC6-SS-3	AOC6-SS-3	5/9/2007	N	0-0.5
AOC 6	AOC6-SS-4	AOC6-SS-4	5/9/2007	N	0-1.5
AOC 6	AOC6-SS-5	AOC6-SS-5	5/9/2007	N	0-0.5
AOC 6	AOC6-SS-6	AOC6-SS-6	5/9/2007	N	0-1.5
AOC 6	AOC6-SS-6	AOC6-SS-6D	5/9/2007	FD	0-1.5
AOC 6	AOC6-SS-7	AOC6-SS-7	5/9/2007	N	0-1
AOC 6	AOC6-SS-8	AOC6-SS-8	5/9/2007	N	0-0.5
AOC 6	AOC6-SS-9	AOC6-SS-9	5/9/2007	N	0-1
AOC 6	SP54-AOC-6	SG002AOC6SP54 (MS/MSD) 8/14/199	8/14/1996	N	NA
AOC 6	SP54B-AOC-6	SG002A0C6SP54B 9/25/1996	9/25/1996	N	NA
AOC 6	SP55A-AOC-6	SG002A0C6SP55A 9/25/1996	9/25/1996	N	NA
AOC 6	SP55-AOC-6	SG002AOC6SP55 8/14/1996	8/14/1996	N	NA
AOC 6	SP58-AOC-6	SG002A0C6SP58 8/15/1996	8/15/1996	N	NA
AOC 6	SP61A-AOC-6	SG002A0C6SP61A 9/25/1996	9/25/1996	N	NA
AOC 6	SP61-AOC-6	SG004A0C6SP61 8/15/1996	8/15/1996	N	NA
AOC 6	SP62A-AOC-6	SG002A0C6SP62A 9/25/1996	9/25/1996	N	NA
AOC 6	SP62-AOC-6	SG004A0C6SP62 8/15/1996	8/15/1996	N	NA
AOC 6	SP63-AOC-6	SG002A0C6SP63 8/15/1996	8/15/1996	N	NA
AOC 6	SP64-AOC-6	G002A0C6SP64 (FIELD DUP) 8/15/19	8/15/1996	FD	NA
AOC 6	SP64-AOC-6	SG002A0C6SP64 8/15/1996	8/15/1996	N	NA
AOC 6	SP65-AOC-6	SG002A0C6SP65 8/15/1996	8/15/1996	N	NA
AOC 7A	SP01-AOC-7A	SG002AOC-7SP01C 8/22/1996	8/22/1996	N	NA
AOC 7A	SP01-AOC-7A	SG003AOC-7SP01D 8/22/1996	8/22/1996	N	NA
AOC 7A	SP02-AOC-7A	SG000AOC-7SP02A 8/22/1996	8/22/1996	N	NA
AOC 7A	SP02-AOC-7A	SG001AOC-7SP02B 8/22/1996	8/22/1996	N	NA
AOC 7A	SP02-AOC-7A	SG002AOC-7SP02C 8/22/1996	8/22/1996	N	NA
AOC 7A	SP02-AOC-7A	SG004AOC-7SP02D 8/22/1996	8/22/1996	N	NA
AOC 7A	SP02-AOC-7A	SG006AOC-7SP02E-S 8/22/1996	8/22/1996	N	NA
AOC 7A	SP02-AOC-7A	SG008AOC-7SP02F-S 8/22/1996	8/22/1996	N	NA
AOC 7A	SP02-AOC-7A	SG009AOC-7SP02G-S 8/22/1996	8/22/1996	N	NA
AOC 7A	SP02-AOC-7A	SG010AOC-7SP02H-S 8/22/1996	8/22/1996	N	NA
AOC 7A	SP02-AOC-7A	SG011AOC-7SP02I 8/22/1996	8/22/1996	N	NA
AOC 7A	SP03-AOC-7A	SG002AOC7SP03 8/28/1996	8/28/1996	N	NA
AOC 7A	SP04-AOC-7A	SG003AOC7SP04 8/28/1996	8/28/1996	N	NA
AOC 7A	SP05-AOC-7A	SG003AOC7SP05 8/28/1996	8/28/1996	N	NA
AOC 7A	SP06-AOC-7A	SG003AOC7SP06 8/28/1996	8/28/1996	N	NA
AOC 7A	SP07-AOC-7A	SG002AOC7SP07 8/28/1996	8/28/1996	N	NA
AOC 7A	SP08B-AOC-7A	SG003AOC7SP08B 9/3/1996	9/3/1996	N	NA
AOC 7A	SP08B-AOC-7A	SG003AOC7SP08B DUP 9/3/1996	9/3/1996	FD	NA
AOC 7A	SP09A-AOC-7A	SG003AOC7SP09A (MS/MSD) 9/3/199	9/3/1996	N	NA
AOC 7A	SP10A-AOC-7A	SG004AOC7SP10A 9/3/1996	9/3/1996	N	NA
AOC 7A	SP10A-AOC-7A	SG004AOC7SP10A DUP 9/3/1996	9/3/1996	FD	NA
AOC 7B	AOC-7B	SG002A0C7SP33 9/13/1996	9/13/1996	N	NA
AOC 7B	SP34-AOC-7B	SG005A0C7SP34 9/13/1996	9/13/1996	N	NA
AOC 7B	SP35-AOC-7B	SG002A0C7SP35 9/13/1996	9/13/1996	N	NA
AOC 7B	SP36-AOC-7B	SG003A0C7SP36 9/13/1996	9/13/1996	N	NA
AOC 7C	AOC-7C-GP-1	AOC7C-GP-1(2)	7/26/2006	N	0-2
AOC 7C	AOC-7C-GP-2	AOC7C-GP-2(2)	7/26/2006	N	0-2
AOC 7C	AOC-7C-GP-3	AOC7C-GP-3(2)	7/26/2006	N	0-2

Area	Location Code	Sample Code	Sample Date	Duplicate?	Sample Depth (ft)
AOC 7C	AOC-7C-GP-4	AOC7C-GP-4(2)	7/26/2006	N	0-2
AOC 7C	AOC-7C-GP-5	AOC7C-GP-5(2)	7/26/2006	N	0-2
AOC 7C	AOC-7C-GP-6	AOC7C-GP-6(2)	7/26/2006	N	0-2
AOC 7C	AOC-7C-GP-6	AOC7C-GP-6-F(2)	7/26/2006	N	0-2
AOC 7C	SP37-AOC-7C	SG003A0C7-SP37 8/21/1997	8/21/1997	N	NA
AOC 7C	SP38-AOC-7C	SG003A0C7-SP38 8/21/1997	8/21/1997	N	NA
AOC 7C	SP39-AOC-7C	SG004A0C7-SP39 8/21/1997	8/21/1997	N	NA
AOC 7C	SP40-AOC-7C	SG003A0C7-SP40 8/21/1997	8/21/1997	N	NA
SWMU F	SP01-SWMU-F	SG005SWMUFSP01 8/1/1996	8/1/1996	N	NA
SWMU F	SP02-SWMU-F	SG002SWMUFSP02 8/1/1996	8/1/1996	N	NA
SWMU F	SP03-SWMU-F	SG006SMWUFSP03 7/30/1996	7/30/1996	N	NA
SWMU F	SP04-SWMU-F	SG006SMWUFSP04 7/30/1996	7/30/1996	N	NA
SWMU F	SP06-SWMU-F	SG010SWMUFSP06 8/1/1996	8/1/1996	N	NA
SWMU F	SP07-SWMU-F	SG005SWMUFSP07 8/1/1996	8/1/1996	N	NA
SWMU F	SP08-SWMU-F	SG004SWMUFSP08 8/1/1996	8/1/1996	N	NA
SWMU F	SP09-SWMU-F	G004SWMUFSP09 (MS/MSD) 8/1/199	8/1/1996	N	NA
SWMU F	SP11-SWMU-F	SG006SWMUFSP11 8/1/1996	8/1/1996	N	NA
SWMU F	SP18-SWMU-F	SG011SWMUFSP18 8/1/1996	8/1/1996	N	NA
SWMU F	SWMUF-SS-1	SWMUF-SS-1	5/9/2007	N	0-0.5
SWMU F	SWMUF-SS-10	SWMUF-SS-10	5/9/2007	N	0-1.5
SWMU F	SWMUF-SS-2	SWMUF-SS-2	5/9/2007	N	0-1
SWMU F	SWMUF-SS-3	SWMUF-SS-3	5/9/2007	N	0-1
SWMU F	SWMUF-SS-4	SWMUF-SS-4	5/9/2007	N	0-0.5
SWMU F	SWMUF-SS-4	SWMUF-SS-4D	5/9/2007	FD	0-0.5
SWMU F	SWMUF-SS-5	SWMUF-SS-5	5/9/2007	N	0-0.5
SWMU F	SWMUF-SS-6	SWMUF-SS-6	5/9/2007	N	0-1.5
SWMU F	SWMUF-SS-7	SWMUF-SS-7	5/9/2007	N	0-1
SWMU F	SWMUF-SS-8	SWMUF-SS-8	5/9/2007	N	0-0.5
SWMU F	SWMUF-SS-9	SWMUF-SS-9	5/9/2007	N	0-1.5
SWMU G	SWMUG-1	SS001 SWMUG-1 8/20/1996	8/20/1996	N	0-2
SWMU G	SWMUG-10	SS001 SWMUG-10 8/20/1996	8/20/1996	N	0-2
SWMU G	SWMUG-2	SS001 SWMUG-2 8/20/1996	8/20/1996	N	0-2
SWMU G	SWMUG-3	SS001 SWMUG-3 8/20/1996	8/20/1996	N	0-2
SWMU G	SWMUG-4	SS001 SWMUG-4 8/20/1996	8/20/1996	N	0-2
SWMU G	SWMUG-5	SS001 SWMUG-5 8/20/1996	8/20/1996	N	0-2
SWMU G	SWMUG-6	SS001 SWMUG-6 8/20/1996	8/20/1996	N	0-2
SWMU G	SWMUG-6	SS001 SWMUG-6 DUP 8/20/1996	8/20/1996	FD	0-2
SWMU G	SWMUG-7	S001 SWMUG-7 (MS/MSD) 8/20/199	8/20/1996	N	0-2
SWMU G	SWMUG-8	SS001 SWMUG-8 8/20/1996	8/20/1996	N	0-2
SWMU G	SWMUG-9	SS001 SWMUG-9 8/20/1996	8/20/1996	N	0-2
SWMU H	SP01-A-SWMU-H	SG006SWMUHSP01A 9/11/1996	9/11/1996	N	NA
SWMU H	SP02-C-SWMU-H	SG014SWMUHSP02C 9/11/1996	9/11/1996	N	NA
SWMU H	SP03-A-SWMU-H	SG018SWMUHSP03A 9/12/1996	9/12/1996	N	NA
SWMU H	SP04-A2-SWMU-H	SG022SWMUHSP04AII 9/24/1996	9/24/1996	N	NA
SWMU H	SP05B-SWMU-H	SG003SWMUHSP05B 9/12/1996	9/12/1996	N	NA
SWMU H	SP05C-SWMU-H	SG017SWMUHSP05C 9/12/1996	9/12/1996	N	NA
SWMU H	SP06E-SWMU-H	SG017SWMUHSP06E 9/13/1996	9/13/1996	N	NA
SWMU H	SP07A-SWMU-H	SG010SWMUHSP07A 9/10/1996	9/10/1996	N	NA
SWMU H	SP08B-SWMU-H	SG009SWMUHSP08B 9/10/1996	9/10/1996	N	NA
SWMU H	SP09A-SWMU-H	SG015SWMUHSP09A 9/10/1996	9/10/1996	N	NA
SWMU H	SP10A-SWMU-H	SG015SWMUHSP10A 9/10/1996	9/10/1996	N	NA
SWMU H	SWMUH-SS-1	SWMUH-SS-1	5/9/2007	N	0-1.5
SWMU H	SWMUH-SS-10	SWMUH-SS-10	5/9/2007	N	0-1.5
SWMU H	SWMUH-SS-10	SWMUH-SS-10D	5/9/2007	FD	0-1.5
SWMU H	SWMUH-SS-2	SWMUH-SS-2	5/9/2007	N	0-0.5
SWMU H	SWMUH-SS-3	SWMUH-SS-3	5/9/2007	N	0-0.5
SWMU H	SWMUH-SS-4	SWMUH-SS-4	5/9/2007	N	0-1
SWMU H	SWMUH-SS-5	SWMUH-SS-5	5/9/2007	N	0-1
SWMU H	SWMUH-SS-6	SWMUH-SS-6	5/9/2007	N	0-0.5
SWMU H	SWMUH-SS-7	SWMUH-SS-7	5/9/2007	N	0-1.5
SWMU H	SWMUH-SS-8	SWMUH-SS-8	5/9/2007	N	0-0.5
SWMU H	SWMUH-SS-9	SWMUH-SS-9	5/9/2007	N	0-1
Background	RFI-MW27	SG001RFIMW27 7/9/1996	7/9/1996	N	0-2

Area	Location Code	Sample Code	Sample Date	Duplicate?	Sample Depth (ft)
Background	RFI-MW27	SG013RFIMW27 7/9/1996	7/9/1996	N	15-19
Background	RFI-MW25	SG001RFIMW25 7/10/1996	7/10/1996	N	0-2
Background	RFI-MW25	SG005RFIDUP 7/10/1996	7/10/1996	N	0-2
Background	RFI-MW28	SG002RFIMW28 7/10/1996	7/10/1996	N	0-2
Background	RFI-MW25	SG005RFIMW25 7/10/1996	7/10/1996	N	3-7.5
Background	RFI-MW28	SG007RFIMW28 7/10/1996	7/10/1996	N	5-10
Background	RFI-MW24	SG001RFIMW24 7/11/1996	7/11/1996	N	0.2
Background	RFI-MW26	SG002RFIMW26 7/11/1996	7/11/1996	N	0-2
Background	RFI-MW24	SG004RFIMW24 7/11/1996	7/11/1996	N	3-8
Background	RFI-MW26	SG005RFIMW26 (MS/MSD) 7/11/1996	7/11/1996	N	3.5-8
Background	WHI4-2S	WHI42S-HA-S(2)	7/26/2006	N	2
Background	WHI4-2S	WHI42S-HA-S(2)	7/26/2006	N	2
Background	WHI3-3S	WHI33S-HA-S(2)	7/26/2006	N	2
Background	WHI2-3S	WHI23S-HA-S(2)	7/26/2006	N	2
Background	RFI-MW27	RFIMW27-GP-F (2)	7/27/2006	N	2
Background	P11N-GP-G	P11N-GP-F (2)	7/27/2006	N	2
Background	RFI-MW28	RFIMW28-GP-5 (2)	7/27/2006	N	2
Background	BG-GP1-F	BG-GP1-F (7)	7/27/2006	N	7
Background	BG-GP2-F	BG-GP2-F (2)	7/27/2006	N	2

Notes:

Consistent with the RFI, AOC 1 includes samples collected as part of the styrene investigation associated with AOC 8, as well as other samples located outside of the boundary, but in the vicinity of, AOC 1.

FD - Field Duplicate

NA - Not Available.

Table 3-1
Summary of Tier 1 Risk Screening Results (April 2005)
Using Part 201 Criteria
Exceedance List for Soil
BASF Wyandotte, MI Facility

Chemical (a)	Area	FOD (b)	Maximum Detected Conc (c)	DCC Cancer	DCC NonCancer	PSIC Cancer	PSIC NonCancer	SVIIC Cancer	SVIIC NonCancer	Infinite VSIC Cancer	Infinite VSIC NonCancer	Soil Saturation Screening Level	State Bkg	GW Contact Protection	GSI Protection	GSI Protection Area? (e)
BENZENE	AOC 1	1 : 43 : 52	3.80E+02	No		No		No		No		No		No	Yes	No
ARSENIC	AOC 2	8 : 8 : 8	4.11E+04	Yes	No	No							Yes	No	Yes	No
BARIUM	AOC 2	8 : 8 : 8	7.89E+04		No		No						Yes	No	No	No
CADMIUM	AOC 2	8 : 8 : 8	3.50E+03		No	No							Yes	No	Yes	No
CHROMIUM	AOC 2	8 : 8 : 8	1.01E+05		No	No	No							No	Yes	No
LEAD	AOC 2	8 : 8 : 8	9.01E+04		(d)		(d)						Yes		No	No
MERCURY	AOC 2	5 : 8 : 8	1.71E+04		No		No		No		No		Yes	No	Yes	No
NAPHTHALENE	AOC 2	4 : 8 : 8	2.50E+03		No	No	No	No	No	No	No			No	Yes	No
SELENIUM	AOC 2	1 : 8 : 8	7.60E+02		No		No						Yes	No	Yes	No
TOTAL CYANIDE	AOC 2	6 : 8 : 8	4.60E+04		No		No						Yes	No	Yes	No
ZINC	AOC 2	8 : 8 : 8	9.66E+05		No								Yes	No	Yes	No
2-METHYLNAPHTHALENE	AOC 4	2 : 2 : 2	9.00E+06		Yes									Yes		No
ACENAPHTHYLENE	AOC 4	2 : 2 : 2	9.30E+06		Yes		No		Yes		Yes			Yes		No
ANTHRACENE	AOC 4	2 : 2 : 2	7.10E+06		No		No		No		No			Yes		No
ARSENIC	AOC 4	2 : 2 : 2	2.05E+04	No	No	No							Yes	No	No	No
BENZENE	AOC 4	2 : 2 : 2	6.80E+05	Yes		No		Yes		Yes		Yes		Yes	Yes	No
BENZO(A)ANTHRACENE	AOC 4	2 : 2 : 2	4.90E+06	Yes												No
BENZO(A)PYRENE	AOC 4	2 : 2 : 2	4.10E+06	Yes		Yes		No		Yes						No
BENZO(B)FLUORANTHENE	AOC 4	2 : 2 : 2	4.40E+06	Yes												No
BENZO(K)FLUORANTHENE	AOC 4	2 : 2 : 2	2.50E+06	Yes												No
CADMIUM	AOC 4	2 : 2 : 2	1.40E+03		No	No							Yes	No	No	No
CHRYSENE	AOC 4	2 : 2 : 2	5.20E+06	Yes												No
DIBENZOFURAN	AOC 4	2 : 2 : 2	5.90E+06												Yes	No
FLUORANTHENE	AOC 4	2 : 2 : 2	1.40E+07		No		No		No		No			Yes	Yes	No
FLUORENE	AOC 4	2 : 2 : 2	9.50E+06		No		No		No		No			Yes	Yes	No
INDENO(1,2,3-CD)PYRENE	AOC 4	2 : 2 : 2	1.60E+06	Yes												No
LEAD	AOC 4	2 : 2 : 2	8.28E+04		(d)		(d)						Yes		No	No
MERCURY	AOC 4	2 : 2 : 2	6.20E+02		No		No		No		No		Yes	No	Yes	No
NAPHTHALENE	AOC 4	2 : 2 : 2	4.80E+07		Yes	No	No	Yes	Yes	Yes	Yes			Yes	Yes	No
PHENANTHRENE	AOC 4	2 : 2 : 2	2.30E+07		Yes		Yes		Yes		Yes			Yes	Yes	No
PHENOL	AOC 4	1 : 2 : 2	2.30E+06		No		No		No		No	No		No	Yes	No
PYRENE	AOC 4	2 : 2 : 2	9.90E+06		No		No		No					Yes		No
SELENIUM	AOC 4	2 : 2 : 2	3.60E+03		No		No						Yes	No	Yes	No

Table 3-1
Summary of Tier 1 Risk Screening Results (April 2005)
Using Part 201 Criteria
Exceedance List for Soil
BASF Wyandotte, MI Facility

Chemical (a)	Area	FOD (b)	Maximum Detected Conc (c)	DCC Cancer	DCC NonCancer	PSIC Cancer	PSIC NonCancer	SVIIC Cancer	SVIIC NonCancer	Infinite VSIC Cancer	Infinite VSIC NonCancer	Soil Saturation Screening Level	State Bkg	GW Contact Protection	GSI Protection	GSI Protection Area? (e)
STYRENE	AOC 4	2 : 2 : 2	2.40E+05	No	No	No	No	No	No	No	No	No		No	Yes	No
THALLIUM	AOC 4	2 : 2 : 2	1.40E+04		No									No	Yes	No
TOLUENE	AOC 4	2 : 2 : 2	5.90E+05		No		No		Yes		No	Yes		Yes	Yes	No
TOTAL CYANIDE	AOC 4	2 : 2 : 2	1.90E+04		No		No						Yes	No	Yes	No
Total METHYLPHENOL	AOC 4	2 : 2 : 2	9.90E+06		Yes		No		No		No			No	Yes	No
Total XYLENES	AOC 4	2 : 2 : 2	9.80E+05		No		No		No		No	Yes		Yes	Yes	No
ZINC	AOC 4	2 : 2 : 2	1.14E+05		No								Yes	No	No	No
ACENAPHTHENE	AOC 6	3 : 10 : 12	1.20E+04		No		No		No		No			No	Yes	No
ANTHRACENE	AOC 6	6 : 11 : 12	1.20E+05		No		No		No		No			Yes		No
ARSENIC	AOC 6	12 : 12 : 12	2.00E+05	Yes	No	No							Yes	No	Yes	No
BARIUM	AOC 6	12 : 12 : 12	1.87E+05		No		No						Yes	No	No	No
BENZENE	AOC 6	5 : 12 : 12	1.40E+06	Yes		No		Yes		Yes		Yes		Yes	Yes	No
BENZO(A)ANTHRACENE	AOC 6	9 : 11 : 12	1.30E+05	Yes												No
BENZO(A)PYRENE	AOC 6	9 : 11 : 12	9.40E+04	Yes		No		No		No						No
BENZO(B)FLUORANTHENE	AOC 6	9 : 11 : 12	1.00E+05	Yes												No
BIS(2-CHLOROISOPROPYL) ETHER	AOC 6	5 : 10 : 12	5.20E+03	No		No		No		No		No		No	Yes	No
CADMIUM	AOC 6	9 : 12 : 12	2.00E+03		No	No							Yes	No	No	No
CHROMIUM	AOC 6	12 : 12 : 12	5.32E+04		No	No	No							No	Yes	No
COPPER	AOC 6	12 : 12 : 12	4.94E+04		No		No						Yes	No	No	No
DIBENZ(A,H)ANTHRACENE	AOC 6	7 : 10 : 12	1.20E+04	Yes												No
DIBENZOFURAN	AOC 6	9 : 11 : 12	9.90E+04												Yes	No
ETHYLBENZENE	AOC 6	1 : 9 : 9	3.20E+04		No	No	No	No	No	No	No	No		No	Yes	No
FLUORANTHENE	AOC 6	9 : 12 : 12	3.50E+05		No		No		No		No			No	Yes	No
FLUORENE	AOC 6	10 : 12 : 12	2.10E+05		No		No		No		No			No	Yes	No
LEAD	AOC 6	12 : 12 : 12	3.08E+05		(d)		(d)						Yes		No	No
MERCURY	AOC 6	8 : 12 : 12	3.30E+03		No		No		No		No		Yes	No	Yes	No
NAPHTHALENE	AOC 6	10 : 12 : 12	2.70E+06		No	No	No	No	Yes	Yes	Yes			Yes	Yes	No
NICKEL	AOC 6	8 : 12 : 12	3.39E+04		No	No							Yes	No	No	No
PHENANTHRENE	AOC 6	9 : 12 : 12	4.90E+05		No		No		No		Yes			No	Yes	No
SELENIUM	AOC 6	7 : 12 : 12	2.30E+04		No		No						Yes	No	Yes	No
TOTAL CYANIDE	AOC 6	8 : 12 : 12	2.40E+03		No		No						Yes	No	Yes	No
Total XYLENES	AOC 6	1 : 9 : 9	1.76E+05		No		No		No		No	Yes		Yes	Yes	No
ZINC	AOC 6	12 : 12 : 12	2.52E+05		No								Yes	No	Yes	No

Table 3-1
Summary of Tier 1 Risk Screening Results (April 2005)
Using Part 201 Criteria
Exceedance List for Soil
BASF Wyandotte, MI Facility

Chemical (a)	Area	FOD (b)	Maximum Detected Conc (c)	DCC Cancer	DCC NonCancer	PSIC Cancer	PSIC NonCancer	SVIIC Cancer	SVIIC NonCancer	Infinite VSIC Cancer	Infinite VSIC NonCancer	Soil Saturation Screening Level	State Bkg	GW Contact Protection	GSI Protection	GSI Protection Area? (e)
ARSENIC	AOC 7A	14 : 14 : 14	6.24E+04	Yes	No	No							Yes	No	Yes	No
BARIUM	AOC 7A	14 : 14 : 14	1.48E+05		No		No						Yes	No	No	No
CHROMIUM	AOC 7A	14 : 14 : 14	2.91E+04		No	No	No							No	Yes	No
COBALT	AOC 7A	2 : 14 : 14	9.70E+03		No		No						Yes	No	Yes	No
COPPER	AOC 7A	14 : 14 : 14	3.70E+04		No		No						Yes	No	No	No
LEAD	AOC 7A	14 : 14 : 14	3.35E+05		(d)		(d)						Yes		No	No
MERCURY	AOC 7A	11 : 14 : 14	4.80E+03		No		No		No		No		Yes	No	Yes	No
NICKEL	AOC 7A	13 : 14 : 14	3.18E+04		No	No							Yes	No	No	No
SELENIUM	AOC 7A	4 : 14 : 14	1.70E+03		No		No						Yes	No	Yes	No
SILVER	AOC 7A	1 : 14 : 14	1.00E+04		No		No						Yes	No	Yes	No
TOTAL CYANIDE	AOC 7A	15 : 19 : 19	5.70E+03		No		No						Yes	No	Yes	No
ZINC	AOC 7A	14 : 14 : 14	1.90E+05		No								Yes	No	Yes	No
ARSENIC	AOC 7B	4 : 4 : 4	1.17E+04	No	No	No							Yes	No	No	No
BARIUM	AOC 7B	4 : 4 : 4	1.08E+05		No		No						Yes	No	No	No
CHROMIUM	AOC 7B	4 : 4 : 4	2.69E+04		No	No	No							No	Yes	No
LEAD	AOC 7B	4 : 4 : 4	3.06E+04		(d)		(d)						Yes		No	No
MERCURY	AOC 7B	2 : 4 : 4	5.70E+02		No		No		No		No		Yes	No	Yes	No
ZINC	AOC 7B	4 : 4 : 4	1.51E+05		No								Yes	No	Yes	No
ARSENIC	AOC 7C	4 : 4 : 4	3.45E+04	Yes	No	No							Yes	No	Yes	No
BARIUM	AOC 7C	4 : 4 : 4	1.47E+05		No		No						Yes	No	No	No
CHROMIUM	AOC 7C	4 : 4 : 4	1.72E+04		No	No	No							No	Yes	No
LEAD	AOC 7C	4 : 4 : 4	1.13E+05		(d)		(d)						Yes		No	No
MERCURY	AOC 7C	2 : 4 : 4	2.20E+03		No		No		No		No		Yes	No	Yes	No
NICKEL	AOC 7C	4 : 4 : 4	8.99E+04		No	No							Yes	No	Yes	No
SELENIUM	AOC 7C	4 : 4 : 4	2.40E+03		No		No						Yes	No	Yes	No
ZINC	AOC 7C	4 : 4 : 4	6.03E+05		No								Yes	No	Yes	No
NAPHTHALENE	RFIMW 07	2 : 6 : 6	9.65E+02		No	No	No	No	No	No	No			No	Yes	Yes
PHENOL	RFIMW 07	2 : 6 : 6	1.10E+04		No		No		No		No	No		No	Yes	Yes
Total METHYLPHENOL	RFIMW 07	2 : 6 : 6	4.30E+03		No		No		No		No			No	Yes	Yes
ARSENIC	RFIMW 24	2 : 2 : 2	8.00E+03	No	No	No							Yes	No	No	No
BARIUM	RFIMW 24	2 : 2 : 2	9.70E+04		No		No						Yes	No	No	No
CADMIUM	RFIMW 24	1 : 2 : 2	1.40E+03		No	No							Yes	No	No	No
CHROMIUM	RFIMW 24	2 : 2 : 2	8.41E+05		No	Yes	Yes							No	Yes	No

Table 3-1
Summary of Tier 1 Risk Screening Results (April 2005)
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Exceedance List for Soil
BASF Wyandotte, MI Facility

Chemical (a)	Area	FOD (b)	Maximum Detected Conc (c)	DCC Cancer	DCC NonCancer	PSIC Cancer	PSIC NonCancer	SVIIC Cancer	SVIIC NonCancer	Infinite VSIC Cancer	Infinite VSIC NonCancer	Soil Saturation Screening Level	State Bkg	GW Contact Protection	GSI Protection	GSI Protection Area? (e)
LEAD	RFIMW 24	2 : 2 : 2	3.34E+04		(d)		(d)						Yes		No	No
TOTAL CYANIDE	RFIMW 24	2 : 2 : 2	2.70E+03		No		No						Yes	No	Yes	No
VANADIUM	RFIMW 24	2 : 2 : 2	2.22E+05		No									No	Yes	No
ZINC	RFIMW 24	2 : 2 : 2	1.16E+05		No								Yes	No	No	No
ARSENIC	RFIMW 25	2 : 2 : 2	6.00E+03	No	No	No							Yes	No	No	No
BARIUM	RFIMW 25	2 : 2 : 2	1.01E+05		No		No						Yes	No	No	No
CHROMIUM	RFIMW 25	2 : 2 : 2	9.00E+03		No	No	No							No	Yes	No
MERCURY	RFIMW 25	1 : 2 : 2	1.60E+02		No		No		No		No		Yes	No	Yes	No
TOTAL CYANIDE	RFIMW 25	2 : 2 : 2	1.90E+03		No		No						Yes	No	Yes	No
ARSENIC	RFIMW 26	2 : 2 : 2	9.50E+03	No	No	No							Yes	No	No	No
CHROMIUM	RFIMW 26	2 : 2 : 2	1.56E+04		No	No	No							No	Yes	No
COBALT	RFIMW 26	1 : 2 : 2	6.10E+03		No		No						No	No	Yes	No
LEAD	RFIMW 26	2 : 2 : 2	3.20E+04		(d)		(d)						Yes		No	No
MERCURY	RFIMW 26	1 : 2 : 2	2.70E+02		No		No		No		No		Yes	No	Yes	No
SELENIUM	RFIMW 26	1 : 2 : 2	1.20E+03		No		No						Yes	No	Yes	No
TOTAL CYANIDE	RFIMW 26	1 : 2 : 2	3.70E+03		No		No						Yes	No	Yes	No
ZINC	RFIMW 26	2 : 2 : 2	5.81E+04		No								Yes	No	No	No
ARSENIC	RFIMW 27	2 : 2 : 2	7.40E+03	No	No	No							Yes	No	No	No
BARIUM	RFIMW 27	2 : 2 : 2	8.07E+04		No		No						Yes	No	No	No
CHROMIUM	RFIMW 27	2 : 2 : 2	9.70E+03		No	No	No							No	Yes	No
MERCURY	RFIMW 27	1 : 2 : 2	5.20E+02		No		No		No		No		Yes	No	Yes	No
TOTAL CYANIDE	RFIMW 27	1 : 2 : 2	7.80E+02		No		No						Yes	No	Yes	No
ZINC	RFIMW 27	2 : 2 : 2	1.34E+05		No								Yes	No	Yes	No
ARSENIC	RFIMW 28	2 : 2 : 2	8.90E+03	No	No	No							Yes	No	No	No
BARIUM	RFIMW 28	2 : 2 : 2	1.79E+05		No		No						Yes	No	No	No
CHROMIUM	RFIMW 28	2 : 2 : 2	1.61E+04		No	No	No							No	Yes	No
ZINC	RFIMW 28	2 : 2 : 2	1.17E+05		No								Yes	No	No	No
1,2-DICHLOROPROPANE	SWMU F	5 : 10 : 10	7.00E+04	No	No		No		Yes		Yes	No		No	Yes	No
2,4-DIMETHYLPHENOL	SWMU F	1 : 10 : 10	2.20E+04		No		No		No		No			No	Yes	No
ACETONE	SWMU F	9 : 10 : 10	1.90E+05		No		No		No		No	No		No	Yes	No
ANTIMONY	SWMU F	3 : 10 : 10	1.60E+04		No		No							No	Yes	No
ARSENIC	SWMU F	10 : 10 : 10	6.39E+04	Yes	No	No							Yes	No	Yes	No
BARIUM	SWMU F	10 : 10 : 10	4.91E+05		No		No						Yes	No	Yes	No

Table 3-1
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Using Part 201 Criteria
Exceedance List for Soil
BASF Wyandotte, MI Facility

Chemical (a)	Area	FOD (b)	Maximum Detected Conc (c)	DCC Cancer	DCC NonCancer	PSIC Cancer	PSIC NonCancer	SVIIC Cancer	SVIIC NonCancer	Infinite VSIC Cancer	Infinite VSIC NonCancer	Soil Saturation Screening Level	State Bkg	GW Contact Protection	GSI Protection	GSI Protection Area? (e)
BENZENE	SWMU F	1 : 9 : 10	2.00E+03	No		No		No		No		No		No	Yes	No
BIS(2-CHLOROISOPROPYL) ETHER	SWMU F	6 : 10 : 10	2.80E+04	Yes		No		No		Yes		No		No	Yes	No
CADMIUM	SWMU F	10 : 10 : 10	7.30E+03		No	No							Yes	No	Yes	No
CHROMIUM	SWMU F	10 : 10 : 10	1.30E+05		No	No	No							No	Yes	No
COBALT	SWMU F	1 : 10 : 10	4.05E+04		No		No						Yes	No	Yes	No
COPPER	SWMU F	10 : 10 : 10	7.71E+06		No		No						Yes	No	Yes	No
LEAD	SWMU F	10 : 10 : 10	8.76E+05		(d)		(d)						Yes		No	No
MERCURY	SWMU F	6 : 10 : 10	2.11E+04		No		No		No		No		Yes	No	Yes	No
NICKEL	SWMU F	9 : 10 : 10	1.70E+05		No	No							Yes	No	Yes	No
PHENANTHRENE	SWMU F	4 : 7 : 10	6.00E+03		No		No		No		No			No	Yes	No
PHENOL	SWMU F	2 : 7 : 10	6.40E+03		No		No		No		No	No		No	Yes	No
SELENIUM	SWMU F	5 : 10 : 10	6.30E+03		No		No						Yes	No	Yes	No
SILVER	SWMU F	1 : 10 : 10	1.05E+04		No		No						Yes	No	Yes	No
TOLUENE	SWMU F	7 : 10 : 10	1.10E+05		No		No		No		No	No		No	Yes	No
TOTAL CYANIDE	SWMU F	8 : 10 : 10	5.10E+03		No		No						Yes	No	Yes	No
Total METHYLPHENOL	SWMU F	4 : 10 : 10	4.41E+04		No		No		No		No			No	Yes	No
ZINC	SWMU F	9 : 10 : 10	1.00E+06		No								Yes	No	Yes	No
ANTIMONY	SWMU G	1 : 10 : 10	2.60E+03		No		No							No	Yes	No
ARSENIC	SWMU G	10 : 10 : 10	1.01E+05	Yes	No	No							Yes	No	Yes	No
BARIUM	SWMU G	10 : 10 : 10	1.66E+05		No		No						Yes	No	No	No
CADMIUM	SWMU G	10 : 10 : 10	2.30E+03		No	No							Yes	No	No	No
CHROMIUM	SWMU G	10 : 10 : 10	3.36E+04		No	No	No							No	Yes	No
COBALT	SWMU G	1 : 10 : 10	1.01E+04		No		No						Yes	No	Yes	No
COPPER	SWMU G	10 : 10 : 10	9.53E+04		No		No						Yes	No	Yes	No
LEAD	SWMU G	10 : 10 : 10	2.38E+05		(d)		(d)						Yes		No	No
MERCURY	SWMU G	8 : 10 : 10	5.40E+03		No		No		No		No		Yes	No	Yes	No
NICKEL	SWMU G	10 : 10 : 10	2.56E+04		No	No							Yes	No	No	No
SELENIUM	SWMU G	1 : 10 : 10	4.40E+02		No		No						Yes	No	Yes	No
TOTAL CYANIDE	SWMU G	1 : 10 : 10	6.60E+02		No		No						Yes	No	Yes	No
ZINC	SWMU G	10 : 10 : 10	3.35E+05		No								Yes	No	Yes	No
1,2-DICHLOROBENZENE	SWMU H	1 : 8 : 11	6.80E+02		No		No		No		No	No		No	Yes	Yes (f)
1,2-DICHLOROPROPANE	SWMU H	9 : 11 : 11	5.00E+07	Yes	No		No		Yes		Yes	Yes		Yes	Yes	Yes (f)
2,4-DIMETHYLPHENOL	SWMU H	1 : 10 : 11	8.30E+03		No		No		No		No			No	Yes	Yes (f)

Table 3-1
Summary of Tier 1 Risk Screening Results (April 2005)
Using Part 201 Criteria
Exceedance List for Soil
BASF Wyandotte, MI Facility

Chemical (a)	Area	FOD (b)	Maximum Detected Conc (c)	DCC Cancer	DCC NonCancer	PSIC Cancer	PSIC NonCancer	SVIIC Cancer	SVIIC NonCancer	Infinite VSIC Cancer	Infinite VSIC NonCancer	Soil Saturation Screening Level	State Bkg	GW Contact Protection	GSI Protection	GSI Protection Area? (e)	
ACENAPHTHENE	SWMU H	1 : 10 : 11	6.70E+03		No		No		No		No			No	Yes	Yes	(f)
ANTIMONY	SWMU H	4 : 11 : 11	1.53E+04		No		No							No	Yes	Yes	(f)
ARSENIC	SWMU H	11 : 11 : 11	1.16E+05	Yes	No	No							Yes	No	Yes	Yes	(f)
BARIUM	SWMU H	11 : 11 : 11	2.23E+05		No		No						Yes	No	No	Yes	(f)
BENZENE	SWMU H	1 : 8 : 11	7.80E+02	No		No		No		No		No		No	Yes	Yes	(f)
BIS(2-CHLOROETHYL) ETHER	SWMU H	2 : 10 : 11	1.20E+04	No		No		No		No		No		No	Yes	Yes	(f)
BIS(2-CHLOROISOPROPYL) ETHER	SWMU H	8 : 11 : 11	1.40E+06	Yes		No		Yes		Yes		No		Yes	Yes	Yes	(f)
CADMIUM	SWMU H	10 : 11 : 11	4.20E+03		No	No							Yes	No	Yes	Yes	(f)
CHROMIUM	SWMU H	11 : 11 : 11	1.95E+05		No	No	Yes							No	Yes	Yes	(f)
COBALT	SWMU H	6 : 11 : 11	1.37E+04		No		No						Yes	No	Yes	Yes	(f)
COPPER	SWMU H	11 : 11 : 11	2.21E+05		No		No						Yes	No	Yes	Yes	(f)
DIBENZOFURAN	SWMU H	2 : 10 : 11	4.20E+03												Yes	Yes	(f)
ETHYLBENZENE	SWMU H	1 : 8 : 11	4.70E+02		No	No	No	No	No	No	No	No		No	Yes	Yes	(f)
FLUORANTHENE	SWMU H	3 : 10 : 11	1.10E+04		No		No		No		No			No	Yes	Yes	(f)
FLUORENE	SWMU H	1 : 10 : 11	5.40E+03		No		No		No		No			No	Yes	Yes	(f)
LEAD	SWMU H	11 : 11 : 11	4.33E+05		(d)		(d)						Yes		No	Yes	(f)
MERCURY	SWMU H	5 : 11 : 11	5.29E+04		No		No		No		Yes		Yes	Yes	Yes	Yes	(f)
NAPHTHALENE	SWMU H	3 : 10 : 11	1.60E+04		No	No	No	No	No	No	No			No	Yes	Yes	(f)
NICKEL	SWMU H	11 : 11 : 11	9.34E+04		No	No							Yes	No	Yes	Yes	(f)
PHENANTHRENE	SWMU H	3 : 10 : 11	2.00E+04		No		No		No		No			No	Yes	Yes	(f)
SELENIUM	SWMU H	2 : 11 : 11	1.40E+03		No		No						Yes	No	Yes	Yes	(f)
SILVER	SWMU H	1 : 11 : 11	2.17E+04		No		No						Yes	No	Yes	Yes	(f)
TOLUENE	SWMU H	2 : 10 : 11	5.80E+03		No		No		No		No	No		No	Yes	Yes	(f)
TOTAL CYANIDE	SWMU H	4 : 11 : 11	1.60E+04		No		No						Yes	No	Yes	Yes	(f)
Total METHYLPHENOL	SWMU H	2 : 10 : 11	1.89E+04		No		No		No		No			No	Yes	Yes	(f)
Total XYLENES	SWMU H	1 : 8 : 11	2.07E+03		No		No		No		No	No		No	Yes	Yes	(f)
ZINC	SWMU H	11 : 11 : 11	6.28E+05		No								Yes	No	Yes	Yes	(f)

Table 3-1
Summary of Tier 1 Risk Screening Results (April 2005)
Using Part 201 Criteria
Exceedance List for Soil
BASF Wyandotte, MI Facility

Chemical (a)	Area	FOD (b)	Maximum Detected Conc (c)	DCC Cancer	DCC NonCancer	PSIC Cancer	PSIC NonCancer	SVIIC Cancer	SVIIC NonCancer	Infinite VSIC Cancer	Infinite VSIC NonCancer	Soil Saturation Screening Level	State Bkg	GW Contact Protection	GSI Protection	GSI Protection Area? (e)

Notes:

CAS - Chemical Abstract Service.
DCC - Direct Contact Criteria.
GSI - Groundwater Surface Water Interface Protection Criteria.
GW - Groundwater Contact Protection Criteria.
PSIC - Particulate Soil Inhalation Criteria (Ambient Air).
SVIIC - Soil Volatilization to Indoor Air Inhalation Criteria.
VSIC - Infinite Source Volatilization Inhalation Criteria (Ambient Air).
(a) Only chemicals with at least one positively detected result are reported.
(b) Frequency of detection - Number of detected samples: Number of samples used to calculate statistics: Number of total samples.
(c) Maximum detected concentration for each chemical, after duplicates have been averaged.
(d) Criteria for lead are derived using biological based model, and are not calculated using the Part 201 assumptions and algorithms. Comparison performed in a seperate table on a straight exceed/not exceed basis.
(e) Soil area located at the groundwater-surface water interface (i.e., along the Detroit River).
(f) Easternmost portion of SWMU H only.

Table 3-2
Calculation of Upper Confidence Limits for COI in Soil
BASF Wyandotte
Wyandotte, Michigan
Tier 2 Risk Evaluation

Area	CAS No.	Chemical	units	FOD	Minimum Detect	Maximum Detect	Mean (a)	StDev (a)	UCL (b)	UCL Type (b)
AOC 2	7440-38-2	ARSENIC	mg/kg	10:10	0.73	41.1	17.59	13.43	25.38	95% Student's -t UCL
AOC 6	7440-38-2	ARSENIC	mg/kg	22:22	1.8	200	27.82	40.58	41.04	95% Approximate Gamma UCL
AOC 6	71-43-2	BENZENE	mg/kg	12:22	0.0039	1400	192.6	451.3	843.4	99% KM (Chebyshev) UCL
AOC 6	56-55-3	BENZO(A)ANTHRACENE	mg/kg	19:22	0.048	130	12.99	29.75	39.34	95% KM (Chebyshev) UCL
AOC 6	50-32-8	BENZO(A)PYRENE	mg/kg	19:22	0.045	94	10.43	21.67	29.63	95% KM (Chebyshev) UCL
AOC 6	205-99-2	BENZO(B)FLUORANTHENE	mg/kg	19:22	0.061	100	12.68	23.58	33.63	95% KM (Chebyshev) UCL
AOC 6	53-70-3	DIBENZ(A,H)ANTHRACENE	mg/kg	12:22	0.11	12	2.562	3.407	2.993	95%KM (BCA) UCL
AOC 6	91-20-3	NAPHTHALENE	mg/kg	18:22	0.024	2700	168.9	636.1	1367	95% KM (Chebyshev) UCL
AOC 6	85-01-8	PHENANTHRENE	mg/kg	19:22	0.041	490	31.67	111.5	248.9	99% KM (Chebyshev) UCL
AOC 6	1330-20-7	XYLENES	mg/kg	9:19	0.033	176	19.67	58.62	104.4	99% KM (Chebyshev) UCL
AOC 7A	7440-38-2	ARSENIC	mg/kg	14:14	2.5	62.4	17.67	17.63	28.4	95% Approximate Gamma UCL
AOC 7C	7440-38-2	ARSENIC	mg/kg	11:11	9.2	34.5	19.09	8.352	23.66	95% Student's-t UCL
SWMU F	78-87-5	1,2-DICHLOROPROPANE	mg/kg	9:20	0.0042	70	10.11	22.85	10.85	95% KM (t) UCL
SWMU F	7440-38-2	ARSENIC	mg/kg	10:10	4.4	63.9	23.23	22.27	42.24	95% Approximate Gamma UCL
SWMU F	108-60-1	BIS(2-CHLOROISOPROPYL) ETHER	mg/kg	11:22	0.037	28	5.024	8.927	5.907	95% KM (BCA) UCL
SWMU G	7440-38-2	ARSENIC	mg/kg	10:10	4.8	101	26.69	31.76	52.1	95% Approximate Gamma
SWMU H	78-87-5	1,2-DICHLOROPROPANE	mg/kg	17:21	0.004	50000	2959	12122	26219	99% KM (Chebyshev)
SWMU H	7440-38-2	ARSENIC	mg/kg	21:21	1.9	116	18.15	24.98	27.29	95% Approximate Gamma
SWMU H	108-60-1	BIS(2-CHLOROISOPROPYL) ETHER	mg/kg	9:21	0.13	1400	173.9	461.8	760.2	99% KM (Chebyshev)
SWMU H	7440-47-3	CHROMIUM	mg/kg	21:21	6.7	195	38.99	40.59	53.29	95% H-UCL
SWMU H	7439-97-6	MERCURY	mg/kg	15:22	0.036	52.9	4.036	13.53	28.05	99% KM (Chebyshev)

Notes:
(a) Mean taken from ProUCL Version 4.0 output - calculated with detected values only. See Appendix B.
(b) UCL and UCL type were taken from ProUCL Version 4.0 output. See Appendix B.
FOD - Frequency of detection.
UCL - Upper confidence limit.

Table 3-3
Evaluation of Soil Direct Contact Criteria (DCC) Exceedances
BASF North Works Facility
Wyandotte, Michigan
Tier 2 Risk Evaluation

Chemical	Area	Maximum Detected Concentration (ug/kg)	Mean Concentration (ug/kg)	UCL (ug/kg)	Part 201 DCC (ug/kg)	UCL Exceed DCC?	Consistent with Background?	Evaluate Further?
Arsenic	AOC 2	4.11E+04	1.76E+04	2.54E+04	3.68E+04	No	Yes	No
Arsenic	AOC 6	2.00E+05	2.78E+04	4.10E+04	3.68E+04	Yes	No	Yes - UCL likely skewed by outlier of 200 mg/kg at SP-61
Benzene	AOC 6	1.40E+06	1.93E+05	8.43E+05	8.38E+05	Yes	--	Yes - UCL skewed by Csat exceedances at SP-61 and SP-62
Benzo(a)anthracene	AOC 6	1.30E+05	1.30E+04	3.93E+01	8.00E+04	No	--	No
Benzo(a)pyrene	AOC 6	9.40E+04	1.04E+01	2.96E+04	8.00E+03	Yes	--	Yes
Benzo(b)fluoranthene	AOC 6	1.00E+05	1.27E+04	3.36E+04	8.00E+04	No	--	No
Dibenz(ah)anthracene	AOC 6	1.20E+04	2.56E+03	2.99E+03	8.00E+03	No	--	No
Arsenic	AOC 7A	6.24E+04	1.77E+04	2.84E+04	3.68E+04	No	Yes	No
Arsenic	AOC 7C	3.45E+04	1.91E+04	2.37E+04	3.68E+04	No	No	No
Arsenic	SWMU F	6.39E+04	2.32E+04	4.22E+04	3.68E+04	Yes	Yes (a)	No
Bis(2-chloroisopropyl)ether	SWMU F	2.80E+04	5.02E+03	5.91E+03	5.78E+04	No	--	No
Arsenic	SWMU G	1.01E+05	2.67E+04	5.21E+04	3.68E+04	Yes	Yes (a)	No
Arsenic	SWMU H	1.16E+05	1.82E+04	2.73E+04	3.68E+04	No	Yes	No

Notes:
(a) Based on comparison of mean and maximum concentrations for the SWMU/AOC and background.
DCC - Direct Contact Criterion.
UCL - Upper Confidence Limit.

Table 3-4
Evaluation of Volatilization Criteria Exceedances in AOC 6
BASF North Works Facility
Wyandotte, Michigan
Tier 2 Risk Evaluation

Chemical	Area	Maximum Detected Concentration (ug/kg)	Mean Concentration (a) (ug/kg)	UCL (b) (ug/kg)		Finite Source VSIC 2-meter (f) (ug/kg)	Site-specific Finite Source 2-m VSIC (g) (ug/kg)	UCL Exceed Finite Source VSIC?	Evaluate Further?
Tier 2 Evaluation of VSIC Exceedances Using All AOC 6 Soil Data (d)									
Benzene	AOC 6	1.40E+06	1.93E+05	8.43E+05		2.30E+05	2.00E+05	Yes	Yes - evaluate vadose zone data
Naphthalene	AOC 6	2.70E+06	2.53E+05	1.37E+06		3.54E+05	3.08E+05	Yes	Yes - evaluate vadose zone data
Phenanthrene	AOC 6	4.90E+05	3.17E+04	2.49E+05		1.86E+05	1.62E+05	Yes	Yes - evaluate vadose zone data
Tier 2 Evaluation of VSIC Exceedances Using Shallow AOC 6 Soil Data Only (e)									
Benzene	AOC 6	4.60E+02	2.04E+02	2.58E+02		2.30E+05	2.00E+05	No	No
Naphthalene	AOC 6	1.65E+03	7.08E+02	9.75E+02		3.54E+05	3.08E+05	No	No
Phenanthrene	AOC 6	1.80E+04	5.31E+03	1.80E+04	(h)	1.86E+05	1.62E+05	No	No

Chemical	Area	Maximum Detected Concentration (ug/kg)	Mean Concentration (a) (ug/kg)	UCL (b) (ug/kg)	Infinite Source SVIIC (i) (ug/kg)	UCL Exceed Finite Source SVIIC?	Evaluate Further?
Tier 2 Evaluation of SVIIC Exceedances Using All AOC 6 Soil Data (d)							
Benzene	AOC 6	1.40E+06	1.93E+05	8.43E+05	8.39E+03	Yes	Yes - evaluate vadose zone data
Naphthalene	AOC 6	2.70E+06	2.53E+05	1.37E+06	4.63E+05	Yes	Yes - evaluate vadose zone data
Tier 2 Evaluation of SVIIC Exceedances Using Shallow AOC 6 Soil Data Only (e)							
Benzene	AOC 6	4.60E+02	2.04E+02	2.58E+02	8.39E+03	No	No
Naphthalene	AOC 6	1.65E+03	7.08E+02	9.75E+02	4.63E+05	No	No

Notes:
(a) Mean taken from ProUCL Version 4.0 output - calculated with detected values only. See Appendix B.
(b) UCL taken from ProUCL Version 4.0 output. See Appendix B.
(c) Calculated for 4 foot source thickness in vadose zone based on average depth to groundwater in AOC 6.
(d) Includes all soil samples including soil samples collected below the water table (but depth information is uncertain).
(e) Includes only shallow soil samples collected above the water table during May 2007 sampling event.
(f) Part 201 default VSIC for 2 meter source thickness.
(g) Calculated using site-specific modifier of 0.87 for 1 acre source size.
(h) Maximum detect.
(i) Part 201 default SVIIC for infinite source.
SVIIC - Soil Volatilization to Indoor Air Inhalation Criteria.
UCL - Upper Confidence Limit.
VSIC - Infinite Source Volatilization Soil Inhalation Criteria (Ambient Air).

Table 3-5
Evaluation of Volatilization Criteria Exceedances in SWMU F
BASF North Works Facility
Wyandotte, Michigan
Tier 2 Risk Evaluation

Chemical	Area	Maximum Detected Concentration (ug/kg)	Mean Concentration (a) (ug/kg)	UCL (b) (ug/kg)	Infinite Source VSIC (ug/kg)	Site-specific Infinite Source VSIC (c) (ug/kg)	UCL Exceed Infinite Source VSIC?	SVIIC (ug/kg)	UCL Exceed SVIIC?	Evaluate Further?
Tier 2 Evaluation of Volatilization Criteria Exceedances Using All SWMU F Soil Data (d)										
1,2-Dichloropropane	SWMU F	7.00E+04	1.01E+04	1.09E+04	3.00E+04	2.61E+04	No	7.40E+03	Yes	Yes.
bis(2-chloroisopropyl)ether	SWMU F	2.80E+04	5.02E+03	5.91E+03	1.31E+04	1.14E+04	No	NCOPC	NA	NA
Tier 2 Evaluation of Volatilization Criteria Exceedances Using Shallow SWMU F Soil Data Only (e)										
1,2-Dichloropropane	SWMU F	4.40E+02	1.63E+02	2.32E+02	3.00E+04	2.61E+04	No	7.40E+03	No	No
bis(2-chloroisopropyl)ether	SWMU F	3.70E+01	2.14E+02	2.83E+02	1.31E+04	1.14E+04	No	NCOPC	NA	NA

Notes:
(a) Mean taken from ProUCL Version 4.0 output - calculated with detected values only. See Appendix B.
(b) UCL taken from ProUCL Version 4.0 output. See Appendix B.
(c) Calculated using site-specific modifier of 0.87 for 1 acre source size.
(d) Includes all soil samples including soil samples collected below the water table (but depth information is uncertain).
(e) Includes only shallow soil samples collected above the water table during May 2007 sampling event.
NCOPC - Not a constituent of potential concern for this area/pathway.
SVIIC - Soil Volatilization to Indoor Air Inhalation Criteria.
UCL - Upper Confidence Limit.
VSIC - Infinite Source Volatilization Soil Inhalation Criteria (Ambient Air).

Table 3-6
Evaluation of Volatilization and Particulate Soil Inhalation Criteria Exceedances in SWMU H
BASF North Works Facility
Wyandotte, Michigan
Tier 2 Risk Evaluation

Chemical	Area	Maximum Detected Concentration (ug/kg)	Mean Concentration (a) (ug/kg)	UCL (b) (ug/kg)	PSIC Chromium VI (ug/kg)	Site-specific PSIC Cr VI (c) (ug/kg)	UCL Exceed Site-specific PSIC?	PSIC Chromium III (ug/kg)	Site-specific PSIC Cr III (c) (ug/kg)	UCL Exceed Site-specific PSIC?	Evaluate Further?
Chromium	SWMU H	1.95E+05	3.90E+04	5.33E+04	5.10E+04	4.44E+04	Yes - evaluate Cr as trivalent	1.50E+08	1.31E+08	No	No

Chemical	Area	Maximum Detected Concentration (ug/kg)	Mean Concentration (a) (ug/kg)	UCL (b) (ug/kg)	Infinite Source VSIC (d) (ug/kg)	Site-specific Infinite Source VSIC (c) (ug/kg)	UCL Exceed Site-specific VSIC?	Evaluate Further?
Mercury	SWMU H	5.29E+04	4.04E+03	2.81E+04	6.20E+04	5.39E+04	No	No

Notes:
(a) Mean taken from ProUCL Version 4.0 output - calculated with detected values only. See Appendix B.
(b) UCL taken from ProUCL Version 4.0 output. See Appendix B.
(c) Calculated using site-specific modifier of 0.87 for 1 acre source size.
(d) Finite source VSIC for 2-meter and 5-meter source thicknesses are the same as the infinite source VSIC for mercury.
PSIC - Particulate Soil Inhalation Criteria.
UCL - Upper Confidence Limit.
VSIC - Infinite Source Volatilization Soil Inhalation Criteria (Ambient Air).

Table 3-7
Wells Used to Estimate Groundwater Exposure Point Concentrations at AOC/SWMUs
Redevelopment Scenario
BASF North Works Facility
Wyandotte, Michigan
Tier 2 Risk Evaluation

AOC/SWMU	Wells in Vicinity	Data?	Downgradient Wells	Data?	Comment
AOC 1	TMW-1	Yes - limited (a)	P-26-N	Yes	
	TMW-3	No	WHI6-3F	Yes	
	TMW-5	No	WHI6-3S	Yes	
	PW1	Yes - limited (a)	WHI6-4F	Yes	
	PM2NC	Yes - limited (a)	WHI6-4S	Yes	
	DNR3	No	CMS-MW-14S	Yes	
			RFI-MW-14	Yes	
			RFI-MW-3	Yes	
			WHI6-2S	Yes	
AOC 2	RFI-MW-15	Yes	RFI-MW-5	Yes	
	RFI-MW-16	Yes	RFI-MW-4	Yes	
	CMS-MW-16	Yes	RFI-MW-6	Yes	
	WHI6-5S	Yes - limited (a)	CMS-MW-5	No	
	WHI6-5F	Yes - limited (a)	P40N	No	
	P25N	No			
	DNR 7	No			
	P2NC	No			
	PM1NC	No			
	DNR 6	No			
	P20N	No			
AOC 4	NA	NA	NA	NA	Excluded from Tier 2 RA - going directly to CMS.
AOC 5	AOC5-MIP-7	Yes	RFI-MW-7F	Yes	
	AOC5-MIP-8	Yes	RFI-MW-7I	Yes	
	AOC5-MIP-13	Yes	WHI7-2F	Yes	
	AOC5-MIP-17	Yes	WHI7-4F	Yes	
	AOC5-MIP-25	Yes	WHI7-4P	No	
	RFI-MW-21	Yes (b)	WHI7-4S	Yes	
			WHI73F	Yes	
			P1NB	No	
			PM1NB	Yes	
			RFI-MW-18	Yes	
			CMS-MW7	No	
			RFI-MW-8	Yes	
			RFI-MW-8F	Yes	
			RFI-MW-8I	Yes	
			P42N	No	
			P17N	No	
			P18N	No	
			RFI-MW7	Yes	
			CMS-MW-6	No	
AOC 6	PE-1-NA	No	CMS-MW-12	Yes	Groundwater in AOC 6 is captured by extraction wells.
	PE-2-NA	No	CMS-MW-13F	Yes	The closest downgradient wells are used to estimate
	PE-3-NA	No	CMS-MW-13S	Yes	interior AOC groundwater concentrations.
	PE-4-NA	No			
AOC 7A	CMS-MW-1	Yes	RFI-MW-22	Yes	
	RFI-MW-23	Yes	CMS-MW-2	Yes	
AOC 7B	WHI2-2S	Yes	TMW-4	Yes - limited (a)	
AOC 7C	AOC5-MIP-7	Yes	RFI-MW-7F	Yes	
	AOC5-MIP-8	Yes	RFI-MW-7I	Yes	
	AOC5-MIP-13	Yes			
	AOC5-MIP-17	Yes			
	AOC5-MIP-25	Yes			

Table 3-7
Wells Used to Estimate Groundwater Exposure Point Concentrations at AOC/SWMUs
Redevelopment Scenario
BASF North Works Facility
Wyandotte, Michigan
Tier 2 Risk Evaluation

SWMU F	P16N	No	WHI7-2F	No	
			P17N	No	
			CMS-MW-6	No	
			RFI-MW-6	Yes	
			RFI-MW-7	Yes	
			RFI-MW7F	Yes	
			RFI-MW-17	No	
			WHI7-1F	No	
			P40N	No	
			CMS-MW-5	No	
			WHI7-2F	No	
SWMU G	PE-1-NA	No	CMS-MW-12	Yes	Groundwater in SWMU G is captured by extraction wells.
	PE-2-NA	No	CMS-MW-13F	Yes	The closest downgradient wells are used to estimate
	PE-3-NA	No	CMS-MW-13S	Yes	interior SWMU groundwater concentrations.
	PE-4-NA	No			
SWMU H (west end)	AOC5-MIP-7	Yes			
	AOC5-MIP-8	Yes			
	AOC5-MIP-13	Yes			
	AOC5-MIP-17	Yes			
	AOC5-MIP-25	Yes			
SWMU H (central)	P43N	No			
	P1NB	No			
	PM1NB	Yes			
SWMU H (east end)	WHI7-3F	No	RFI-MW-8	Yes	
			RFI-MW-8F	Yes	
			RFI-MW-8I	Yes	
	P42N	No	CMS-MW-7	No	
			P18N	No	

Notes:
(a) - BASF storm sewer sampling data from 2007.
(b) - RFI-MW-21 is located in the northeastern corner of AOC 5, well away from the area of known high dichloropropane concentrations present in the southwestern corner of AOC 5.
Shading indicates well was selected to represent groundwater concentrations at AOC/SWMU for the utility worker redevelopment scenario.

TABLE 3-8
CONSTITUENTS OF INTEREST - REDEVELOPMENT SCENARIO
BASF NORTH WORKS FACILITY
WYANDOTTE, MICHIGAN
TIER 2 RISK ASSESSMENT

Chemical	CAS	Soil	Groundwater
1,2-DICHLOROETHANE	107-06-2	X	X
1,2-DICHLOROPROPANE	78-87-5	X	X
ACETONE	67-64-1		X
2-PICOLINE	109-06-8		X
ARSENIC	7440-38-2	X	X
BENZENE	71-43-2	X	X
BENZO(A)ANTHRACENE	56-55-3	X	
BENZO(A)PYRENE	50-32-8	X	
BENZO(B)FLUORANTHENE	205-99-2	X	
BIS(2-ETHYLHEXYL)PHTHALATE	117-81-7		X
BIS(2-CHLOROETHYL)ETHER	111-44-4	X	X
BIS(2-CHLOROISOPROPYL)ETHER	108-60-1	X	X
CADMIUM	7440-43-9		X
CHLOROFORM	67-66-3		X
CHROMIUM	7440-47-3	X	X
COBALT	7440-48-4		X
CYANIDE	57-12-5		X
DIBENZ(AH)ANTHRACENE	53-70-3	X	
ETHYLBENZENE	100-41-4		X
LEAD	7439-92-1		X
MERCURY	7439-97-6	X	X
METHYLENE CHLORIDE	75-09-2		X
NAPHTHALENE	91-20-3	X	
NICKEL	7440-02-0		X
PENTACHLOROPHENOL	87-86-5		X
PHENANTHRENE	85-01-8	X	
THALLIUM	7440-28-0		X
TOLUENE	108-88-3		X
VANADIUM	7440-62-2		X
XYLENES (TOTAL)	1330-20-7		X
ZINC	7440-66-6		X

Notes:
CAS - Chemical Abstracts Service.

TABLE 3-9
SUMMARY OF POTENTIAL EXPOSURE ASSUMPTIONS - UTILITY/REDEVELOPMENT WORKER - REDEVELOPMENT SCENARIO
TIER 2 HUMAN HEALTH RISK ASSESSMENT
BASF NORTH WORKS
WYANDOTTE, MICHIGAN

Parameter	Utility/Redevelopment Worker	
Parameters Used in the Soil Fugitive Dust/VOC Inhalation Pathway		
Exposure Time (ET) (hr/day)	8	(a)
Exposure Frequency (EF) (days/year)	20	(b)
Exposure Duration (ED) (yr)	1	(c)
Inhalation Rate (IR) (m^3/hour)	2.5	(e)
Body Weight (BW) (kg)	70	(f)
Parameters Used in the Soil Direct Contact Pathway		
Exposure Frequency (EF) (days/year)	20	(b)
Exposure Duration (ED) (yr)	1	(c)
Soil Ingestion Rate (IR) (mg/day)	330	(d)
Skin Surface Area Exposed (SA) (cm^2)	3339	(g)
Adherence Factor (AF) (cm^2)	0.19	(h)
Body Weight (BW) (kg)	70	(f)
Parameters Used in the Excavation Trench VOC Inhalation Pathway		
Exposure Time (ET) (hr/day)	2	(i)
Exposure Frequency (EF) (days/year)	20	(b)
Exposure Duration (ED) (yr)	1	(c)
Inhalation Rate (IR) (m^3/hour)	2.5	(e)
Body Weight (BW) (kg)	70	(f)
Parameters Used in the Groundwater Pathway		
Exposure Time (Dermal only) (hr/day)	2	(i)
Exposure Frequency (days/year)	20	(b)
Exposure Duration (yr)	1	(c)
Water Ingestion Rate (L/day)	0.005	(j)
Skin Surface Area Exposed (SA) (cm^2)	3339	(g)
Body Weight (kg)	70	(f)

Notes:
(a) - USEPA, 1997a. Exposure Factors Handbook. 50th percentile time spent at work, males and females, all ages. EFH Table 15-68.
(b) - Exposure frequency is equivalent to 5 days per week for 4 weeks, which is a conservative estimate of the anticipated duration of a utility repair, installation, or removal activity associated with redevelopment. An exposure frequency of 20 days per year is also the same exposure frequency used by MDEQ to derive the Part 201 generic groundwater contact criteria (GCC) for a utility worker (MDEQ, 2006).
(c) - Soil excavation/utility activities are assumed to occur within a 1 year period.
(d) - USEPA, 2002. Default construction worker soil ingestion rate.
(e) - USEPA, 1997a. Exposure Factors Handbook. Rate for heavy activity for an outdoor worker listed in EFH Table 5-23.
(f) - USEPA, 1991b. Standard Default Exposure Factors.
(g) - USEPA, 1997a. Exposure Factors Handbook. Represents 50th percentile values for males and females based on hands, forearms, and head, listed in EFH Tables 6-2 and 6-3.
(h) - USEPA, 1997a. Exposure Factors Handbook. Used soil loading rate for utility workers.
(i) - It is assumed that groundwater is exposed for only a fraction of the workday.
(j) - USEPA, 1989. Risk Assessment Guidance for Superfund, Volume I. Value is one-tenth of that assumed to occur during a swimming event.

TABLE 3-10
EXPOSURE POINT CONCENTRATIONS FOR COI IN SOIL - REDEVELOPMENT SCENARIO
BASF NORTH WORKS FACILITY
WYANDOTTE, MICHIGAN
TIER 2 RISK ASSESSMENT

Chemical	CAS	AOC 2	AOC 5		AOC 6	AOC 7A	AOC 7C	SWMU F	SWMU G	SWMU H
1,2-DICHLOROETHANE	107-06-2	NCOI	1.00E+02	(a)	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
1,2-DICHLOROPROPANE	78-87-5	NCOI	2.90E+03	(a)	NCOI	NCOI	NCOI	1.09E+01	NCOI	2.62E+04
ACETONE	67-64-1	NCOI	NCOI		NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
2-PICOLINE	109-06-8	NCOI	NCOI		NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
ARSENIC	7440-38-2	2.54E+01	NCOI		4.10E+01	2.84E+01	2.37E+01	4.22E+01	5.21E+01	2.73E+01
BENZENE	71-43-2	NCOI	NCOI		8.43E+02	NCOI	NCOI	NCOI	NCOI	NCOI
BENZO(A)ANTHRACENE	56-55-3	NCOI	NCOI		3.93E+01	NCOI	NCOI	NCOI	NCOI	NCOI
BENZO(A)PYRENE	50-32-8	NCOI	NCOI		2.96E+01	NCOI	NCOI	NCOI	NCOI	NCOI
BENZO(B)FLUORANTHENE	205-99-2	NCOI	NCOI		3.36E+01	NCOI	NCOI	NCOI	NCOI	NCOI
BIS(2-ETHYLHEXYL)PHTHALATE	117-81-7	NCOI	NCOI		NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
BIS(2-CHLOROETHYL)ETHER	111-44-4	NCOI	6.40E+00	(a)	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
BIS(2-CHLOROISOPROPYL)ETHER	108-60-1	NCOI	4.00E+01	(a)	NCOI	NCOI	NCOI	5.91E+00	NCOI	7.60E+02
CADMIUM	7440-43-9	NCOI	NCOI		NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
CHLOROFORM	67-66-3	NCOI	NCOI		NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
CHROMIUM	7440-47-3	NCOI	NCOI		NCOI	NCOI	NCOI	NCOI	NCOI	5.33E+01
COBALT	7440-48-4	NCOI	NCOI		NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
CYANIDE	57-12-5	NCOI	NCOI		NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
DIBENZ(AH)ANTHRACENE	53-70-3	NCOI	NCOI		2.99E+00	NCOI	NCOI	NCOI	NCOI	NCOI
ETHYLBENZENE	100-41-4	NCOI	NCOI		NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
LEAD	7439-92-1	NCOI	NCOI		NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
MERCURY	7439-97-6	NCOI	NCOI		NCOI	NCOI	NCOI	NCOI	NCOI	2.81E+01
METHYLENE CHLORIDE	75-09-2	NCOI	NCOI		NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
NAPHTHALENE	91-20-3	NCOI	NCOI		1.37E+03	NCOI	NCOI	NCOI	NCOI	NCOI
NICKEL	7440-02-0	NCOI	NCOI		NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
PENTACHLOROPHENOL	87-86-5	NCOI	NCOI		NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
PHENANTHRENE	85-01-8	NCOI	NCOI		2.49E+02	NCOI	NCOI	NCOI	NCOI	NCOI
THALLIUM	7440-28-0	NCOI	NCOI		NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
TOLUENE	108-88-3	NCOI	NCOI		NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
VANADIUM	7440-62-2	NCOI	NCOI		NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
XYLENES (TOTAL)	1330-20-7	NCOI	NCOI		1.04E+02	NCOI	NCOI	NCOI	NCOI	NCOI
ZINC	7440-66-6	NCOI	NCOI		NCOI	NCOI	NCOI	NCOI	NCOI	NCOI

Notes:
In units of mg/kg.
EPCs are upper confidence limits (UCLs) calculated using USEPA's Version 4.0 ProUCL (April 2007) unless otherwise noted.
Only AOC/SWMUs with soil COPCs are shown.
CAS - Chemical Abstracts Service.
NCOI - Not a compound of interest in this medium/area.
(a) EPC is maximum detect due to limited number of soil samples.

TABLE 3-11
EXPOSURE POINT CONCENTRATIONS FOR COI IN GROUNDWATER - REDEVELOPMENT SCENARIO
BASF NORTH WORKS FACILITY
WYANDOTTE, MICHIGAN
TIER 2 RISK ASSESSMENT

Chemical	CAS	AOC 1	AOC 2	AOC 5	AOC 6	AOC 7A	AOC 7B	AOC 7C	SWMU F	SWMU G	SWMU H (west end)	SWMU H (central)	SWMU H (east end)
1,2-DICHLOROETHANE	107-06-2	NCOI	NCOI	2.00E+02	NCOI	NCOI	NCOI	2.00E+02	NCOI	NCOI	2.00E+02	NCOI	NCOI
1,2-DICHLOROPROPANE	78-87-5	NCOI	NCOI	2.40E+03	NCOI	NCOI	NCOI	2.40E+03	1.30E-02	NCOI	2.40E+03	NCOI	NCOI
ACETONE	67-64-1	NCOI	NCOI	6.80E+01	NCOI	NCOI	NCOI	6.80E+01	NCOI	NCOI	6.80E+01	NCOI	NCOI
2-PICOLINE	109-06-8	NCOI	NCOI	NCOI	2.90E-02	NCOI	NCOI	NCOI	NCOI	2.90E-02	NCOI	NCOI	NCOI
ARSENIC	7440-38-2	3.60E-02	2.73E-01	NCOI	NCOI	NCOI	3.80E-02	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
BENZENE	71-43-2	4.06E+00	2.10E-02	NCOI	6.60E-02	NCOI	7.80E-03	NCOI	NCOI	6.60E-02	NCOI	NCOI	NCOI
BENZO(A)ANTHRACENE	56-55-3	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
BENZO(A)PYRENE	50-32-8	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
BENZO(B)FLUORANTHENE	205-99-2	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
BIS(2-ETHYLHEXYL)PHTHALATE	117-81-7	NCOI	NCOI	1.60E+01	NCOI	NCOI	8.40E-03	1.60E+01	NCOI	NCOI	1.60E+01	NCOI	NCOI
BIS(2-CHLOROETHYL)ETHER	111-44-4	4.69E-02	NCOI	1.45E+02	NCOI	NCOI	NCOI	1.45E+02	NCOI	NCOI	1.45E+02	NCOI	NCOI
BIS(2-CHLOROISOPROPYL)ETHER	108-60-1	NCOI	NCOI	4.85E+02	NCOI	NCOI	NCOI	4.85E+02	9.40E-03	NCOI	4.85E+02	NCOI	NCOI
CADMIUM	7440-43-9	NCOI	NCOI	NCOI	NCOI	NCOI	8.00E-03	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
CHLOROFORM	67-66-3	NCOI	NCOI	1.50E+01	NCOI	NCOI	NCOI	1.50E+01	NCOI	NCOI	1.50E+01	NCOI	NCOI
CHROMIUM	7440-47-3	NCOI	2.50E-01	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
COBALT	7440-48-4	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
CYANIDE	57-12-5	NCOI	9.80E-01	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
DIBENZ(AH)ANTHRACENE	53-70-3	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
ETHYLBENZENE	100-41-4	1.71E+01	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
LEAD	7439-92-1	NCOI	4.30E-03	NCOI	NCOI	NCOI	2.39E-01	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
MERCURY	7439-97-6	NCOI	NCOI	NCOI	NCOI	NCOI	3.34E-02	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
METHYLENE CHLORIDE	75-09-2	NCOI	NCOI	5.30E+01	NCOI	NCOI	NCOI	5.30E+01	NCOI	NCOI	5.30E+01	NCOI	NCOI
NAPHTHALENE	91-20-3	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
NICKEL	7440-02-0	NCOI	1.50E+00	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
PENTACHLOROPHENOL	87-86-5	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	3.00E-03
PHENANTHRENE	85-01-8	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
THALLIUM	7440-28-0	NCOI	9.60E-03	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	6.20E-03
TOLUENE	108-88-3	NCOI	NCOI	NCOI	NCOI	NCOI	2.18E+00	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
VANADIUM	7440-62-2	NCOI	1.90E-01	NCOI	NCOI	NCOI	7.70E-02	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
XYLENES (TOTAL)	1330-20-7	8.72E+00	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
ZINC	7440-66-6	NCOI	NCOI	NCOI	NCOI	NCOI	1.41E+01	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI

Notes:
In units of mg/L.
EPCs are maximum detected concentrations in wells located within or in vicinity of each AOC/SWMU.
CAS - Chemical Abstracts Service.
NCOI - Not a compound of interest in this medium/area.

TABLE 3-12
EXPOSURE POINT CONCENTRATIONS FOR COI IN AMBIENT AIR FROM SOIL DUST AND VOLATILES - REDEVELOPMENT SCENARIO (a)
BASF NORTH WORKS FACILITY
WYANDOTTE, MICHIGAN
TIER 2 RISK ASSESSMENT

Chemical	CAS	AOC 2	AOC 5	AOC 6	AOC 7A	AOC 7C	SWMU F	SWMU G	SWMU H
		10.8 acres	11.25 acres	1.4 acres	0.1 acre	0.09 acre	0.95 acre	6.3 acre	1.08 acre
1,2-DICHLOROETHANE	107-06-2	NCOI	2.63E-01	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
1,2-DICHLOROPROPANE	78-87-5	NCOI	9.25E+00	NCOI	NCOI	NCOI	2.25E-02	NCOI	5.58E+01
ACETONE	67-64-1	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
2-PICOLINE	109-06-8	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
ARSENIC	7440-38-2	2.60E-03	NCOI	6.92E-03	4.79E-03	3.99E-03	7.12E-03	5.33E-03	4.60E-03
BENZENE	71-43-2	NCOI	NCOI	2.52E+00	NCOI	NCOI	NCOI	NCOI	NCOI
BENZO(A)ANTHRACENE	56-55-3	NCOI	NCOI	6.63E-03	NCOI	NCOI	NCOI	NCOI	NCOI
BENZO(A)PYRENE	50-32-8	NCOI	NCOI	4.99E-03	NCOI	NCOI	NCOI	NCOI	NCOI
BENZO(B)FLUORANTHENE	205-99-2	NCOI	NCOI	5.67E-03	NCOI	NCOI	NCOI	NCOI	NCOI
BIS(2-ETHYLHEXYL)PHTHALATE	117-81-7	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
BIS(2-CHLOROETHYL)ETHER	111-44-4	NCOI	2.04E-02	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
BIS(2-CHLOROISOPROPYL)ETHER	108-60-1	NCOI	1.28E-01	NCOI	NCOI	NCOI	1.78E-03	NCOI	2.35E-01
CADMIUM	7440-43-9	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
CHLOROFORM	67-66-3	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
CHROMIUM	7440-47-3	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	8.98E-03
COBALT	7440-48-4	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
CYANIDE	57-12-5	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
DIBENZ(AH)ANTHRACENE	53-70-3	NCOI	NCOI	5.04E-04	NCOI	NCOI	NCOI	NCOI	NCOI
ETHYLBENZENE	100-41-4	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
LEAD	7439-92-1	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
MERCURY	7439-97-6	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	4.73E-03
METHYLENE CHLORIDE	75-09-2	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
NAPHTHALENE	91-20-3	NCOI	NCOI	2.48E-01	NCOI	NCOI	NCOI	NCOI	NCOI
NICKEL	7440-02-0	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
PENTACHLOROPHENOL	87-86-5	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
PHENANTHRENE	85-01-8	NCOI	NCOI	4.19E-02	NCOI	NCOI	NCOI	NCOI	NCOI
THALLIUM	7440-28-0	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
TOLUENE	108-88-3	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
VANADIUM	7440-62-2	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
XYLENES (TOTAL)	1330-20-7	NCOI	NCOI	1.80E-01	NCOI	NCOI	NCOI	NCOI	NCOI
ZINC	7440-66-6	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI

Notes:
In units of mg/m3.
(a) Dust concentrations in air for inorganics and heavier SVOCs were calculated using a PEF for a 10-acre source size for AOC 2 and SWMU G, and a PEF for a 0.5 acre source size for AOC 6, AOC 7A, AOC 7C, SWMU F and SWMU H. Volatile concentrations in air were calculated for VOCs and lighter SVOCs using a VF specific to each AOC/SWMU. See Appendix _.
Only AOC/SWMUs with soil COI are shown.
CAS - Chemical Abstracts Service.
NCOI - Not a compound of interest in this medium/area.

TABLE 3-13
EXPOSURE POINT CONCENTRATIONS FOR COI IN TRENCH AIR FROM GROUNDWATER VOLATILES - REDEVELOPMENT SCENARIO (a)
BASF NORTH WORKS FACILITY
WYANDOTTE, MICHIGAN
TIER 2 RISK ASSESSMENT

Chemical	CAS	AOC 1	AOC 2	AOC 5	AOC 6	AOC 7A	AOC 7B	AOC 7C	SWMU F	SWMU G	SWMU H (west end)	SWMU H (central)	SWMU H (east end)
1,2-DICHLOROETHANE	107-06-2	NCOI	NCOI	5.42E+00	NCOI	NCOI	NCOI	5.42E+00	NCOI	NCOI	5.42E+00	NCOI	NCOI
1,2-DICHLOROPROPANE	78-87-5	NCOI	NCOI	6.03E+01	NCOI	NCOI	NCOI	6.03E+01	3.27E-04	NCOI	6.03E+01	NCOI	NCOI
ACETONE	67-64-1	NCOI	NCOI	1.49E+00	NCOI	NCOI	NCOI	1.49E+00	NCOI	NCOI	1.49E+00	NCOI	NCOI
2-PICOLINE	109-06-8	NCOI	NCOI	NCOI	2.99E-04	NCOI	NCOI	NCOI	NCOI	2.99E-04	NCOI	NCOI	NCOI
ARSENIC	7440-38-2	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
BENZENE	71-43-2	1.10E-01	5.69E-04	NCOI	1.79E-03	NCOI	2.11E-04	NCOI	NCOI	1.79E-03	NCOI	NCOI	NCOI
BENZO(A)ANTHRACENE	56-55-3	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
BENZO(A)PYRENE	50-32-8	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
BENZO(B)FLUORANTHENE	205-99-2	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
BIS(2-ETHYLHEXYL)PHTHALATE	117-81-7	NCOI	NCOI	1.46E-03	NCOI	NCOI	7.66E-07	1.46E-03	NCOI	NCOI	1.46E-03	NCOI	NCOI
BIS(2-CHLOROETHYL)ETHER	111-44-4	4.78E-04	NCOI	1.48E+00	NCOI	NCOI	NCOI	1.48E+00	NCOI	NCOI	1.48E+00	NCOI	NCOI
BIS(2-CHLOROISOPROPYL)ETHER	108-60-1	NCOI	NCOI	1.08E+01	NCOI	NCOI	NCOI	1.08E+01	2.10E-04	NCOI	1.08E+01	NCOI	NCOI
CADMIUM	7440-43-9	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
CHLOROFORM	67-66-3	NCOI	NCOI	4.11E-01	NCOI	NCOI	NCOI	4.11E-01	NCOI	NCOI	4.11E-01	NCOI	NCOI
CHROMIUM	7440-47-3	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
COBALT	7440-48-4	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
CYANIDE	57-12-5	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
DIBENZ(AH)ANTHRACENE	53-70-3	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
ETHYLBENZENE	100-41-4	3.98E-01	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
LEAD	7439-92-1	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
MERCURY	7439-97-6	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
METHYLENE CHLORIDE	75-09-2	NCOI	NCOI	1.61E+00	NCOI	NCOI	NCOI	1.61E+00	NCOI	NCOI	1.61E+00	NCOI	NCOI
NAPHTHALENE	91-20-3	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
NICKEL	7440-02-0	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
PENTACHLOROPHENOL	87-86-5	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	8.99E-08
PHENANTHRENE	85-01-8	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
THALLIUM	7440-28-0	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
TOLUENE	108-88-3	NCOI	NCOI	NCOI	NCOI	NCOI	5.42E-02	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
VANADIUM	7440-62-2	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
XYLENES (TOTAL)	1330-20-7	2.14E-01	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI
ZINC	7440-66-6	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI	NCOI

Notes:
In units of mg/m3.
(a) Volatile concentrations in trench air are calculated from groundwater EPCs using a trench model attenuation factor (see Appendix D).
CAS - Chemical Abstracts Service.
NCOI - Not a compound of interest in this medium/area.

TABLE 3-14
DOSE-RESPONSE INFORMATION FOR COMPOUNDS WITH POTENTIAL NONCARCINOGENIC EFFECTS THROUGH THE ORAL ROUTE
BASF NORTH WORKS FACILITY
WYANDOTTE, MICHIGAN
TIER 2 RISK ASSESSMENT

Chemical	CAS	Oral Reference Dose (mg/kg-day)		Fraction Absorbed ABS_{GI} (a)		Dermal Reference Dose (h) (mg/kg-day)	Reference (Last Verifed) Type	EPA Confidence Level	Uncertainty Factor	Modifying Factor	Target Organ/ Critical Effect at LOAEL	Study Animal	Study Method
1,2-DICHLOROETHANE	107-06-2	2.00E-02		NA	(g)	2.00E-02	NCEA (k)	NA	NA	NA	Liver and kidneys	NA	NA
1,2-DICHLOROPROPANE	78-87-5	4.40E-01		NA	(g)	4.40E-01	MDEQ (01/2006)	NA	NA	NA	Blood, liver, reproductive effects (IRIS file)	NA	NA
ACETONE	67-64-1	9.00E-01		NA	(g)	9.00E-01	IRIS (07/2007)	MEDIUM	1000	1	Nephropathy	RAT	ORAL:DRINKING WATER
2-PICOLINE	109-06-8	1.00E-03	(m)	NA	(g)	1.00E-03	IRIS (07/2007)	MEDIUM	1000	1	Increased liver weight	RAT	ORAL:GAVAGE
ARSENIC	7440-38-2	3.00E-04		NA	(g)	3.00E-04	IRIS (07/2007)	MEDIUM	3	1	Hyperpig., Skin Keratosis and Possible Vascular Complications	HUMAN	ORAL:DRINKING WATER
BENZENE	71-43-2	1.20E-02	(o)	NA	(g)	1.20E-02	IRIS (07/2007)	MEDIUM	100	1	Decreased Lymphocyte Count	HUMAN	INHALATION:OCCUPATIONAL
BENZO(A)ANTHRACENE	56-55-3	3.00E-01	(c,p)	NA	(g)	3.00E-01	IRIS (07/2007)	LOW	300	1	Kidney Effects	MOUSE	ORAL:BIOASSAY
BENZO(A)PYRENE	50-32-8	3.00E-01	(c,p)	NA	(g)	3.00E-01	IRIS (07/2007)	LOW	300	1	Kidney Effects	MOUSE	ORAL:BIOASSAY
BENZO(B)FLUORANTHENE	205-99-2	3.00E-01	(c,p)	NA	(g)	3.00E-01	IRIS (07/2007)	LOW	300	1	Kidney Effects	MOUSE	ORAL:BIOASSAY
BIS(2-ETHYLHEXYL)PHTHALATE	117-81-7	2.00E-02		NA	(g)	2.00E-02	IRIS (07/2007)	MEDIUM	1000	1	Increased relative liver weight	GUINEA PIG	ORAL: BIOASSAY
BIS(2-CHLOROETHYL)ETHER	111-44-4	4.00E-02	(b)	NA	(g)	4.00E-02	IRIS (07/2007)	LOW	1000	1	Decrease in hemoglobin and possible erythrocyte destruction	MOUSE	ORAL:DIET
BIS(2-CHLOROISOPROPYL)ETHER	108-60-1	4.00E-02		NA	(g)	4.00E-02	IRIS (07/2007)	LOW	1000	1	Decrease in hemoglobin and possible erythrocyte destruction	MOUSE	ORAL:DIET
CADMIUM	7440-43-9	5.00E-04	(n)	0.05		2.50E-05	IRIS (07/2007)	HIGH	10	1	Significant proteinuria	HUMAN	ORAL:DRINKING WATER
CHLOROFORM	67-66-3	1.00E-02		NA	(g)	1.00E-02	IRIS (07/2007)	MEDIUM	100	1	Fatty cyst formation in liver and elevated SGTP	DOG	ORAL:CAPSULE
CHROMIUM	7440-47-3	1.50E+00	(f)	0.013		1.95E-02	IRIS (07/2007)	LOW	100	10	No Observed Effects	RAT	ORAL:DIET
COBALT	7440-48-4	2.00E-02		NA	(g)	2.00E-02	NCEA (01/2002)	MED/LOW	10	1	Polycythemia	HUMAN	ORAL
CYANIDE	57-12-5	2.00E-02		NA	(g)	2.00E-02	IRIS (07/2007)	MEDIUM	100	5	No Adverse Effects (Other Effects: Weight Loss, Thyroid)	RAT	ORAL
DIBENZ(AH)ANTHRACENE	53-70-3	3.00E-01	(c,p)	NA	(g)	3.00E-01	IRIS (07/2007)	LOW	300	1	Kidney Effects	MOUSE	ORAL:BIOASSAY
ETHYLBENZENE	100-41-4	1.00E-01		NA	(g)	1.00E-01	IRIS (07/2007)	LOW	1000	1	Liver and Kidney Toxicity	RAT	ORAL:GAVAGE
LEAD	7439-92-1	NA	(i)	NA	(g)	NA	NA	NA	NA	NA	NA	NA	NA
MERCURY	7439-97-6	3.00E-03	(j)	0.07		2.10E-04	HEAST (1997)	NA	100	1	Autoimmune Effects	RAT	ORAL
METHYLENE CHLORIDE	75-09-2	6.00E-02		NA	(g)	6.00E-02	IRIS (07/2007)	MEDIUM	100	1	Liver Toxicity	RAT	DRINKING WATER:BIOASSAY
NAPHTHALENE	91-20-3	2.00E-01	(p)	NA	(g)	2.00E-01	IRIS (07/2007)	LOW	300	1	Decreased Mean Terminal Body Weight in Males	RAT	ORAL
NICKEL	7440-02-0	2.00E-02		0.04		8.00E-04	IRIS (07/2007)	MEDIUM	300	1	Decreased Body and Weight Organs	RAT	ORAL
PENTACHLOROPHENOL	87-86-5	3.00E-02		NA		3.00E-02	IRIS (07/2007)	MEDIUM	100	1	Liver and kidney pathology	RAT	ORAL
PHENANTHRENE	85-01-8	3.00E-01	(e)	NA	(g)	3.00E-01	IRIS (07/2007)	LOW	3000	1	No Observed Effects	MOUSE	ORAL
THALLIUM	7440-28-0	6.67E-04	(d,p)	NA	(g)	6.67E-04	IRIS (07/2007)	LOW	300	1	Increased levels of SGOT and LDH	RAT	ORAL:DIET
TOLUENE	108-88-3	8.00E-01	(p)	NA	(g)	8.00E-01	IRIS (07/2007)	MEDIUM	300	1	Increased kidney weight	RAT	ORAL: GAVAGE
VANADIUM	7440-62-2	1.00E-03		0.026		2.60E-05	NCEA (01/2005)	MEDIUM	300	1	Kidney Toxicity	HUMAN	ORAL
XYLENES (TOTAL)	1330-20-7	2.00E-01		NA	(g)	2.00E-01	IRIS (07/2007)	MEDIUM	1000	1	Decreased Body Weight, Increased Mortality	RAT	ORAL:GAVAGE
ZINC	7440-66-6	3.00E-01		NA	(g)	3.00E-01	IRIS (07/2007)	MED/HIGH	3	1	Hematologic Effects	HUMAN	ORAL:DIET SUPPLEMENT

Notes:
ABS_{GI} - Gastrointestinal absorption.
CAS - Chemical Abstracts Service.
CNS - Central Nervous System.
IRIS - Integrated Risk Information System, an on-line computer database of toxicological information (USEPA, 2007).
LOAEL - Lowest Observed Adverse Effects Level.
MDEQ - Michigan Department of Environmental Quality. RRD Op Memo No 1. Table 4. Toxicological and Chemical-Physical Data. January 23, 2006.
NA - Not applicable.
NCEA - National Center for Environmental Assessment.
RBC - Region 3 Risk Based Concentration Table (04/2007) (USEPA, 2007).
RfD - Reference Dose.
USEPA - United States Environmental Protection Agency.
(a) USEPA, 2004. Risk Assessment Guidance for Superfund. Volume 1, Part E, Supplemental Guidance for Dermal Risk Assessment. Exhibit 4-1.
(b) Value for bis(2-chloroisopropyl)ether used as surrogate based on structural similarities.
(c) Value for pyrene used as surrogate based on structural similiarities.
(d) The NOAEL of 0.25 mg/kg-day for Thallium Sulfate (IRIS, 07/2007) was adjusted for the molecular weight of Thallium (see the Thallium Acetate IRIS file (07/2007) to 0.20 mg/kg-day. Therefore, the Thallium RfD = 0.20 mg/kg-day / UF 3000 = 6.67E-05 mg/kg-day.
(e) Value for anthracene used as surrogate based on structural similarities.
(f) Value for chromium III.
(g) No adjustment, per USEPA 2004.
(h) Dermal RfD = Oral RfD x ABS_{GI}, where applicable (USEPA, 2004).
(i) Lead evaluated using USEPA Adult Blood Lead Model.
(j) Value for Mercuric chloride.
(k) Value cited in the USEPA Region 9 PRG table (USEPA, 2004).
(m) Value for pyridine used as surrogate based on structural similarities.
(n) Value for water.
(o) Subchronic value derived from chronic value by removal of uncertainty factor of 3 used for subchronic-to-chronic extrapolation.
(p) Subchronic value derived from chronic value by removal of uncertainty factor of 10 used for subchronic-to-chronic extrapolation.

TABLE 3-15
DOSE-RESPONSE INFORMATION FOR COMPOUNDS WITH POTENTIAL NONCARCINOGENIC EFFECTS THROUGH THE INHALATION ROUTE
BASF NORTH WORKS FACILITY
WYANDOTTE, MICHIGAN
TIER 2 RISK ASSESSMENT

Chemical	CAS	Inhalation Dose-Response Value (mg/kg-day)		Inhalation Reference Concentration (mg/m^3)		Reference (Last Verified) Type	EPA Confidence Level	Uncertainty Factor	Modifying Factor	Target Organ/ Critical Effect at LOAEL	Study Animal	Study Method
1,2-DICHLOROETHANE	107-06-2	7.00E-01		NA		HEAST (1997) (e)	NA	NA	NA	NA	NA	NA
1,2-DICHLOROPROPANE	78-87-5	3.43E-03	(a)	1.20E-02	(i)	IRIS (07/2007)	MEDIUM	100	1	Hyperplasia of the nasal mucosa	RAT	INHALATION
ACETONE	67-64-1	9.00E-01	(b)	NA		IRIS (07/2007)	MEDIUM	1000	1	Nephropathy	RAT	ORAL:DRINKING WATER
2-PICOLINE	109-06-8	1.00E-03	(b)	NA		IRIS (07/2007)	MEDIUM	1000	1	Increased liver weight	RAT	ORAL:GAVAGE
ARSENIC	7440-38-2	3.00E-04	(b)	NA		IRIS (07/2007)	MEDIUM	3	1	Hyperpig., Skin Keratosis and Possible Vascular Complications	HUMAN	ORAL:DRINKING WATER
BENZENE	71-43-2	2.57E-02	(a)	9.00E-02	(i)	IRIS (07/2007)	MEDIUM	100	1	Dcreased Lymphocyte Count	HUMAN	INHALATION:OCCUPATIONAL
BENZO(A)ANTHRACENE	56-55-3	3.00E-01	(b,d,j)	NA		IRIS (07/2007)	LOW	300	1	Kidney Effects (Renal Tubular Pathology, Decreased Kidney Weights)	MOUSE	ORAL:GAVAGE
BENZO(A)PYRENE	50-32-8	3.00E-01	(b,d,j)	NA		IRIS (07/2007)	LOW	300	1	Kidney Effects (Renal Tubular Pathology, Decreased Kidney Weights)	MOUSE	ORAL:GAVAGE
BENZO(B)FLUORANTHENE	205-99-2	3.00E-01	(b,d,j)	NA		IRIS (07/2007)	LOW	300	1	Kidney Effects (Renal Tubular Pathology, Decreased Kidney Weights)	MOUSE	ORAL:GAVAGE
BIS(2-ETHYLHEXYL)PHTHALATE	117-81-7	2.00E-02	(b)	NA		IRIS (07/2007)	MEDIUM	1000	1	Increased relative liver weight	GUINEA PIG	ORAL: BIOASSAY
BIS(2-CHLOROETHYL)ETHER	111-44-4	4.00E-02	(b,f)	NA		IRIS (07/2007)	LOW	1000	1	Decrease in hemoglobin and possible erythrocyte destruction	MOUSE	ORAL:DIET
BIS(2-CHLOROISOPROPYL)ETHER	108-60-1	4.00E-02	(b)	NA		IRIS (07/2007)	LOW	1000	1	Decrease in hemoglobin and possible erythrocyte destruction	MOUSE	ORAL:DIET
CADMIUM	7440-43-9	5.70E-05		NA		NCEA (e)	NA	NA	NA	Kidney and lung effects	NA	NA
CHLOROFORM	67-66-3	1.43E-02	(a)	5.00E-02		NCEA (1/22/03) (e)	LOW/MED	100	NA	Liver, kidney and CNS effects	MOUSE	INHALATION
CHROMIUM	7440-47-3	1.50E+00	(b)	NA		IRIS (07/2007)	LOW	100	10	No Observed Effects	RAT	ORAL:DIET
COBALT	7440-48-4	5.71E-06	(a)	2.00E-05		NCEA	MED/LOW	100	1	Lung/respiratory Effects	HUMAN	OCCUPATIONAL
CYANIDE	57-12-5	2.00E-02	(b)	NA		IRIS (07/2007)	MEDIUM	100	5	No Adverse Effects (Other Effects: Weight Loss, Thyroid)	RAT	ORAL
DIBENZ(AH)ANTHRACENE	53-70-3	3.00E-01	(b,d,j)	NA		IRIS (07/2007)	LOW	300	1	Kidney Effects (Renal Tubular Pathology, Decreased Kidney Weights)	MOUSE	ORAL:GAVAGE
ETHYLBENZENE	100-41-4	2.86E-01	(a)	1.00E+00		IRIS (07/2007)	LOW	300	1	Developmental Toxicity	RAT/RABBIT	INHALATION
LEAD	7439-92-1	NA		NA		NA	NA	NA	NA	NA	NA	NA
MERCURY	7439-97-6	8.57E-05	(a,h)	3.00E-04		IRIS (07/2007)	MEDIUM	30	1	Hand tremor; memory disturbances; autonomic dysfunction	HUMAN	INHALATION:OCCUPATIONAL
METHYLENE CHLORIDE	75-09-2	3.00E-01		NA		ATSDR MRL (e)	NA	30	NA	Hepatic	NA	NA
NAPHTHALENE	91-20-3	2.57E-03	(a)	9.00E-03	(i)	IRIS (07/2007)	MEDIUM	1000	1	Nasal Effects: Hyperplasia and Metaplasia in Repiratory and Olfactory Epithelium	MOUSE	INHALATION
NICKEL	7440-02-0	NA		NA		NA	NA	NA	NA	NA	NA	NA
PENTACHLOROPHENOL	87-86-5	3.00E-02	(b)	NA		IRIS (07/2007)	MEDIUM	100	1	Liver and kidney pathology	RAT	ORAL
PHENANTHRENE	85-01-8	3.00E-01	(b,g)	NA		IRIS (07/2007)	LOW	1000	1	No Observed Effects	MOUSE	ORAL
THALLIUM	7440-28-0	NA		NA		NA	NA	NA	NA	NA	NA	NA
TOLUENE	108-88-3	1.43E+00	(a)	5.00E+00		IRIS (07/2007)	HIGH	10	1	Neurological Effects	HUMAN	OCCUPATIONAL
VANADIUM	7440-62-2	NA		NA		NA	NA	NA	NA	NA	NA	NA
XYLENES (TOTAL)	1330-20-7	8.57E-02	(a)	3.00E-01	(i)	IRIS (07/2007)	MEDIUM	100	1	Impaired Motor Coordination (Decreased Rotarod Performance)	RAT	INHALATION
ZINC	7440-66-6	NA		NA		NA	NA	NA	NA	NA	NA	NA

Notes:
ATSDR MRL - Agency for Toxic Substances and Disease Registry. Minimal Risk Level. December 2006. As cited in RBC table.
CAS - Chemical Abstracts Service.
CNS - Central Nervous System.
HEAST - Health Effects Assessment Summary Tables, published annually by the USEPA (1997). HEAST alternative value. As cited in RBC table.
IRIS - Integrated Risk Information System, an on-line computer database of toxicological information (USEPA, 2007).
LOAEL - Lowest Observed Adverse Effects Level.
NA - Not Available.
NCEA - National Center for Environmental Assessment.
PPRTV - Provisional Peer-Reviewed Toxicity Value.
PRG - Region 9 Preliminary Remediation Goal Table (10/2004) (USEPA, 2004).
RBC - Region 3 Risk Based Concentration Table (04/2007) (USEPA, 2007).
RfC - Reference Concentration.
USEPA - United States Environmental Protection Agency.
(a) Converted from reference concentration: RfC (mg/m3) x ((20 m3 air/day)/70kg).
(b) Inhalation RfD based on route-to-route extrapolation from the oral RfD.
(c) Provisional value cited in the USEPA Region 9 PRG table (October, 2004), based on route to route extrapolation.
(d) Value for pyrene used as surrogate based on structural similaritiies.
(e) Value cited in the Region 3 Risk Based Concentrations (RBC) Table, (USEPA, 2007).
(f) Value for bis(2-chloroisopropyl)ether used as surrogate based on structural similarities.
(g) Value for anthracene used as surrogate based on structural similarities.
(h) Value for elemental mercury.
(i) Subchronic value derived from chronic value by removal of uncertainty factor of 3 used for subchronic-to-chronic extrapolation.
(j) Subchronic value derived from chronic value by removal of uncertainty factor of 10 used for subchronic-to-chronic extrapolation.

TABLE 3-16
DOSE-RESPONSE INFORMATION FOR COMPOUNDS WITH POTENTIAL CARCINOGENIC EFFECTS BY THE ORAL ROUTE OF EXPOSURE
BASF NORTH WORKS FACILITY
WYANDOTTE, MICHIGAN
TIER 2 RISK ASSESSMENT

Chemical	CAS	EPA Carcinogen Class	Oral CSF $(mg/kg\text{-}day)^{-1}$		Fraction Absorbed ABS_{GI} (a)		Dermal CSF Value (mg/kg-day)	Oral CSF Reference (Last Verified)	Oral CSF Study Animal	Oral CSF Study Method
1,2-DICHLOROETHANE	107-06-2	B2	9.10E-02		NA	(e)	9.10E-02	IRIS (07/2007)	RAT	ORAL:GAVAGE
1,2-DICHLOROPROPANE	78-87-5	NA	NA		NA	(e)	NA	IRIS (07/2007)	NA	NA
ACETONE	67-64-1	NA	NA		NA	(e)	NA	IRIS (07/2007)	NA	NA
2-PICOLINE	109-06-8	NA	NA		NA	(e)	NA	IRIS (07/2007)	NA	NA
ARSENIC	7440-38-2	A	1.50E+00		NA	(e)	1.50E+00	IRIS (07/2007)	HUMAN	ORAL:DRINKING WATER
BENZENE	71-43-2	A	5.50E-02	(d)	NA	(e)	5.50E-02	IRIS (07/2007)	HUMAN	INHALATION:OCCUPATIONAL
BENZO(A)ANTHRACENE	56-55-3	B2	7.30E-01	(c)	NA	(e)	7.30E-01	IRIS (07/2007)	MOUSE	ORAL:DIET
BENZO(A)PYRENE	50-32-8	B2	7.30E+00		NA	(e)	7.30E+00	IRIS (07/2007)	MOUSE	ORAL:DIET
BENZO(B)FLUORANTHENE	205-99-2	B2	7.30E-01	(c)	NA	(e)	7.30E-01	IRIS (07/2007)	MOUSE	ORAL:DIET
BIS(2-ETHYLHEXYL)PHTHALATE	117-81-7	B2	1.40E-02		NA	(e)	1.40E-02	IRIS (07/2007)	MOUSE	ORAL:DIET
BIS(2-CHLOROETHYL)ETHER	111-44-4	B2	1.10E+00		NA	(e)	1.10E+00	IRIS (07/2007)	MOUSE	ORAL:GAVAGE
BIS(2-CHLOROISOPROPYL)ETHER	108-60-1	B2	7.00E-02		NA	(e)	7.00E-02	HEAST (1997) (f)	MOUSE	ORAL:DIET
CADMIUM	7440-43-9	B1	NA		NA	(e)	NA	IRIS (07/2007)	NA	NA
CHLOROFORM	67-66-3	B2	NA	(g)	NA	(e)	NA	IRIS (07/2007)	NA	NA
CHROMIUM	7440-47-3	D	NA		NA	(e)	NA	IRIS (07/2007)	NA	NA
COBALT	7440-48-4	NA	NA		NA	(e)	NA	IRIS (07/2007)	NA	NA
CYANIDE	57-12-5	D	NA		NA	(e)	NA	IRIS (07/2007)	NA	NA
DIBENZ(AH)ANTHRACENE	53-70-3	B2	7.30E+00	(b)	NA	(e)	7.30E+00	IRIS (07/2007)	MOUSE	ORAL:DIET
ETHYLBENZENE	100-41-4	D	NA		NA	(e)	NA	IRIS (07/2007)	NA	NA
LEAD	7439-92-1	NA	NA		NA	(e)	NA	IRIS 07/2007)	NA	NA
MERCURY	7439-97-6	D	NA		0.07		NA	IRIS 07/2007)	NA	NA
METHYLENE CHLORIDE	75-09-2	B2	7.50E-03		NA	(e)	7.50E-03	IRIS (07/2007)	MOUSE	ORAL:DRINKING WATER
NAPHTHALENE	91-20-3	C	NA		NA	(e)	NA	IRIS (07/2007)	NA	NA
NICKEL	7440-02-0	NA	NA		0.04		NA	IRIS (07/2007)	NA	NA
PENTACHLOROPHENOL	87-86-5	B2	1.20E-01		NA	(e)	1.20E-01	IRIS (07/2007)	MOUSE	ORAL:DIET
PHENANTHRENE	85-01-8	D	NA		NA	(e)	NA	IRIS (07/2007)	NA	NA
THALLIUM	7440-28-0	NA	NA		NA	(e)	NA	IRIS (07/2007)	NA	NA
TOLUENE	108-88-3	NA	NA		NA	(e)	NA	IRIS (07/2007)	NA	NA
VANADIUM	7440-62-2	NA	NA		0.026		NA	IRIS (07/2007)	NA	NA
XYLENES (TOTAL)	1330-20-7	NA	NA		NA	(e)	NA	IRIS (07/2007)	NA	NA
ZINC	7440-66-6	D	NA		NA	(e)	NA	IRIS (07/2007)	NA	NA

Notes:

A - Human carcinogen.
B1 - Probable human carcinogen.
C - Possible human carcinogen.
2A - Probable human carcinogen.
B2 - Probable human carcinogen.
D - Not classifiable as to human carcinogenicity.

ABS_{GI} - Gastrointestinal absorption.
CAS - Chemical Abstracts Service.
CSF - Cancer Slope Factor.
IRIS - Integrated Risk Information System, an online computer database of toxicological infomation (USEPA, 2007).
NA - Not available.
OEHHA - Office of Environmental Health Hazard Assessment, Cancer Potency Factors. August 2005. (CalEPA, 2005).
USEPA - United States Environmental Protection Agency.
(a) USEPA, 2004. Risk Assessment Guidance for Superfund. Volume 1, Part E, Supplimental Guidance for Dermal Risk Assessment. Exhibit 4-1. Default values were used where no chemical specific values available.
(b) Calculated using benzo(a)pyrene toxicity equivalency factor of 1 (USEPA, 1993).
(c) Calculated using benzo(a)pyrene toxicity equivalency factor of 0.1 (USEPA, 1993).
(d) Upper end of the range of cancer slope factors provided on IRIS (1.5E02 to 5.5E-02 $(mg/kg\text{-}day)^{-1}$).
(e) No adjustment, per USEPA (2004).
(f) Value cited in the Region 3 Risk Based Concentrations (RBC) Table, (USEPA, 2007).
(g) The Oral RfD can be considered protective of cancer according to IRIS (USEPA, 2007).

TABLE 3-17
DOSE-RESPONSE INFORMATION FOR CHEMICALS WITH POTENTIAL CARCINOGENIC EFFECTS BY THE INHALATION ROUTE OF EXPOSURE
BASF NORTH WORKS FACILITY
WYANDOTTE, MICHIGAN
TIER 2 RISK ASSESSMENT

Chemical	CAS	EPA Carcinogen Class	Inhalation CSF $(mg/kg\text{-}day)^{-1}$	Unit Risk Factor (m^3/ug)	Inhalation CSF Reference (Last Verified)	Inhalation CSF Study Animal	Inhalation CSF Study Method
1,2-DICHLOROETHANE	107-06-2	B2	9.10E-02 (a)	2.60E-05	IRIS (07/2007)	RAT	ORAL:GAVAGE
1,2-DICHLOROPROPANE	78-87-5	NA	NA	NA	IRIS (07/2007)	NA	NA
ACETONE	67-64-1	NA	NA	NA	IRIS (07/2007)	NA	NA
2-PICOLINE	109-06-8	NA	NA	NA	IRIS (07/2007)	NA	NA
ARSENIC	7440-38-2	A	1.51E+01	4.30E-03	IRIS (07/2007)	NA	NA
BENZENE	71-43-2	A	2.73E-02 (a)	7.80E-06 (d)	IRIS (07/2007)	HUMAN	INHALATION
BENZO(A)ANTHRACENE	56-55-3	B2	3.10E-01 (b)	NA	NCEA (11/18/94) (c)	HAMSTER	INHALATION
BENZO(A)PYRENE	50-32-8	B2	3.10E+00 (a)	8.86E-04	NCEA (11/18/94) (c)	HAMSTER	INHALATION
BENZO(B)FLUORANTHENE	205-99-2	B2	3.10E-01 (b)	NA	NCEA (11/18/94) (c)	HAMSTER	INHALATION
BIS(2-ETHYLHEXYL)PHTHALATE	117-81-7	B2	NA	NA	IRIS (07/2007)	NA	NA
BIS(2-CHLOROETHYL)ETHER	111-44-4	B2	1.16E+00 (a)	3.30E-04	IRIS (07/2007)	MOUSE	ORAL:GAVAGE
BIS(2-CHLOROISOPROPYL)ETHER	108-60-1	B2	3.50E-02	NA	HEAST (1997) (c)	NA	NA
CADMIUM	7440-43-9	B1	6.30E+00 (a)	1.80E-03	IRIS (07/2007)	HUMAN	INHALATION:OCCUPATIONAL
CHLOROFORM	67-66-3	B2	8.05E-02 (a)	2.30E-05	IRIS (07/2007)	MOUSE	ORAL:GAVAGE
CHROMIUM	7440-47-3	D	NA	NA	IRIS (07/2007)	NA	NA
COBALT	7440-48-4	NA	NA	NA	IRIS (07/2007)	NA	NA
CYANIDE	57-12-5	D	NA	NA	IRIS (07/2007)	NA	NA
DIBENZ(AH)ANTHRACENE	53-70-3	B2	3.10E+00	8.86E-04	NCEA (11/18/94) (c)	HAMSTER	INHALATION
ETHYLBENZENE	100-41-4	D	NA	NA	IRIS (07/2007)	NA	NA
LEAD	7439-92-1	NA	NA	NA	IRIS (07/2007)	NA	NA
MERCURY	7439-97-6	D	NA	NA	IRIS (07/2007)	NA	NA
METHYLENE CHLORIDE	75-09-2	B2	1.65E-03 (a)	4.70E-07	IRIS (07/2007)	MOUSE	INHALATION
NAPHTHALENE	91-20-3	C	NA	NA	IRIS (07/2007)	NA	NA
NICKEL	7440-02-0	A	8.40E-01 (a)	2.40E-04 (e)	IRIS (07/2007)	HUMAN	INHALATION
PENTACHLOROPHENOL	87-86-5	B2	NA	NA	IRIS (07/2007)	NA	NA
PHENANTHRENE	85-01-8	D	NA	NA	IRIS (07/2007)	NA	NA
THALLIUM	7440-28-0	NA	NA	NA	IRIS (07/2007)	NA	NA
TOLUENE	108-88-3	NA	NA	NA	IRIS (07/2007)	NA	NA
VANADIUM	7440-62-2	NA	NA	NA	IRIS (07/2007)	NA	NA
XYLENES (TOTAL)	1330-20-7	NA	NA	NA	IRIS (07/2007)	NA	NA
ZINC	7440-66-6	D	NA	NA	IRIS (07/2007)	NA	NA

Notes:
A - Human carcinogen.
B1 - Probable human carcinogen.
C - Possible human carcinogen.
2A - Probable human carcinogen.
B2 - Probable human carcinogen.
D - Not classifiable as to human carcinogenicity.
CalEPA - California Environmental Protection Agency.
CSF - Cancer Slope Factor.
IRIS - Integrated Risk Information System, an online computer database of toxicological infomation (USEPA, 2007).
NA - Not available.
NCEA - National Center for Environmental Assessment.
OEHHA - Office of Environmental Health Hazard Assessment, Cancer Potency Factors. August 2005. (CalEPA, 2005).
(a) Converted from inhalation unit risk: URF m3/kg x (70g x (1day/20m3) x 1000 ug/mg).
(b) Calculated using benzo(a)pyrene toxicity equivalency factor of 0.1 (USEPA, 1993).
(c) As cited in USEPA Region 3 RBC Table (USEPA, 2007).
(d) Upper end of the range of inhalation unit risk factors provided on IRIS (2.2E-06 to 7.8E-06 $(ug/m^3)^{-1}$)
(e) Value for nickel refinery dust.

TABLE 3-18
DERMAL ABSORPTION FRACTIONS FOR EXPOSURE TO SOIL
BASF NORTH WORKS FACILITY
WYANDOTTE, MICHIGAN
TIER 2 RISK ASSESSMENT

Chemical	Dermal (Soil) (a)	
1,2-DICHLOROETHANE	1.00E-02	(b)
1,2-DICHLOROPROPANE	1.00E-02	(b)
ACETONE	1.00E-02	(b)
2-PICOLINE	1.00E-02	(b)
ARSENIC	3.00E-02	(a)
BENZENE	1.00E-02	(b)
BENZO(A)ANTHRACENE	1.30E-01	(a)
BENZO(A)PYRENE	1.30E-01	(a)
BENZO(B)FLUORANTHENE	1.30E-01	(a)
BIS(2-ETHYLHEXYL)PHTHALATE	1.00E-02	(b)
BIS(2-CHLOROETHYL)ETHER	1.00E-02	(a)
BIS(2-CHLOROISOPROPYL)ETHER	1.00E-02	(a)
CADMIUM	1.00E-03	(a)
CHLOROFORM	1.00E-02	(b)
CHROMIUM	1.00E-03	(b)
COBALT	1.00E-03	(b)
CYANIDE	1.00E-03	(b)
DIBENZ(AH)ANTHRACENE	1.30E-01	(a)
ETHYLBENZENE	1.00E-02	(b)
LEAD	1.00E-03	(b)
MERCURY	1.00E-03	(b)
METHYLENE CHLORIDE	1.00E-02	(b)
NAPHTHALENE	1.30E-01	(a)
NICKEL	1.00E-03	(b)
PENTACHLOROPHENOL	2.50E-01	(a)
PHENANTHRENE	1.30E-01	(a)
THALLIUM	1.00E-03	(b)
TOLUENE	1.00E-02	(b)
VANADIUM	1.00E-03	(b)
XYLENES (TOTAL)	1.00E-02	(b)
ZINC	1.00E-03	(b)

Notes:
DAF - Dermal Absorption Fraction.
DAFs are only presented for chemicals which have a corresponding dose response value.
(a) USEPA, 2004. Risk Assessment Guidance for Superfund. Vol. 1, Part E. July, 2004. Exhibit 3-4.
(b) For chemicals not covered by Exhibit 3-4 of RAGS Part E, the default dermal absorption factor of 1.00E-02 for organic chemicals and 1.00E-03 for inorganic chemicals is recommended by USEPA Region 4 Risk Assessment Bulletins: Supplement to RAGS (USEPA, 2000). (www.epa.gov/region04/waste/ots/heatbul.htm#hhtox).

TABLE 3-19a
CONSTANTS AND VARIABLES USED IN THE CALCULATION OF DERMAL DOSE VIA WATER EXPOSURE
BASF NORTH WORKS FACILITY
WYANDOTTE, MICHIGAN
TIER 2 RISK ASSESSMENT

Chemical	Permeability Constant (cm/hr)		B (dimensionless)		Lag Time (τ) (hr)		Time to Steady State (t*) (hr)		Fraction Absorbed (dimensionless)	
1,2-DICHLOROETHANE	4.20E-03	(a)	1.61E-02	(a)	3.80E-01	(a)	9.20E-01	(a)	1.00E+00	(a)
1,2-DICHLOROPROPANE	7.80E-03	(a)	3.17E-02	(a)	4.60E-01	(a)	1.10E+00	(a)	1.00E+00	(a)
ACETONE	5.20E-04	(d)	1.53E-03	(d)	2.22E-01	(d)	5.34E-01	(d)	1.00E+00	(a)
2-PICOLINE	1.58E-03	(d)	8.86E-03	(d)	3.49E-01	(d)	8.39E-01	(d)	1.00E+00	(a)
ARSENIC	1.00E-03	(b)	--		--		--		--	
BENZENE	1.50E-02	(a)	1.00E-01	(a)	2.90E-01	(a)	7.00E-01	(a)	1.00E+00	(a)
BENZO(A)ANTHRACENE	4.70E-01	(a)	2.80E+00	(a)	2.03E+00	(a)	8.53E+00	(a)	1.00E+00	(a)
BENZO(A)PYRENE	7.00E-01	(a)	4.30E+00	(a)	2.69E+00	(a)	1.17E+01	(a)	1.00E+00	(a)
BENZO(B)FLUORANTHENE	7.00E-01	(a)	4.30E+00	(a)	2.77E+00	(a)	1.20E+01	(a)	1.00E+00	(a)
BIS(2-ETHYLHEXYL)PHTHALATE	2.50E-02	(a)	2.00E-01	(a)	1.66E+01	(a)	3.99E+01	(a)	8.00E-01	(a)
BIS(2-CHLOROETHYL)ETHER	1.80E-03	(a)	8.17E-03	(a)	6.80E-01	(a)	1.62E+00	(a)	1.00E+00	(a)
BIS(2-CHLOROISOPROPYL)ETHER	9.08E-03	(d)	4.57E-02	(d)	9.55E-01	(d)	2.29E+00	(d)	1.00E+00	(a)
CADMIUM	1.00E-03	(b)	--		--		--		--	
CHLOROFORM	6.80E-03	(a)	2.87E-02	(a)	5.00E-01	(a)	1.19E+00	(a)	1.00E+00	(a)
CHROMIUM	1.00E-03	(b)	--		--		--		--	
COBALT	1.50E-04	(e)	--		--		--		--	
CYANIDE	1.00E-03	(b)	--		--		--		--	
DIBENZ(AH)ANTHRACENE	1.50E+00	(a)	9.70E+00	(a)	3.88E+00	(a)	1.76E+01	(a)	6.00E-01	(a)
ETHYLBENZENE	4.90E-02	(a)	2.00E-01	(a)	4.20E-01	(a)	1.01E+00	(a)	1.00E+00	(a)
LEAD	1.50E-04	(e)	--		--		--		--	
MERCURY	1.00E-03	(b)	--		--		--		--	
METHYLENE CHLORIDE	3.50E-03	(a)	1.26E-02	(a)	3.20E-01	(a)	7.60E-01	(a)	1.00E+00	(a)
NAPHTHALENE	4.70E-02	(a)	2.00E-01	(a)	5.60E-01	(a)	1.34E+00	(a)	1.00E+00	(a)
NICKEL	2.00E-04	(b)	--		--		--		--	
PENTACHLOROPHENOL	3.90E-01	(a)	2.50E+00	(a)	3.33E+00	(a)	1.38E+01	(a)	9.00E-01	(a)
PHENANTHRENE	1.40E-01	(a)	7.00E-01	(a)	1.06E+00	(a)	4.11E+00	(a)	1.00E+00	(a)
THALLIUM	1.00E-03	(b)	--		--		--		--	
TOLUENE	3.10E-02	(a)	1.00E-01	(a)	3.50E-01	(a)	8.40E-01	(a)	1.00E+00	(a)
VANADIUM	1.00E-03	(b)	--		--		--		--	
XYLENES (TOTAL)	5.30E-02	(c)	2.00E-01	(c)	4.20E-01	(c)	1.01E+00	(c)	1.00E+00	(c)
ZINC	6.00E-04	(b)	--		--		--		--	

Notes:
"--" - Value not needed for inorganics.
NA - Not Applicable.
(a) U.S. EPA, 2004. Risk Assessment Guidance for Superfund. Volume 1, Part E, Supplemental Guidance for Dermal Risk Assessment. Exhibit B-3.
(b) U.S. EPA, 2004. Risk Assessment Guidance for Superfund. Volume 1, Part E, Supplemental Guidance for Dermal Risk Assessment. Exhibit B-4.
(c) Value for Xylene, m- used as surrogate for Xylenes (Total) due to structural similarities.
(d) Calculated using Log K_{OW} and molecular weight from Handbook of RCRA Groundwater Monitoring Constituents. Physical and Chemical Properties. Equation 3.8 from USEPA, 2004. Supplemental Guidance for Dermal Risk Assessment, Equation 3.8: Log PC = -2.80 + 0.66(log K_{ow}) - 0.0056(MW). See Table 3-19b for variables and calculations.
(e) Value for water.

TABLE 3-19b
CONSTANTS AND VARIABLES USED IN THE CALCULATION OF DERMAL DOSE VIA WATER EXPOSURE
BASF NORTH WORKS FACILITY
WYANDOTTE, MICHIGAN
TIER 2 RISK ASSESSMENT

Constituent	Chemical Data: Molecular Weight (g/mol)		Chemical Data: Log K_{ow}		Log PC (a)	PC (a) (cm/hr)	B (d) (--)	D_{sc} (e) (cm2/hr)	Lag Time (t) (Tau) (f) (hr)	b (c)	c (c)	Time to Steady State (t*) (c) (hr)
2-PICOLINE	93.13	(b)	1.06	(b)	-2.62E+00	2.39E-03	8.86E-03	4.77E-07	3.49E-01	2.95E-01	3.39E-01	8.39E-01
ACETONE	5.81E+01	(b)	-2.40E-01	(b)	-3.28E+00	5.20E-04	1.53E-03	7.49E-07	2.22E-01	3.04E-01	3.34E-01	5.34E-01
BIS(2-CHLOROISOPROPYL)ETHER	1.71E+02	(g)	2.60E+00	(g)	-2.04E+00	9.08E-03	4.57E-02	1.75E-07	9.55E-01	3.32E-01	3.64E-01	2.29E+00

Notes:
K_{ow} - Octanol-Water Partition Coefficient.
PC - Permeability Constant.
(a) U.S. EPA, 2004. Supplemental Guidance for Dermal Risk Assessment, Equation 3.8: Log PC = -2.80 + 0.66(log K_{ow}) - 0.0056(MW)
(b) Handbook of RCRA Groundwater Monitoring Constituents. Physical and Chemical Properties. USEPA, September 1992.
(c) U.S. EPA, 2004. Supplemental Guidance for Dermal Risk Assessment:
If $B \leq 0.6$, Equation A.5: $t^* = 2.4^* t$
If $B > 0.6$: $t^* = (b - (b^2-c^2)^{0.5}) * l_{sc}^2/(Dsc)$
Equation A-7: $b = (2*(1+B)^2/p) - c$
Equation A-8: $c = (1+3B+3B^2)/(3*(1+B))$
(d) U.S. EPA, 2004. Supplemental Guidance for Dermal Risk Assessment, Equation A.1: $B = PC \times MW^{0.5}/2.6$
(e) U.S. EPA, 2004. Supplemental Guidance for Dermal Risk Assessment, Equation A.2: Log Dsc/lsc = -2.8-0.0056 MW, where lsc = 1E-3 cm.
Solving for Dsc: $Dsc = 10^{-2.8-0.0056\ MW} * lsc$.
(f) U.S. EPA, 2004. Supplemental Guidance for Dermal Risk Assessment, Equation A.4: $t = l_{sc}^2/(6*D_{sc})$.
(g) Howard, PH, 1997. Handbook of Environmental Fate and Exposure Data for Organic Chemicals.

TABLE 3-20
TOTAL POTENTIAL CARCINOGENIC RISK
UTILITY/REDEVELOPMENT WORKER - REDEVELOPMENT SCENARIO
BASF NORTH WORKS
WYANDOTTE, MICHIGAN
TIER 2 HUMAN HEALTH RISK ASSESSMENT

	AOC1					AOC2					AOC5				
	Soil		Groundwater		Total	Soil		Groundwater		Total	Soil		Groundwater		Total
Chemical	**Ing/Derm.**	**Inhalation**	**Ing/Derm.**	**Inhalation**	**Risk**	**Ing/Derm.**	**Inhalation**	**Ing/Derm.**	**Inhalation**	**Risk**	**Ing/Derm.**	**Inhalation**	**Ing/Derm.**	**Inhalation**	**Risk**
1,2-DICHLOROETHANE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	3.42E-08	5.36E-06	8.84E-06	2.76E-05	4.18E-05
1,2-DICHLOROPROPANE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NC	NC	NC	NC	0.00E+00
ACETONE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NC	NC	0.00E+00
2-PICOLINE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
ARSENIC	NCOI	NCOI	7.05E-09	NCOI	7.05E-09	1.49E-07	8.78E-06	5.35E-08	NCOI	8.98E-06	NCOI	NCOI	NCOI	NCOI	0.00E+00
BENZENE	NCOI	NCOI	3.20E-07	1.68E-07	4.87E-07	NCOI	NCOI	1.65E-09	8.68E-10	2.52E-09	NCOI	NCOI	NCOI	NCOI	0.00E+00
BENZO(A)ANTHRACENE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
BENZO(A)PYRENE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
BENZO(B)FLUORANTHENE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
BIS(2-ETHYLHEXYL)PHTHALATE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	2.68E-06	NC	2.68E-06
BIS(2-CHLOROETHYL)ETHER	NCOI	NCOI	1.45E-08	3.09E-08	4.54E-08	NCOI	NCOI	NCOI	NCOI	0.00E+00	2.65E-08	5.27E-06	4.49E-05	9.54E-05	1.46E-04
BIS(2-CHLOROISOPROPYL)ETHER	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	1.05E-08	9.99E-07	4.58E-05	2.12E-05	6.81E-05
CADMIUM	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
CHLOROFORM	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NC	1.85E-06	1.85E-06
CHROMIUM	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NC	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
COBALT	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
CYANIDE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NC	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
DIBENZ(AH)ANTHRACENE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
ETHYLBENZENE	NCOI	NCOI	NC	NC	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
LEAD	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NC	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
MERCURY	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
METHYLENE CHLORIDE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	1.58E-07	1.48E-07	3.06E-07
NAPHTHALENE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
NICKEL	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NC	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
PENTACHLOROPHENOL	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
PHENANTHRENE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
THALLIUM	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NC	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
TOLUENE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
VANADIUM	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NC	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
XYLENES (TOTAL)	NCOI	NCOI	NC	NC	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
ZINC	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
Total Risk:	NC	NC	3.41E-07	1.99E-07	**5.40E-07**	1.49E-07	8.78E-06	5.51E-08	8.68E-10	**8.98E-06**	7.12E-08	1.16E-05	1.02E-04	1.46E-04	**2.60E-04**

Notes:
Ing/Derm - Ingestion/Dermal Contact.
NC - Not Calculated or no dose-response value.
NCOI - Not a chemical of interest
in this area/medium.

TABLE 3-20
TOTAL POTENTIAL CARCINOGENIC RISK
UTILITY/REDEVELOPMENT WORKER - REDEV
BASF NORTH WORKS
WYANDOTTE, MICHIGAN
TIER 2 HUMAN HEALTH RISK ASSESSMENT

	AOC6					AOC7A					AOC7B				
	Soil		Groundwater		Total	Soil		Groundwater		Total	Soil		Groundwater		Total
Chemical	**Ing/Derm.**	**Inhalation**	**Ing/Derm.**	**Inhalation**	**Risk**	**Ing/Derm.**	**Inhalation**	**Ing/Derm.**	**Inhalation**	**Risk**	**Ing/Derm.**	**Inhalation**	**Ing/Derm.**	**Inhalation**	**Risk**
1,2-DICHLOROETHANE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
1,2-DICHLOROPROPANE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
ACETONE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
2-PICOLINE	NCOI	NCOI	NC	NC	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
ARSENIC	2.40E-07	2.34E-05	NCOI	NCOI	2.36E-05	1.66E-07	1.62E-05	NCOI	NCOI	1.63E-05	NCOI	NCOI	7.44E-09	NCOI	7.44E-09
BENZENE	1.74E-07	1.54E-05	5.20E-09	2.73E-09	1.56E-05	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	6.14E-10	3.23E-10	9.37E-10
BENZO(A)ANTHRACENE	1.32E-07	4.60E-07	NCOI	NCOI	5.92E-07	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
BENZO(A)PYRENE	9.98E-07	3.46E-06	NCOI	NCOI	4.46E-06	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
BENZO(B)FLUORANTHENE	1.13E-07	3.93E-07	NCOI	NCOI	5.06E-07	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
BIS(2-ETHYLHEXYL)PHTHALATE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	1.41E-09	NC	1.41E-09
BIS(2-CHLOROETHYL)ETHER	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
BIS(2-CHLOROISOPROPYL)ETHER	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
CADMIUM	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NC	NCOI	0.00E+00
CHLOROFORM	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
CHROMIUM	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
COBALT	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
CYANIDE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
DIBENZ(AH)ANTHRACENE	1.01E-07	3.49E-07	NCOI	NCOI	4.50E-07	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
ETHYLBENZENE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
LEAD	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NC	NCOI	0.00E+00
MERCURY	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NC	NCOI	0.00E+00
METHYLENE CHLORIDE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
NAPHTHALENE	NC	NC	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
NICKEL	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
PENTACHLOROPHENOL	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
PHENANTHRENE	NC	NC	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
THALLIUM	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
TOLUENE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NC	NC	0.00E+00
VANADIUM	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NC	NCOI	0.00E+00
XYLENES (TOTAL)	NC	NC	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
ZINC	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NC	NCOI	0.00E+00
Total Risk:	1.76E-06	4.34E-05	5.20E-09	2.73E-09	**4.52E-05**	1.66E-07	1.62E-05	NC	NC	**1.63E-05**	NC	NC	9.46E-09	3.23E-10	**9.79E-09**

Notes:
Ing/Derm - Ingestion/Dermal Contact.
NC - Not Calculated or no dose-response value.
NCOI - Not a chemical of interest
in this area/medium.

TABLE 3-20
TOTAL POTENTIAL CARCINOGENIC RISK
UTILITY/REDEVELOPMENT WORKER - REDEV
BASF NORTH WORKS
WYANDOTTE, MICHIGAN
TIER 2 HUMAN HEALTH RISK ASSESSMENT

	AOC7C					SWMU F					SWMU G				
	Soil		Groundwater		Total	Soil		Groundwater		Total	Soil		Groundwater		Total
Chemical	**Ing/Derm.**	**Inhalation**	**Ing/Derm.**	**Inhalation**	**Risk**	**Ing/Derm.**	**Inhalation**	**Ing/Derm.**	**Inhalation**	**Risk**	**Ing/Derm.**	**Inhalation**	**Ing/Derm.**	**Inhalation**	**Risk**
1,2-DICHLOROETHANE	NCOI	NCOI	8.84E-06	2.76E-05	3.64E-05	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
1,2-DICHLOROPROPANE	NCOI	NCOI	NC	NC	0.00E+00	NC	NC	NC	NC	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
ACETONE	NCOI	NCOI	NC	NC	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
2-PICOLINE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NC	NC	0.00E+00
ARSENIC	1.39E-07	1.35E-05	NCOI	NCOI	1.36E-05	2.47E-07	2.40E-05	NCOI	NCOI	2.43E-05	3.05E-07	1.80E-05	NCOI	NCOI	1.83E-05
BENZENE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	5.20E-09	2.73E-09	7.92E-09
BENZO(A)ANTHRACENE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
BENZO(A)PYRENE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
BENZO(B)FLUORANTHENE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
BIS(2-ETHYLHEXYL)PHTHALATE	NCOI	NCOI	2.68E-06	NC	2.68E-06	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
BIS(2-CHLOROETHYL)ETHER	NCOI	NCOI	4.49E-05	9.54E-05	1.40E-04	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
BIS(2-CHLOROISOPROPYL)ETHER	NCOI	NCOI	4.58E-05	2.12E-05	6.70E-05	1.56E-09	1.40E-08	8.89E-10	4.11E-10	1.68E-08	NCOI	NCOI	NCOI	NCOI	0.00E+00
CADMIUM	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
CHLOROFORM	NCOI	NCOI	NC	1.85E-06	1.85E-06	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
CHROMIUM	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
COBALT	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
CYANIDE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
DIBENZ(AH)ANTHRACENE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
ETHYLBENZENE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
LEAD	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
MERCURY	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
METHYLENE CHLORIDE	NCOI	NCOI	1.58E-07	1.48E-07	3.06E-07	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
NAPHTHALENE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
NICKEL	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
PENTACHLOROPHENOL	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
PHENANTHRENE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
THALLIUM	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
TOLUENE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
VANADIUM	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
XYLENES (TOTAL)	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
ZINC	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
Total Risk:	1.39E-07	1.35E-05	1.02E-04	1.46E-04	**2.62E-04**	2.49E-07	2.41E-05	8.89E-10	4.11E-10	**2.43E-05**	3.05E-07	1.80E-05	5.20E-09	2.73E-09	**1.83E-05**

Notes:
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NC - Not Calculated or no dose-response value.
NCOI - Not a chemical of interest
in this area/medium.

TABLE 3-20
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UTILITY/REDEVELOPMENT WORKER - REDEV
BASF NORTH WORKS
WYANDOTTE, MICHIGAN
TIER 2 HUMAN HEALTH RISK ASSESSMENT

	SWMU H (west end)					SWMU H (central)					SWMU H (east end)				
	Soil		Groundwater		Total	Soil		Groundwater		Total	Soil		Groundwater		Total
Chemical	**Ing/Derm.**	**Inhalation**	**Ing/Derm.**	**Inhalation**	**Risk**	**Ing/Derm.**	**Inhalation**	**Ing/Derm.**	**Inhalation**	**Risk**	**Ing/Derm.**	**Inhalation**	**Ing/Derm.**	**Inhalation**	**Risk**
1,2-DICHLOROETHANE	NCOI	NCOI	8.84E-06	2.76E-05	3.64E-05	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
1,2-DICHLOROPROPANE	NC	NC	NC	NC	0.00E+00	NC	NC	NCOI	NCOI	0.00E+00	NC	NC	NCOI	NCOI	0.00E+00
ACETONE	NCOI	NCOI	NC	NC	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
2-PICOLINE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
ARSENIC	1.60E-07	1.55E-05	NCOI	NCOI	1.57E-05	1.60E-07	1.55E-05	NCOI	NCOI	1.57E-05	1.60E-07	1.55E-05	NCOI	NCOI	1.57E-05
BENZENE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
BENZO(A)ANTHRACENE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
BENZO(A)PYRENE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
BENZO(B)FLUORANTHENE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
BIS(2-ETHYLHEXYL)PHTHALATE	NCOI	NCOI	2.68E-06	NC	2.68E-06	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
BIS(2-CHLOROETHYL)ETHER	NCOI	NCOI	4.49E-05	9.54E-05	1.40E-04	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
BIS(2-CHLOROISOPROPYL)ETHER	2.00E-07	1.84E-06	4.58E-05	2.12E-05	6.91E-05	2.00E-07	1.84E-06	NCOI	NCOI	2.04E-06	2.00E-07	1.84E-06	NCOI	NCOI	2.04E-06
CADMIUM	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
CHLOROFORM	NCOI	NCOI	NC	1.85E-06	1.85E-06	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
CHROMIUM	NC	NC	NCOI	NCOI	0.00E+00	NC	NC	NCOI	NCOI	0.00E+00	NC	NC	NCOI	NCOI	0.00E+00
COBALT	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
CYANIDE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
DIBENZ(AH)ANTHRACENE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
ETHYLBENZENE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
LEAD	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
MERCURY	NC	NC	NCOI	NCOI	0.00E+00	NC	NC	NCOI	NCOI	0.00E+00	NC	NC	NCOI	NCOI	0.00E+00
METHYLENE CHLORIDE	NCOI	NCOI	1.58E-07	1.48E-07	3.06E-07	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
NAPHTHALENE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
NICKEL	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
PENTACHLOROPHENOL	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	3.37E-08	NC	3.37E-08
PHENANTHRENE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
THALLIUM	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NC	NCOI	0.00E+00
TOLUENE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
VANADIUM	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
XYLENES (TOTAL)	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
ZINC	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
Total Risk:	3.60E-07	1.74E-05	1.02E-04	1.46E-04	**2.66E-04**	3.60E-07	1.74E-05	NC	NC	**1.77E-05**	3.60E-07	1.74E-05	3.37E-08	NC	**1.78E-05**

Notes:
Ing/Derm - Ingestion/Dermal Contact.
NC - Not Calculated or no dose-response value.
NCOI - Not a chemical of interest
in this area/medium.

TABLE 3-21
TOTAL POTENTIAL HAZARD INDEX
UTILITY/REDEVELOPMENT WORKER - REDEVELOPMENT SCENARIO
BASF NORTH WORKS
WYANDOTTE, MICHIGAN
TIER 2 HUMAN HEALTH RISK ASSESSMENT

	AOC1					AOC2					AOC5				
	Soil		Groundwater		Total	Soil		Groundwater		Total	Soil		Groundwater		Total
Chemical	Ing/Derm.	Inhalation	Ing/Derm.	Inhalation	HQ	Ing/Derm.	Inhalation	Ing/Derm.	Inhalation	HQ	Ing/Derm.	Inhalation	Ing/Derm.	Inhalation	HQ
1,2-DICHLOROETHANE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	1.32E-03	5.89E-03	3.40E-01	3.03E-02	3.77E-01
1,2-DICHLOROPROPANE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	1.74E-03	4.22E+01	3.42E-01	6.89E+01	1.11E+02
ACETONE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	5.47E-04	6.49E-03	7.04E-03
2-PICOLINE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
ARSENIC	NCOI	NCOI	1.10E-03	NCOI	1.10E-03	2.31E-02	1.36E-01	8.32E-03	NCOI	1.67E-01	NCOI	NCOI	NCOI	NCOI	0.00E+00
BENZENE	NCOI	NCOI	3.39E-02	1.67E-02	5.06E-02	NCOI	NCOI	1.75E-04	8.66E-05	2.62E-04	NCOI	NCOI	NCOI	NCOI	0.00E+00
BENZO(A)ANTHRACENE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
BENZO(A)PYRENE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
BENZO(B)FLUORANTHENE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
BIS(2-ETHYLHEXYL)PHTHALATE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	6.70E-01	2.85E-04	6.70E-01
BIS(2-CHLOROETHYL)ETHER	NCOI	NCOI	2.31E-05	4.68E-05	6.99E-05	NCOI	NCOI	NCOI	NCOI	0.00E+00	4.21E-05	7.99E-03	7.14E-02	1.45E-01	2.24E-01
BIS(2-CHLOROISOPROPYL)ETHER	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	2.63E-04	4.99E-02	1.15E+00	1.06E+00	2.26E+00
CADMIUM	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
CHLOROFORM	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	8.51E-02	1.13E-01	1.98E-01
CHROMIUM	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	6.77E-05	NCOI	6.77E-05	NCOI	NCOI	NCOI	NCOI	0.00E+00
COBALT	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
CYANIDE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	4.48E-04	NCOI	4.48E-04	NCOI	NCOI	NCOI	NCOI	0.00E+00
DIBENZ(AH)ANTHRACENE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
ETHYLBENZENE	NCOI	NCOI	5.91E-02	5.46E-03	6.46E-02	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
LEAD	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NC	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
MERCURY	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
METHYLENE CHLORIDE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	2.47E-02	2.10E-02	4.56E-02
NAPHTHALENE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
NICKEL	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	2.25E-03	NCOI	2.25E-03	NCOI	NCOI	NCOI	NCOI	0.00E+00
PENTACHLOROPHENOL	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
PHENANTHRENE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
THALLIUM	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	1.32E-04	NCOI	1.32E-04	NCOI	NCOI	NCOI	NCOI	0.00E+00
TOLUENE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
VANADIUM	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	3.89E-02	NCOI	3.89E-02	NCOI	NCOI	NCOI	NCOI	0.00E+00
XYLENES (TOTAL)	NCOI	NCOI	1.63E-02	9.77E-03	2.61E-02	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
ZINC	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
Total HI:	NCOI	NCOI	1.10E-01	3.20E-02	**1.42E-01**	2.31E-02	1.36E-01	5.03E-02	8.66E-05	**2.09E-01**	3.36E-03	4.23E+01	2.68E+00	7.02E+01	**1.15E+02**

Notes:
HI - Hazard Index.
HQ - Hazard Quotient.
Ing/Derm - Ingestion/Dermal Contact.
NC - Not Calculated or no dose-response value.
NCOI - Not a chemical of interest
in this area/medium.

TABLE 3-21
TOTAL POTENTIAL HAZARD INDEX
UTILITY/REDEVELOPMENT WORKER - REDEVI
BASF NORTH WORKS
WYANDOTTE, MICHIGAN
TIER 2 HUMAN HEALTH RISK ASSESSMENT

	AOC6					AOC7A					AOC7B				
	Soil		Groundwater		Total	Soil		Groundwater		Total	Soil		Groundwater		Total
Chemical	Ing/Derm.	Inhalation	Ing/Derm.	Inhalation	HQ	Ing/Derm.	Inhalation	Ing/Derm.	Inhalation	HQ	Ing/Derm.	Inhalation	Ing/Derm.	Inhalation	HQ
1,2-DICHLOROETHANE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
1,2-DICHLOROPROPANE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
ACETONE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
2-PICOLINE	NCOI	NCOI	4.36E-04	1.17E-03	1.61E-03	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
ARSENIC	3.74E-02	3.61E-01	NCOI	NCOI	3.98E-01	2.59E-02	2.50E-01	NCOI	NCOI	2.76E-01	NCOI	NCOI	1.16E-03	NCOI	1.16E-03
BENZENE	1.85E-02	1.53E+00	5.51E-04	2.72E-04	1.55E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	6.51E-05	3.22E-05	9.73E-05
BENZO(A)ANTHRACENE	4.23E-05	3.46E-04	NCOI	NCOI	3.88E-04	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
BENZO(A)PYRENE	3.19E-05	2.61E-04	NCOI	NCOI	2.92E-04	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
BENZO(B)FLUORANTHENE	3.62E-05	2.96E-04	NCOI	NCOI	3.32E-04	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
BIS(2-ETHYLHEXYL)PHTHALATE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	3.52E-04	1.50E-07	3.52E-04
BIS(2-CHLOROETHYL)ETHER	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
BIS(2-CHLOROISOPROPYL)ETHER	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
CADMIUM	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	1.74E-03	NCOI	1.74E-03
CHLOROFORM	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
CHROMIUM	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
COBALT	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
CYANIDE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
DIBENZ(AH)ANTHRACENE	3.22E-06	2.63E-05	NCOI	NCOI	2.95E-05	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
ETHYLBENZENE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
LEAD	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NC	NCOI	0.00E+00
MERCURY	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	8.75E-04	NCOI	8.75E-04
METHYLENE CHLORIDE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
NAPHTHALENE	2.21E-03	1.51E+00	NCOI	NCOI	1.51E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
NICKEL	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
PENTACHLOROPHENOL	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
PHENANTHRENE	2.68E-04	2.19E-03	NCOI	NCOI	2.46E-03	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
THALLIUM	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
TOLUENE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	5.82E-04	1.48E-04	7.30E-04
VANADIUM	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	1.58E-02	NCOI	1.58E-02
XYLENES (TOTAL)	1.37E-04	3.29E-02	NCOI	NCOI	3.31E-02	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
ZINC	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	3.31E-04	NCOI	3.31E-04
Total HI:	5.86E-02	3.44E+00	9.87E-04	1.44E-03	**3.50E+00**	2.59E-02	2.50E-01	NCOI	NCOI	**2.76E-01**	NCOI	NCOI	2.09E-02	1.81E-04	**2.11E-02**

Notes:
HI - Hazard Index.
HQ - Hazard Quotient.
Ing/Derm - Ingestion/Dermal Contact.
NC - Not Calculated or no dose-response value.
NCOI - Not a chemical of interest
in this area/medium.

TABLE 3-21
TOTAL POTENTIAL HAZARD INDEX
UTILITY/REDEVELOPMENT WORKER - REDEVE
BASF NORTH WORKS
WYANDOTTE, MICHIGAN
TIER 2 HUMAN HEALTH RISK ASSESSMENT

	AOC7C					SWMU F					SWMU G				
	Soil		Groundwater		Total	Soil		Groundwater		Total	Soil		Groundwater		Total
Chemical	Ing/Derm.	Inhalation	Ing/Derm.	Inhalation	HQ	Ing/Derm.	Inhalation	Ing/Derm.	Inhalation	HQ	Ing/Derm.	Inhalation	Ing/Derm.	Inhalation	HQ
1,2-DICHLOROETHANE	NCOI	NCOI	3.40E-01	3.03E-02	3.70E-01	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
1,2-DICHLOROPROPANE	NCOI	NCOI	3.42E-01	6.89E+01	6.92E+01	6.49E-06	1.03E-01	1.85E-06	3.73E-04	1.03E-01	NCOI	NCOI	NCOI	NCOI	0.00E+00
ACETONE	NCOI	NCOI	5.47E-04	6.49E-03	7.04E-03	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
2-PICOLINE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	4.36E-04	1.17E-03	1.61E-03
ARSENIC	2.15E-02	2.08E-01	NCOI	NCOI	2.30E-01	3.85E-02	3.71E-01	NCOI	NCOI	4.10E-01	4.74E-02	2.78E-01	NCOI	NCOI	3.26E-01
BENZENE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	5.51E-04	2.72E-04	8.23E-04
BENZO(A)ANTHRACENE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
BENZO(A)PYRENE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
BENZO(B)FLUORANTHENE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
BIS(2-ETHYLHEXYL)PHTHALATE	NCOI	NCOI	6.70E-01	2.85E-04	6.70E-01	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
BIS(2-CHLOROETHYL)ETHER	NCOI	NCOI	7.14E-02	1.45E-01	2.16E-01	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
BIS(2-CHLOROISOPROPYL)ETHER	NCOI	NCOI	1.15E+00	1.06E+00	2.21E+00	3.89E-05	6.98E-04	2.22E-05	2.05E-05	7.79E-04	NCOI	NCOI	NCOI	NCOI	0.00E+00
CADMIUM	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
CHLOROFORM	NCOI	NCOI	8.51E-02	1.13E-01	1.98E-01	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
CHROMIUM	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
COBALT	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
CYANIDE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
DIBENZ(AH)ANTHRACENE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
ETHYLBENZENE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
LEAD	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
MERCURY	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
METHYLENE CHLORIDE	NCOI	NCOI	2.47E-02	2.10E-02	4.56E-02	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
NAPHTHALENE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
NICKEL	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
PENTACHLOROPHENOL	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
PHENANTHRENE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
THALLIUM	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
TOLUENE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
VANADIUM	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
XYLENES (TOTAL)	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
ZINC	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
Total HI:	2.15E-02	2.08E-01	2.68E+00	7.02E+01	**7.31E+01**	3.85E-02	4.75E-01	2.41E-05	3.94E-04	**5.14E-01**	4.74E-02	2.78E-01	9.87E-04	1.44E-03	**3.28E-01**

Notes:
HI - Hazard Index.
HQ - Hazard Quotient.
Ing/Derm - Ingestion/Dermal Contact.
NC - Not Calculated or no dose-response value.
NCOI - Not a chemical of interest
in this area/medium.

TABLE 3-21
TOTAL POTENTIAL HAZARD INDEX
UTILITY/REDEVELOPMENT WORKER - REDEVE
BASF NORTH WORKS
WYANDOTTE, MICHIGAN
TIER 2 HUMAN HEALTH RISK ASSESSMENT

	SWMU H (west end)					SWMU H (central)					SWMU H (east end)				
	Soil		Groundwater		Total	Soil		Groundwater		Total	Soil		Groundwater		Total
Chemical	**Ing/Derm.**	**Inhalation**	**Ing/Derm.**	**Inhalation**	**HQ**	**Ing/Derm.**	**Inhalation**	**Ing/Derm.**	**Inhalation**	**HQ**	**Ing/Derm.**	**Inhalation**	**Ing/Derm.**	**Inhalation**	**HQ**
1,2-DICHLOROETHANE	NCOI	NCOI	3.40E-01	3.03E-02	3.70E-01	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
1,2-DICHLOROPROPANE	1.57E-02	2.55E+02	3.42E-01	6.89E+01	3.24E+02	1.57E-02	2.55E+02	NCOI	NCOI	2.55E+02	1.57E-02	2.55E+02	NCOI	NCOI	2.55E+02
ACETONE	NCOI	NCOI	5.47E-04	6.49E-03	7.04E-03	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
2-PICOLINE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
ARSENIC	2.49E-02	2.40E-01	NCOI	NCOI	2.65E-01	2.49E-02	2.40E-01	NCOI	NCOI	2.65E-01	2.49E-02	2.40E-01	NCOI	NCOI	2.65E-01
BENZENE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
BENZO(A)ANTHRACENE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
BENZO(A)PYRENE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
BENZO(B)FLUORANTHENE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
BIS(2-ETHYLHEXYL)PHTHALATE	NCOI	NCOI	6.70E-01	2.85E-04	6.70E-01	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
BIS(2-CHLOROETHYL)ETHER	NCOI	NCOI	7.14E-02	1.45E-01	2.16E-01	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
BIS(2-CHLOROISOPROPYL)ETHER	5.00E-03	9.19E-02	1.15E+00	1.06E+00	2.30E+00	5.00E-03	9.19E-02	NCOI	NCOI	9.69E-02	5.00E-03	9.19E-02	NCOI	NCOI	9.69E-02
CADMIUM	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
CHLOROFORM	NCOI	NCOI	8.51E-02	1.13E-01	1.98E-01	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
CHROMIUM	1.05E-05	9.37E-05	NCOI	NCOI	1.04E-04	1.05E-05	9.37E-05	NCOI	NCOI	1.04E-04	1.05E-05	9.37E-05	NCOI	NCOI	1.04E-04
COBALT	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
CYANIDE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
DIBENZ(AH)ANTHRACENE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
ETHYLBENZENE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
LEAD	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
MERCURY	2.48E-03	8.63E-01	NCOI	NCOI	8.66E-01	2.48E-03	8.63E-01	NCOI	NCOI	8.66E-01	2.48E-03	8.63E-01	NCOI	NCOI	8.66E-01
METHYLENE CHLORIDE	NCOI	NCOI	2.47E-02	2.10E-02	4.56E-02	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
NAPHTHALENE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
NICKEL	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
PENTACHLOROPHENOL	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	6.55E-04	1.17E-08	6.55E-04
PHENANTHRENE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
THALLIUM	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	8.50E-05	NCOI	8.50E-05
TOLUENE	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
VANADIUM	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
XYLENES (TOTAL)	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
ZINC	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00	NCOI	NCOI	NCOI	NCOI	0.00E+00
Total HI:	4.80E-02	2.56E+02	2.68E+00	7.02E+01	**3.29E+02**	4.80E-02	2.56E+02	NCOI	NCOI	**2.56E+02**	4.80E-02	2.56E+02	7.40E-04	1.17E-08	**2.56E+02**

Notes:
HI - Hazard Index.
HQ - Hazard Quotient.
Ing/Derm - Ingestion/Dermal Contact.
NC - Not Calculated or no dose-response value.
NCOI - Not a chemical of interest
in this area/medium.

TABLE 3-22
SUMMARY OF PRELIMINARY REMEDIATION GOALS FOR UTILITY/REDEVELOPMENT WORKER - REDEVELOPMENT SCENARIO
BASF NORTH WORKS FACILITY
WYANDOTTE, MICHIGAN
TIER 2 RISK EVALUATION

Area	Media	Exposure Pathway	COC	EPC (a)	Preliminary Remediation Goal		Selected PRG (b)		Basis	Units
					Cancer	Non-cancer				
AOC 5	Soil	Ingestion/Dermal/Inhal	1,2-Dichloroethane	100	366	NA	366	(c)	Cancer	mg/kg
AOC 5	Soil	Ingestion/Dermal/Inhal	1,2-Dichloropropane	2900	NA	12	12		Non-cancer	mg/kg
AOC 5	Groundwater	Ingestion/Dermal/Inhal	1,2-Dichloroethane	200	108	95	95		Non-cancer	mg/L
AOC 5	Groundwater	Ingestion/Dermal/Inhal	1,2-Dichloropropane	2400	NA	6	6		Non-cancer	mg/L
AOC 5	Groundwater	Ingestion/Dermal/Inhal	Bis(2-ethylhexyl)phthalate	16	118	4	4		Non-cancer	mg/L
AOC 5	Groundwater	Ingestion/Dermal/Inhal	Bis(2-chloroethyl)ether	145	20	148	20		Cancer	mg/L
AOC 5	Groundwater	Ingestion/Dermal/Inhal	Bis(2-chloroisopropyl)ether	485	143	48	48		Non-cancer	mg/L
AOC 5	Groundwater	Ingestion/Dermal/Inhal	Chloroform	15	160	13	13		Non-cancer	mg/L
AOC 6	Soil	Ingestion/Dermal/Inhal	Benzene	843	NA	522	522		Non-cancer	mg/kg
AOC 6	Soil	Ingestion/Dermal/Inhal	Naphthalene	1367	NA	868	868		Non-cancer	mg/kg
AOC 7C	Soil	Ingestion/Dermal/Inhal	Arsenic	24	29	174	29	(c)	Cancer	mg/kg
AOC 7C	Groundwater	Ingestion/Dermal/Inhal	1,2-Dichloroethane	200	91	128	91		Cancer	mg/L
AOC 7C	Groundwater	Ingestion/Dermal/Inhal	1,2-Dichloropropane	2400	NA	8	8		Non-cancer	mg/L
AOC 7C	Groundwater	Ingestion/Dermal/Inhal	Bis(2-ethylhexyl)phthalate	16	99	6	6		Non-cancer	mg/L
AOC 7C	Groundwater	Ingestion/Dermal/Inhal	Bis(2-chloroethyl)ether	145	17	212	17		Cancer	mg/L
AOC 7C	Groundwater	Ingestion/Dermal/Inhal	Bis(2-chloroisopropyl)ether	485	120	69	69		Non-cancer	mg/L
AOC 7C	Groundwater	Ingestion/Dermal/Inhal	Chloroform	15	135	18	18	(c)	Non-cancer	mg/L
SWMU H (west end)	Soil	Ingestion/Dermal/Inhal	1,2-Dichloropropane	26219	NA	17	17		Non-cancer	mg/kg
SWMU H (west end)	Soil	Ingestion/Dermal/Inhal	Arsenic	27	29	88	Bkgd	(d)	Consistent w/bkgd	mg/kg
SWMU H (west end)	Soil	Ingestion/Dermal/Inhal	Mercury	28	NA	14	14		Non-cancer	mg/kg
SWMU H (west end)	Groundwater	Ingestion/Dermal/Inhal	1,2-Dichloroethane	200	91	92	91		Cancer	mg/L
SWMU H (west end)	Groundwater	Ingestion/Dermal/Inhal	1,2-Dichloropropane	2400	NA	6	6		Non-cancer	mg/L
SWMU H (west end)	Groundwater	Ingestion/Dermal/Inhal	Bis(2-ethylhexyl)phthalate	16	99	4	4		Non-cancer	mg/L
SWMU H (west end)	Groundwater	Ingestion/Dermal/Inhal	Bis(2-chloroethyl)ether	145	17	143	17		Cancer	mg/L
SWMU H (west end)	Groundwater	Ingestion/Dermal/Inhal	Bis(2-chloroisopropyl)ether	485	120	47	47		Non-cancer	mg/L
SWMU H (west end)	Groundwater	Ingestion/Dermal/Inhal	Chloroform	15	135	13	13		Non-cancer	mg/L
SWMU H (central)	Soil	Ingestion/Dermal/Inhal	1,2-Dichloropropane	26219	NA	93	93		Non-cancer	mg/kg
SWMU H (central)	Soil	Ingestion/Dermal/Inhal	Arsenic	27	NA	93	Bkgd	(d)	Consistent w/bkgd	mg/kg
SWMU H (central)	Soil	Ingestion/Dermal/Inhal	Mercury	28	NA	29	29	(c)	Non-cancer	mg/kg
SWMU H (east end)	Soil	Ingestion/Dermal/Inhal	1,2-Dichloropropane	26219	NA	93	93		Non-cancer	mg/kg
SWMU H (east end)	Soil	Ingestion/Dermal/Inhal	Arsenic	27	NA	93	Bkgd	(d)	Consistent w/bkgd	mg/kg
SWMU H (east end)	Soil	Ingestion/Dermal/Inhal	Mercury	28	NA	29	29	(c)	Non-cancer	mg/kg

Notes:
(a) - EPC used in risk calculations.
(b) - Lower of calculated Cancer and Non-Cancer PRG.
(c) - Selected PRG is higher than EPC used in risk calculations; no further action/evaluation warranted.
(d) - Concentrations of COC in this SWMU/AOC is consistent with background; no further action/evaluation warranted.
COC - Constituent of concern.
EPC - Exposure point concentration.
NA - Not applicable
PRG - Preliminary Remediation Goal.

Table 4-1
Samples Evaluated in the SERA
BASF North Works Facility
Wyandotte, Michigan
Screening Ecological Risk Assessment

Medium	Exposure Area	Sample Location ID		
Soil	AOC 6	AOC6-SS-1 AOC6-SS-3	AOC-SS-5 AOC-SS-8	AOC-SS-10
	AOC 7A	SG000AOC-7SP02A 8/22/1996 SG001AOC-7SP02B 8/22/1996 SG002AOC-7SP01C 8/22/1996 SG002AOC-7SP02C 8/22/1996 SG002AOC7SP03 8/28/1996 SG002AOC7SP07 8/28/1996 SG003AOC-7SP01D 8/22/1996	SG003AOC7SP04 8/28/1996 SG003AOC7SP05 8/28/1996 SG003AOC7SP06 8/28/1996 SG003AOC7SP08B 9/3/1996 SG003AOC7SP09A (MS/MSD) 9/3/1996 SG004AOC-7SP02D 8/22/1996 SG004AOC7SP10A 9/3/1996	SG006AOC-7SP02E-S 8/22/1996 SG008AOC-7SP02F-S 8/22/1996 SG009AOC-7SP02G-S 8/22/1996 SG010AOC-7SP02H-S 8/22/1996 SG011AOC-7SP02I 8/22/1996
	SWMU G	SS001 SWMUG-1 8/20/1996 SS001 SWMUG-10 8/20/1996 SS001 SWMUG-2 8/20/1996 SS001 SWMUG-3 8/20/1996	SS001 SWMUG-4 8/20/1996 SS001 SWMUG-5 8/20/1996 SS001 SWMUG-6 8/20/1996	SS001 SWMUG-7 (MS/MSD) 8/20/1996 SS001 SWMUG-8 8/20/1996 SS001 SWMUG-9 8/20/1996
	SWMU H	SWMUH-SS-2 SWMUH-SS-3	SWMUH-SS-6	SWMUH-SS-8
Groundwater	CMS-MW-2	CMS-MW-2-G-0806R-S CMS-MW-2-G-1106-D	CMS-MW-2-G-0507-S CMS-MW-2-G-1106-S	CMS-MW-2-G-0806-S CMS-MW-2-G-0207-S
	RFI-MW10	RFI-MW10-G-0207-D RFI-MW10-G-0207-S RFI-MW10-G-1106-S	RFI-MW10-G-0507-S RFI-MW10-G-0806R-S	RFI-MW-10-G-0806-S RFI-MW10-G-0507-HS
	RFI-MW10F	RFI-MW10F-G-0806R-S RFI-MW10F-G-1106-S1 RFI-MW10F-G-1106-S2 RFI-MW10F-G-1106-S(1MM FILTER)	RFI-MW10F-G-1106-S(0.45MM FILTER) RFI-MW10F-G-0507-S RFI-MW10F-G-1106-S(5MM FILTER) RFI-MW10F-G-0507-HS	RFI-MW-RF-10F-G-0806-S RFI-MW10F-G-1106-S3 RFI-MW10F-G-0207-S
	RFI-MW10I	RFI-MW-RF-10I-G-0806-S RFI-MW10I-G-0207-S RFI-MW10I-G-1106-S	RFI-MW10I-G-0806R-S RFI-MW10I-G-0507-HS	RFI-MW10I-G-0806R-D RFI-MW10I-G-0507-S
	RFI-MW11	RFI-MW11-G-0507-HS RFI-MW-11-G-0806-S RFI-MW11-G-1106-S	RFI-MW11-G-0207-S RFI-MW-11-G-0806-D	RFI-MW-11-G-0806R-S RFI-MW11-G-0507-S
	RFI-MW11F	RFI-MW11F-G-0507-HS RFI-MW-11F-G-0806-S	RFI-MW11F-G-0507-S RFI-MW11F-G-0207-S	RFI-MW11F-G-1106-S RFI-MW11F-G-0806R-S
	RFI-MW12	RFI-MW12-G-1106-S1 RFI-MW12-G-1106-S(0.45MM FILTER) RFI-MW12-G-1106-S3 RFI-MW12-G-1106-S(1MM FILTER)	RFI-MW12-G-1106-D3 RFI-MW12-G-1106-S(5MM FILTER) RFI-MW-12-G-0806-S RFI-MW12-G-1106-S2	RFI-MW12-G-0207-S RFI-MW12-G-0507-S RFI-MW12-G-0806R-S RFI-MW12-G-0507-HS
	RFI-MW12F	RFI-MW-12F-G-0806-S RFI-MW12F-G-0207-S	RFI-MW12F-G-0507-HS RFI-MW12F-G-0806R-S	RFI-MW12F-G-0507-S RFI-MW12F-G-1106-S
	RFI-MW22	RFI-MW22-G-0507-S RFI-MW-22-G-0806-S	RFI-MW22-G-1106-S RFI-MW22-G-0207-S	RFI-MW-22-G-0806R-D RFI-MW-22-G-0806R-S
	RFI-MW4	RFI-MW-4-G-0806R-S RFI-MW4-G-0207-S RFI-MW-4-G-0806-S	RFI-MW4-G-1106-D RFI-MW4-G-1106-S	RFI-MW4-G-0507-S RFI-MW4-G-0507-HS
	RFI-MW5	RFI-MW5-G-1106-S RFI-MW5-G-0207-D	RFI-MW-5-G-0806-S RFI-MW5-G-0207-S	RFI-MW5-G-0507-S RFI-MW5-G-0806R-S
	RFI-MW6	RFI-MW-6-G-0806-S RFI-MW6-G-0507-S	RFI-MW6-G-1106-S RFI-MW6-G-0507-D	RFI-MW6-G-0207-S RFI-MW6-G-0806R-S
	RFI-MW7F	RFI-MW-7F-G-0806-S RFI-MW7F-G-0507-S	RFI-MW7F-G-1106-S RFI-MW7F-G-0806R-S	RFI-MW7F-G-0207-S
	RFI-MW7I	RFI-MW7I-G-0207-S RFI-MW7I-G-1106-S	RFI-MW7I-G-0507-S RFI-MW7I-G-0507-HS	RFI-MW7I-G-0806R-S RFI-MW-7I-G-0806-S
	RFI-MW8	RFI-MW8-G-1106-S RFI-MW8-G-0507-HS RFI-MW-8-0507-D	RFI-MW-8-G-0806-S RFI-MW8-G-0207-S	RFI-MW-8-G-0806R-S RFI-MW8-G-0507-S
	RFI-MW8F	RFI-MW8I-G-0507-S RFI-MW8F-G-1106-S RFI-MW8F-G-0507-S	RFI-MW-8F-G-0806-S RFI-MW-8F-G-0806R-S	RFI-MW8F-G-0207-S RFI-MW8F-G-0507-HS
	RFI-MW8I	RFI-MW-8I-G-0806R-S RFI-MW8I-G-1106-S	RFI-MW8I-G-0507-HS RFI-MW-8I-G-0806-S	RFI-MW8I-G-0207-S
	RFI-MW9	RFI-MW9-G-0507-S RFI-MW9-G-1106-S	RFI-MW9-G-0207-S RFI-MW9-G-0806R-S	RFI-MW-9-G-0806-S RFI-MW9-G-0507-HS
	RFI-MW9F	RFI-MW9F-G-0507-HS RFI-MW9F-G-0507-S RFI-MW9F-G-0207-S	RFI-MW9F-G-0806R-S RFI-MW-9F-G-0806-S	RFI-MW-9F-G-0806-D RFI-MW9F-G-1106-S
	RFI-MW9I	RFI-MW9I-G-0507-HS RFI-MW9I-G-0806R-S RFI-MW-9I-G-0806-S	RFI-MW9I-G-0207-S RFI-MW9I-G-1106-D	RFI-MW9I-G-0507-S RFI-MW9I-G-1106-S
	WHI6-1F	WHI6-1F-G-0507-S WHI6-1F-G-1106-S	WHI-6-1F-G-0806R-S WHI6-1F-G-0207-S	WHI-G-1F-G-0806-S
	WHI6-1S	WHI6-1S-G-0207-D WHI6-1S-G-0507-S	WHI-6-1S-G-0806R-S WHI6-1S-G-1106-S	WHI6-1S-G-0207-S WHI-G-1S-G-0806-S
	WHI6-2F	WHI6-2F-G-0507-S WHI-6-2F-G-0806-S	WHI6-2F-G-0207-S WHI6-2F-G-1106-S	WHI-6-2S-G-0806R-S-91306
	WHI6-2S	WHI-6-2S-G-0806R-S WHI6-2S-G-1106-S	WHI6-2S-G-0507-S WHI6-2S-G-0207-S	WHI-6-2S-G-0806-S
	WHI6-4F	WHI-6-4F-G-0806R-S WHI6-4F-G-1106-S	WHI6-4F-G-0207-S WHI6-4F-G-0507-S	WHI-6-4F-G-0806-S
	WHI6-4S	WHI6-4S-G-0207-S WHI6-4S-G-0507-S	WHI-6-4S-G-0806R-D WHI6-4S-G-1106-S	WHI-6-4S-G-0806R-S WHI-G-4S-G-0806-S

See Figure 2 for sample locations.

Table 4-2
Ecological Screening Values
BASF North Works Facility
Wyandotte, Michigan
Screening Ecological Risk Assessment

Parameter	CAS No.	MIDEQ Surface Water Quality Value	Region 5 Surface Water ESL	Selected Surface Water ESV [17]	Soil ESV
Inorganics					
Antimony	7440-36-0	240	80	240	0.27 [3]
Arsenic	7440-38-2	150	147	150	18 [4]
Barium	7440-39-3	438 [10]	220	438	330 [5]
Beryllium	7440-41-7	2.4 [10]	3.6	2.4	21 [3]
Cadmium	7440-43-9	2.2 [10,11]	0.15	2.2	0.36 [3]
Chromium	7440-47-3	74 [10,11]	42	74	26 [7]
Cobalt	7440-48-4	100	24	100	13 [4]
Copper	7440-50-8	8.96 [10,11]	1.58	9.0	5.4 [1]
Lead	7439-92-1	10.3 [10,11]	1.17	10.3	11 [6]
Mercury	7439-97-6	0.77 [11]	0.0013	0.77	0.1 [1]
Nickel	7440-02-0	52 [10,11]	28.9	52	13.6 [1]
Selenium	7782-49-2	5	5	5	0.0276 [1]
Silver	7440-22-4	--	--	--	4.04 [1]
Thallium	7440-28-0	7.2	10	7.2	0.0569 [1]
Tin	7440-31-5	--	--	--	7.62 [1]
Total Cyanide	57-12-5	5.2 [8]	5.2 [8]	5.2	1.33 [1]
Vanadium	7440-62-2	12	12	12	7.8 [6]
Zinc	7440-66-6	118 [10]	65.7	118	6.62 [1]
Organics					
Semivolatile Organic Compounds					
2-Methylnaphthalene	91-57-6	ID	330	330	3240 [1]
Acenaphthene	83-32-9	38	38	38	682000 [1]
Acenaphthylene	208-96-8	ID	4840	4840	682000 [1]
Anthracene	120-12-7	ID	0.035	0.035	1480000 [1]
Benzo(a)anthracene	56-55-3	ID	0.025	0.025	5210 [1]
Benzo(a)pyrene	50-32-8	ID	0.014	0.014	1520 [1]
Benzo(b)fluoranthene	205-99-2	ID	9.07	9.07	59800 [1]
Benzo(ghi)perylene	191-24-2	NV	7.64	7.64	119000 [1]
Benzo(k)fluoranthene	207-08-9	NV	9.07 [14]	9.07	148000 [1]
Chrysene	218-01-9	ID	9.07 [14]	9.07	4730 [1]
Dibenz(a,h)anthracene	53-70-3	--	--	--	18400 [1]
Fluoranthene	206-44-0	NV	1.9	1.9	122000 [1]
Fluorene	86-73-7	12	19	12	122000 [1]
Indeno(1,2,3-cd)pyrene	193-39-5	ID	4.31	4.31	109000 [1]
Naphthalene	91-20-3	13	13	13	99.4 [1]
Phenanthrene	85-01-8	2.4	3.6	2.4	45700 [1]
Pyrene	129-00-0	ID	0.3	0.3	78500 [1]
1,1-Biphenyl	92-52-4	13	NV	13	60000 [2]
Bis(2-Chloroisopropyl) ether	108-60-1	ID	NV	NV	19900 [1]
2,4-Dimethylphenol	105-67-9	380	100	380	10 [1]
Acetophenone	98-86-2	ID	NV	NV	300000 [1]
Benzaldehyde	100-52-7	NV	NV	NV	NV
Bis(2-Chloroethyl) ether	111-44-4	0.79 [12]	19000	0.79	--
Bis(2-Ethylhexyl) phthalate	117-81-7	25 [12]	0.3	25	925 [1]
Butyl benzyl phthalate	85-68-7	67	23	67	--
Carbazole	86-74-8	4	NV	4	NV
Dibenzofuran	132-64-9	4	4	4	NV
Diethyl phthalate	84-66-2	--	--	--	24800 [1]
Di-n-butyl phthalate	84-74-2	9.7	9.7	9.7	NV
Di-n-octyl phthalate	117-84-0	ID	30	30	709000 [1]
2-Methylphenol	95-48-7	82	67	82	--
3-Methylphenol	108-39-4	71	62	71	3490 [1]
4-Methylphenol	106-44-5	25	25	25	163000 [1]
3-Methylphenol & 4-Methylpheno	65794-96-9	25 [16]	25 [16]	25	NV
Pentachlorophenol	87-86-5	4.05 [13]	4	4.0	1.8 [6]
Phenol	108-95-2	450	180	450	--
Volatile Organic Compounds					
1,1-Dichloroethane	75-34-3	740	47	740	20100 [1]
1,1-Dichloroethene	75-35-4	130	65	130	--
1,2,3-Trichloropropane	96-18-4	--	--	--	3360 [1]
1,2,4-Trimethylbenzene	95-63-6	--	--	--	NV
1,2-Dichloroethane	107-06-2	2000	47 [9]	2000	21200 [1]
1,2-Dichloropropane	78-87-5	230	360	230	32700 [1]
1,3,5-Trimethylbenzene	108-67-8	--	--	--	NV
1,4-Dioxane	123-91-1	22000	22000	22000	--
Methyl ethyl ketone	78-93-3	2200	2200	2200	--
2-Hexanone	591-78-6	ID	99	99	--
4-Isopropyltoluene	99-87-6	--	--	--	NV
4-Methyl-2-pentanone	108-10-1	ID	170	170	--

Table 4-2
Ecological Screening Values
BASF North Works Facility
Wyandotte, Michigan
Screening Ecological Risk Assessment

Parameter	CAS No.	MIDEQ Surface Water Quality Value	Region 5 Surface Water ESL	Selected Surface Water ESV [17]	Soil ESV	
Acetone	67-64-1	1700	1700	1700	2500	[1]
Benzene	71-43-2	200	114	200	255	[1]
Caprolactam	105-60-2	NV	NV	NV	--	
Carbon disulfide	75-15-0	ID	15	15	--	
Carbon tetrachloride	56-23-5	--	--	--	2980	[1]
Chlorobenzene	108-90-7	47	47	47	13100	[1]
Chloroethane	75-00-3	1100	NV	1100	--	
Chloroform	67-66-3	630	140	630	1190	[1]
Chloromethane	74-87-3	ID	NV	NV	--	
Cis-1,2-Dichloroethene	156-59-2	620	NV	620	--	
Cyclohexane	110-82-7	ID	NV	NV	--	
Ethylbenzene	100-41-4	18	14	18	5160	[1]
Isopropylbenzene	98-82-8	NV	NV	NV	NV	
m-Xylene & p-Xylene	MPXYLENE	--	--	--	NV	
Methyl acetate	79-20-9	NV	NV	NV	--	
Methylcyclohexane	108-87-2	NV	NV	NV	--	
Methylene chloride	75-09-2	1500	940	1500	--	
n-Butylbenzene	104-51-8	--	--	--	NV	
n-Propylbenzene	103-65-1	--	--	--	NV	
o-Xylene	95-47-6	--	--	--	NV	
sec-Butylbenzene	135-98-8	--	--	--	NV	
Styrene	100-42-5	160	32	160	--	
tert-Butylbenzene	98-06-6	--	--	--	NV	
Tetrachloroethene	127-18-4	190	45	190	9920	[1]
Toluene	108-88-3	270	253	270	5450	[1]
Trichloroethene	79-01-6	200	47	200	--	
Vinyl chloride	75-01-4	930	930	930	--	
Xylenes	1330-20-7	41	27	41	10000	[1]
Pesticides						
4,4-DDE	72-55-9	--	--	--	596	[1]
4,4-DDT	50-29-3	--	--	--	3.5	[1]
Beta-BHC	319-85-7	--	--	--	3.98	[1]
Dieldrin	60-57-1	--	--	--	2.38	[1]
Endosulfan sulfate	1031-07-8	--	--	--	35.8	[1]
Endrin aldehyde	7421-93-4	--	--	--	10.5	[1]
Endrin ketone	53494-70-5	--	--	--	10.1	[1,15]
Methoxychlor	72-43-5	--	--	--	19.9	[1]
Polychlorinated Biphenyls						
Aroclor 1254	11097-69-1	--	--	--	0.332	[1]
Aroclor 1260	11096-82-5	--	--	--	0.332	[1]
Total PCBs	Total PCBs	--	--	--	0.332	[1]

Units for surface water ESVs are all in ug/L for all compounds
Units for soil ESVs are in mg/kg for inorganic compounds and in ug/kg for organic compounds.

CAS - Chemical Abstracts Service
Eco-SSL - Ecological Soil Screening Level
ESL - Ecological Screening Level
ESV - Ecological Screening Value
HCV - Human Cancer Value
HNV - Human Non-Cancer Value
ID = Insufficient Data to Derive Value
NV - Screening Value Not Identified
-- = Constituent not evaluated in this medium
PCB - Polychlorinated Biphenyl
WV - Wildlife Value

Screening value sources and notes
[1] Region 5 ESLs (USEPA 2003; Available at http://www.epa.gov/RCRIS-Region-5/ca/ESL.pdf)
[2] Region 4 Ecological Screening Values (USEPA, 2001; Available at http://www.epa.gov/region4/waste/ots/ecolbul.htm)
[3] Lowest USEPA Eco-SSL (USEPA, 2005b,c,d). Value is for mammals.
[4] Lowest USEPA Eco-SSL (USEPA, 2005e,f). Value is for plants.
[5] Lowest USEPA Eco-SSL (USEPA, 2005g). Value is for terrestrial invertebrates.
[6] Lowest USEPA Eco-SSL (USEPA, 2005h,i,j). Value is for birds.
[7] Lowest Chromium USEPA Eco-SSL (USEPA, 2005k). Value is for Cr III for mammals.
[8] Value for free cyanide used as a surrogate
[9] Value for 1,1-Dichloroethane used as a surrogate
[10] Value dependent on hardness. Hardness of 100 mg/L as $CaCO_3$ assumed.
[11] Value based on dissolved fraction
[12] Per MIDEQ, lowest of other surface water values (HNV, WV, or HCV) selected for screening value
[13] Value is pH dependent and assumes pH of 6.5.
[14] Value for benzo(b)fluoranthene used as a surrogate
[15] Value for endrin used as a surrogate
[16] Lower of 3-methylphenol and 4-methylphenol used as a surrogate
[17] MIDEQ values selected preferentially, when available

Table 4-3
Soil Ecological Screening Evaluation - AOC 6 Exposure Area
BASF North Works Facility
Wyandotte, Michigan
Screening Ecological Risk Assessment

CAS	Chemical (a)	Units	FOD (b)	Maximum Detected Concentration (c)	Ecological Screening Value	Maximum HQ	Does Maximum Detection Exceed ESV?	Location of Maximum Detection	Number Exceeding the ESV
Inorganics									
7440-36-0	Antimony	mg/kg	100%	***0.8***	0.27	3.0	Yes	AOC6-SS-5	3
7440-38-2	Arsenic	mg/kg	100%	***34.7***	18	1.9	Yes	AOC6-SS-8	2
7440-39-3	Barium	mg/kg	80%	165	330	0.5	No	AOC6-SS-8	0
7440-43-9	Cadmium	mg/kg	100%	***1.4***	0.36	3.9	Yes	AOC6-SS-10	4
7440-47-3	Chromium	mg/kg	100%	24.2	26	0.9	No	AOC6-SS-3	0
7440-48-4	Cobalt	mg/kg	100%	4.7	13	0.4	No	AOC6-SS-10	0
7440-50-8	Copper	mg/kg	100%	***44.2***	5.4	8.2	Yes	AOC6-SS-5	3
7439-92-1	Lead	mg/kg	100%	***192***	11	17.5	Yes	AOC6-SS-10	3
7439-97-6	Mercury	mg/kg	80%	***2.1***	0.1	21.0	Yes	AOC6-SS-10	3
7440-02-0	Nickel	mg/kg	100%	***25***	13.6	1.8	Yes	AOC6-SS-10	3
7782-49-2	Selenium	mg/kg	40%	***0.63***	0.0276	22.8	Yes	AOC6-SS-3	5
7440-22-4	Silver	mg/kg	100%	0.44	4.04	0.1	No	AOC6-SS-10	0
7440-62-2	Vanadium	mg/kg	100%	***19***	7.8	2.4	Yes	AOC6-SS-5	4
7440-66-6	Zinc	mg/kg	100%	***235***	6.62	35.5	Yes	AOC6-SS-10	5
SVOCs									
92-52-4	1,1-Biphenyl	ug/kg	40%	620	60000	0.01	No	AOC6-SS-10	0
91-57-6	2-Methylnaphthalene	ug/kg	60%	437.5	3240	0.1	No	AOC6-SS-10	0
83-32-9	Acenaphthene	ug/kg	50%	280	682000	0.0004	No	AOC6-SS-3	0
208-96-8	Acenaphthylene	ug/kg	80%	3400	682000	0.005	No	AOC6-SS-3	0
120-12-7	Anthracene	ug/kg	80%	4800	1480000	0.003	No	AOC6-SS-10	0
56-55-3	Benzo(a)anthracene	ug/kg	100%	***15000***	5210	2.9	Yes	AOC6-SS-10	0
50-32-8	Benzo(a)pyrene	ug/kg	100%	***11000***	1520	7.2	Yes	AOC6-SS-10	0
205-99-2	Benzo(b)fluoranthene	ug/kg	100%	11000	59800	0.2	No	AOC6-SS-10	0
191-24-2	Benzo(ghi)perylene	ug/kg	100%	9200	119000	0.1	No	AOC6-SS-10	0
207-08-9	Benzo(k)fluoranthene	ug/kg	100%	14000	148000	0.1	No	AOC6-SS-10	0
218-01-9	Chrysene	ug/kg	100%	***16000***	4730	3.4	Yes	AOC6-SS-10	0
53-70-3	Dibenz(a,h)anthracene	ug/kg	50%	1800	18400	0.1	No	AOC6-SS-3	0
206-44-0	Fluoranthene	ug/kg	100%	24000	122000	0.2	No	AOC6-SS-10	0
86-73-7	Fluorene	ug/kg	60%	1100	122000	0.01	No	AOC6-SS-3	0
193-39-5	Indeno(1,2,3-cd)pyrene	ug/kg	100%	9100	109000	0.1	No	AOC6-SS-10	0
91-20-3	Naphthalene	ug/kg	60%	***1250***	99.4	12.6	Yes	AOC6-SS-10	0
85-01-8	Phenanthrene	ug/kg	100%	8700	45700	0.2	No	AOC6-SS-10	0
129-00-0	Pyrene	ug/kg	100%	12000	78500	0.2	No	AOC6-SS-3	0
98-86-2	Acetophenone	ug/kg	50%	310	300000	0.001	No	AOC6-SS-3	0
100-52-7	Benzaldehyde	ug/kg	100%	99	NV	NC	NC	AOC6-SS-5	0
108-60-1	Bis(2-Chloroisopropyl) ether	ug/kg	33%	290	19900	0.01	No	AOC6-SS-3	0
86-74-8	Carbazole	ug/kg	40%	1100	NV	NC	NC	AOC6-SS-10	0
132-64-9	Dibenzofuran	ug/kg	60%	780	NV	NC	NC	AOC6-SS-10	0
VOCs									
95-63-6	1,2,4-Trimethylbenzene	ug/kg	20%	97	NV	NC	NC	AOC6-SS-10	0
107-06-2	1,2-Dichloroethane	ug/kg	40%	260	21200	0.01	No	AOC6-SS-10	0
108-67-8	1,3,5-Trimethylbenzene	ug/kg	40%	110	NV	NC	NC	AOC6-SS-10	0
78-87-5	1,2-Dichloropropane	ug/kg	40%	2500	32700	0.1	No	AOC6-SS-10	0
99-87-6	4-Isopropyltoluene	ug/kg	100%	39	NV	NC	NC	AOC6-SS-3	0
67-64-1	Acetone	ug/kg	80%	650	2500	0.3	No	AOC6-SS-5	0
71-43-2	Benzene	ug/kg	60%	240	255	0.9	No	AOC6-SS-10	0
56-23-5	Carbon tetrachloride	ug/kg	20%	84	2980	0.03	No	AOC6-SS-10	0
67-66-3	Chloroform	ug/kg	20%	160	1190	0.1	No	AOC6-SS-10	0
100-41-4	Ethylbenzene	ug/kg	100%	14	5160	0.003	No	AOC6-SS-10	0
98-82-8	Isopropylbenzene	ug/kg	100%	89	NV	NC	NC	AOC6-SS-10	0
MPXYLENE	m-Xylene & p-Xylene	ug/kg	60%	150	NV	NC	NC	AOC6-SS-10	0
103-65-1	n-Propylbenzene	ug/kg	33%	49	NV	NC	NC	AOC6-SS-10	0
95-47-6	o-Xylene	ug/kg	60%	73	NV	NC	NC	AOC6-SS-10	0
135-98-8	Sec-Butylbenzene	ug/kg	60%	140	NV	NC	NC	AOC6-SS-3	0
98-06-6	Tert-Butylbenzene	ug/kg	60%	120	NV	NC	NC	AOC6-SS-3	0
127-18-4	Tetrachloroethene	ug/kg	20%	63	9920	0.01	No	AOC6-SS-10	0
108-88-3	Toluene	ug/kg	60%	190	5450	0.03	No	AOC6-SS-10	0

Concentrations in boldface italics exceed the ESV.
CAS - Chemical Abstract Service.
ESV - Ecological screening value
HQ - Hazard Quotient (Maximum concentration/ESV)
NV - No value identified
NC - Not calculated due to lack of screening value
(a) Only chemicals with at least one positively detected result are reported.
(b) Frequency of detection
(c) Maximum detected concentration for each chemical, after duplicates have been averaged.
Complete summary statistics presented in Appendix B.

Table 4-4
Soil Ecological Screening Evaluation - AOC 7A Exposure Area
BASF North Works Facility
Wyandotte, Michigan
Screening Ecological Risk Assessment

CAS	Chemical (a)	Units	FOD (b)	Maximum Detected Concentration (c)	Ecological Screening Value	Maximum HQ	Does Maximum Detection Exceed ESV?	Location of Maximum Detection	Number Exceeding the ESV
Inorganics									
7440-38-2	Arsenic	mg/kg	100%	***62.4***	18	3.5	Yes	AOC-7A	4
7440-39-3	Barium	mg/kg	100%	148	330	0.4	No	AOC-7A	0
7440-41-7	Beryllium	mg/kg	14%	0.93	21	0.04	No	AOC-7A	0
7440-43-9	Cadmium	mg/kg	86%	***0.75***	0.36	2.1	Yes	AOC-7A	6
7440-47-3	Chromium	mg/kg	100%	***29.1***	26	1.1	Yes	AOC-7A	2
7440-48-4	Cobalt	mg/kg	14%	9.7	13	0.7	No	AOC-7A	0
7440-50-8	Copper	mg/kg	100%	***37***	5.4	6.9	Yes	AOC-7A	13
7439-92-1	Lead	mg/kg	100%	***335***	11	30.5	Yes	AOC-7A	11
7439-97-6	Mercury	mg/kg	79%	***4.8***	0.1	48.0	Yes	AOC-7A	11
7440-02-0	Nickel	mg/kg	93%	***31.8***	13.6	2.3	Yes	AOC-7A	6
7782-49-2	Selenium	mg/kg	29%	***1.7***	0.0276	61.6	Yes	AOC-7A	14
7440-22-4	Silver	mg/kg	7%	***10***	4.04	2.5	Yes	AOC-7A	1
57-12-5	Total Cyanide	mg/kg	79%	***5.7***	1.33	4.3	Yes	AOC-7A	0
7440-62-2	Vanadium	mg/kg	100%	***41.3***	7.8	5.3	Yes	AOC-7A	14
7440-66-6	Zinc	mg/kg	100%	***190***	6.62	28.7	Yes	AOC-7A	14

Concentrations in boldface italics exceed the ESV.
CAS - Chemical Abstract Service.
ESV - Ecological screening value
HQ - Hazard Quotient (Maximum concentration/ESV)
(a) Only chemicals with at least one positively detected result are reported.
(b) Frequency of detection
(c) Maximum detected concentration for each chemical, after duplicates have been averaged.
Complete summary statistics presented in Appendix B.

Table 4-5
Soil Ecological Screening Evaluation - SWMU G Exposure Area
BASF North Works Facility
Wyandotte, Michigan
Screening Ecological Risk Assessment

CAS	Chemical (a)	Units	FOD (b)	Maximum Detected Concentration (c)	Ecological Screening Value	Maximum HQ	Does Maximum Detection Exceed ESV?	Location of Maximum Detection	Number Exceeding the ESV
Inorganics									
7440-36-0	Antimony	mg/kg	10%	***2.6***	0.27	9.6	Yes	SWMUG-4	9
7440-38-2	Arsenic	mg/kg	100%	***101***	18	5.6	Yes	SWMUG-4	3
7440-39-3	Barium	mg/kg	100%	166	330	0.5	No	SWMUG-9	0
7440-41-7	Beryllium	mg/kg	10%	2	21	0.1	No	SWMUG-9	0
7440-43-9	Cadmium	mg/kg	100%	***2.3***	0.36	6.4	Yes	SWMUG-4	9
7440-47-3	Chromium	mg/kg	100%	***33.6***	26	1.3	Yes	SWMUG-4	2
7440-48-4	Cobalt	mg/kg	10%	10.1	13	0.8	No	SWMUG-10	0
7440-50-8	Copper	mg/kg	100%	***95.3***	5.4	17.6	Yes	SWMUG-4	10
7439-92-1	Lead	mg/kg	100%	***238***	11	21.6	Yes	SWMUG-4	10
7439-97-6	Mercury	mg/kg	80%	***5.4***	0.1	54.0	Yes	SWMUG-2	8
7440-02-0	Nickel	mg/kg	100%	***25.6***	13.6	1.9	Yes	SWMUG-10	2
7782-49-2	Selenium	mg/kg	10%	***0.44***	0.0276	15.9	Yes	SWMUG-6	10
57-12-5	Total Cyanide	mg/kg	10%	0.66	1.33	0.5	No	SWMUG-1	0
7440-62-2	Vanadium	mg/kg	100%	***29.7***	7.8	3.8	Yes	SWMUG-10	9
7440-66-6	Zinc	mg/kg	100%	***335***	6.62	50.6	Yes	SWMUG-7	10
SVOCs									
91-57-6	2-Methylnaphthalene	ug/kg	90%	1300	3240	0.4	No	SWMUG-9	0
83-32-9	Acenaphthene	ug/kg	100%	43	682000	0.00006	No	SWMUG-3	0
208-96-8	Acenaphthylene	ug/kg	90%	1800	682000	0.003	No	SWMUG-9	0
120-12-7	Anthracene	ug/kg	89%	700	1480000	0.0005	No	SWMUG-9	0
56-55-3	Benzo(a)anthracene	ug/kg	90%	3200	5210	0.6	No	SWMUG-9	0
50-32-8	Benzo(a)pyrene	ug/kg	90%	***3700***	1520	2.4	Yes	SWMUG-9	0
205-99-2	Benzo(b)fluoranthene	ug/kg	90%	4500	59800	0.08	No	SWMUG-9	0
191-24-2	Benzo(ghi)perylene	ug/kg	90%	2100	119000	0.02	No	SWMUG-9	0
207-08-9	Benzo(k)fluoranthene	ug/kg	90%	1600	148000	0.01	No	SWMUG-9	0
218-01-9	Chrysene	ug/kg	90%	3600	4730	0.8	No	SWMUG-9	0
53-70-3	Dibenz(a,h)anthracene	ug/kg	44%	640	18400	0.03	No	SWMUG-9	0
206-44-0	Fluoranthene	ug/kg	90%	3800	122000	0.03	No	SWMUG-9	0
86-73-7	Fluorene	ug/kg	33%	250	122000	0.002	No	SWMUG-9	0
193-39-5	Indeno(1,2,3-cd)pyrene	ug/kg	89%	1800	109000	0.02	No	SWMUG-9	0
91-20-3	Naphthalene	ug/kg	89%	***810***	99.4	8.1	Yes	SWMUG-9	0
85-01-8	Phenanthrene	ug/kg	100%	1900	45700	0.04	No	SWMUG-9	0
129-00-0	Pyrene	ug/kg	100%	6100	78500	0.08	No	SWMUG-9	0
105-67-9	2,4-Dimethylphenol	ug/kg	100%	***57***	10	5.7	Yes	SWMUG-6	0
117-81-7	Bis(2-Ethylhexyl) phthalate	ug/kg	100%	41	925	0.04	No	SWMUG-6	0
132-64-9	Dibenzofuran	ug/kg	89%	430	NV	NC	NC	SWMUG-9	0
84-66-2	Diethyl phthalate	ug/kg	100%	100	24800	0.004	No	SWMUG-10	0
108-39-4	3-Methylphenol	ug/kg	100%	120	3490	0.03	No	SWMUG-6	0
106-44-5	4-Methylphenol	ug/kg	100%	130	163000	0.0008	No	SWMUG-6	0
87-86-5	Pentachlorophenol	ug/kg	30%	***620***	1.8	344	Yes	SWMUG-4	0
Pesticides									
50-29-3	4,4-DDT	ug/kg	10%	***15.5***	3.5	4.4	Yes	SWMUG-6	0
PCBs									
11096-82-5	Aroclor 1260	ug/kg	50%	***1100***	0.332	3313	Yes	SWMUG-4	5
Total PCBs	Total PCBs	ug/kg	50%	***1100***	0.332	3313	Yes	SWMUG-4	5

Concentrations in boldface italics exceed the ESV.
CAS - Chemical Abstract Service.
ESV - Ecological screening value
HQ - Hazard Quotient (Maximum concentration/ESV)
NV - No value identified
NC - Not calculated due to lack of screening value
Total PCBs is Aroclor 1260, the only PCB aroclor detected.
(a) Only chemicals with at least one positively detected result are reported.
(b) Frequency of detection
(c) Maximum detected concentration for each chemical, after duplicates have been averaged.
Complete summary statistics presented in Appendix B.

Table 4-6
Soil Ecological Screening Evaluation - SWMU H Exposure Area
BASF North Works Facility
Wyandotte, Michigan
Screening Ecological Risk Assessment

CAS	Chemical (a)	Units	FOD (b)	Maximum Detected Concentration (c)	Ecological Screening Value	Maximum HQ	Does Maximum Detection Exceed ESV?	Location of Maximum Detection	Number Exceeding the ESV
Inorganics									
7440-36-0	Antimony	mg/kg	25%	***17.3***	0.27	64.1	Yes	SWMUH-SS-3	4
7440-38-2	Arsenic	mg/kg	100%	***22.5***	18	1.3	Yes	SWMUH-SS-3	2
7440-39-3	Barium	mg/kg	100%	143	330	0.43	No	SWMUH-SS-8	0
7440-41-7	Beryllium	mg/kg	100%	0.15	21	0.0071	No	SWMUH-SS-2	0
7440-43-9	Cadmium	mg/kg	100%	***2.7***	0.36	7.5	Yes	SWMUH-SS-6	4
7440-47-3	Chromium	mg/kg	100%	***64.6***	26	2.5	Yes	SWMUH-SS-2	3
7440-48-4	Cobalt	mg/kg	100%	7.3	13	0.6	No	SWMUH-SS-3	0
7440-50-8	Copper	mg/kg	100%	***52.7***	5.4	9.8	Yes	SWMUH-SS-3	4
7439-92-1	Lead	mg/kg	100%	***190***	11	17.3	Yes	SWMUH-SS-3	4
7439-97-6	Mercury	mg/kg	100%	***1.1***	0.1	11.0	Yes	SWMUH-SS-3	4
7440-02-0	Nickel	mg/kg	100%	***69.2***	13.6	5.1	Yes	SWMUH-SS-8	3
7440-28-0	Thallium	mg/kg	50%	***1.6***	0.0569	28.1	Yes	SWMUH-SS-3	4
7440-31-5	Tin	mg/kg	25%	***114***	7.62	15.0	Yes	SWMUH-SS-3	1
7440-62-2	Vanadium	mg/kg	100%	***28.2***	7.8	3.6	Yes	SWMUH-SS-3	4
7440-66-6	Zinc	mg/kg	100%	***163***	6.62	24.6	Yes	SWMUH-SS-2	4
SVOCs									
91-57-6	2-Methylnaphthalene	ug/kg	100%	815	3240	0.3	No	SWMUH-SS-8	0
83-32-9	Acenaphthene	ug/kg	100%	18	682000	0.00003	No	SWMUH-SS-6	0
208-96-8	Acenaphthylene	ug/kg	100%	70	682000	0.0001	No	SWMUH-SS-3	0
120-12-7	Anthracene	ug/kg	100%	110	1480000	0.0001	No	SWMUH-SS-3	0
56-55-3	Benzo(a)anthracene	ug/kg	100%	680	5210	0.1	No	SWMUH-SS-3	0
50-32-8	Benzo(a)pyrene	ug/kg	100%	760	1520	0.5	No	SWMUH-SS-2	0
205-99-2	Benzo(b)fluoranthene	ug/kg	100%	1100	59800	0.02	No	SWMUH-SS-2	0
191-24-2	Benzo(ghi)perylene	ug/kg	100%	620	119000	0.005	No	SWMUH-SS-2	0
207-08-9	Benzo(k)fluoranthene	ug/kg	100%	450	148000	0.003	No	SWMUH-SS-3	0
218-01-9	Chrysene	ug/kg	100%	750	4730	0.2	No	SWMUH-SS-3	0
53-70-3	Dibenz(a,h)anthracene	ug/kg	100%	150	18400	0.008	No	SWMUH-SS-2	0
206-44-0	Fluoranthene	ug/kg	100%	1200	122000	0.01	No	SWMUH-SS-3	0
86-73-7	Fluorene	ug/kg	100%	30	122000	0.0002	No	SWMUH-SS-3	0
193-39-5	Indeno(1,2,3-cd)pyrene	ug/kg	100%	580	109000	0.005	No	SWMUH-SS-2	0
91-20-3	Naphthalene	ug/kg	100%	***550***	99.4	5.5	Yes	SWMUH-SS-8	0
85-01-8	Phenanthrene	ug/kg	100%	470	45700	0.01	No	SWMUH-SS-3	0
129-00-0	Pyrene	ug/kg	100%	960	78500	0.01	No	SWMUH-SS-3	0
108-60-1	Bis(2-Chloroisopropyl) ether	ug/kg	25%	690	19900	0.03	No	SWMUH-SS-2	0
117-81-7	Bis(2-Ethylhexyl) phthalate	ug/kg	100%	170	925	0.2	No	SWMUH-SS-2	0
86-74-8	Carbazole	ug/kg	100%	55	NV	NC	NC	SWMUH-SS-3	0
132-64-9	Dibenzofuran	ug/kg	100%	63	NV	NC	NC	SWMUH-SS-8	0
117-84-0	Di-n-octyl phthalate	ug/kg	25%	190	709000	0.0003	No	SWMUH-SS-2	0
VOCs									
75-34-3	1,1-Dichloroethane	ug/kg	25%	43	20100	0.002	No	SWMUH-SS-8	0
96-18-4	1,2,3-Trichloropropane	ug/kg	67%	47	3360	0.01	No	SWMUH-SS-2	0
95-63-6	1,2,4-Trimethylbenzene	ug/kg	100%	580	NV	NC	NC	SWMUH-SS-8	0
107-06-2	1,2-Dichloroethane	ug/kg	100%	72	21200	0.003	No	SWMUH-SS-8	0
78-87-5	1,2-Dichloropropane	ug/kg	100%	2500	32700	0.08	No	SWMUH-SS-8	0
108-67-8	1,3,5-Trimethylbenzene	ug/kg	25%	170	NV	NC	NC	SWMUH-SS-8	0
99-87-6	4-Isopropyltoluene	ug/kg	33%	50	NV	NC	NC	SWMUH-SS-8	0
67-64-1	Acetone	ug/kg	75%	700	2500	0.3	No	SWMUH-SS-2	0
71-43-2	Benzene	ug/kg	100%	54	255	0.2	No	SWMUH-SS-8	0
108-90-7	Chlorobenzene	ug/kg	100%	11	13100	0.0008	No	SWMUH-SS-8	0
67-66-3	Chloroform	ug/kg	100%	51	1190	0.04	No	SWMUH-SS-3	0
100-41-4	Ethylbenzene	ug/kg	100%	190	5160	0.04	No	SWMUH-SS-8	0
98-82-8	Isopropylbenzene	ug/kg	100%	93	NV	NC	NC	SWMUH-SS-8	0
MPXYLENE	m-Xylene & p-Xylene	ug/kg	100%	1000	NV	NC	NC	SWMUH-SS-8	0
104-51-8	n-Butylbenzene	ug/kg	25%	60	NV	NC	NC	SWMUH-SS-8	0
103-65-1	n-Propylbenzene	ug/kg	100%	99	NV	NC	NC	SWMUH-SS-8	0
95-47-6	o-Xylene	ug/kg	100%	740	NV	NC	NC	SWMUH-SS-8	0
135-98-8	sec-Butylbenzene	ug/kg	25%	28	NV	NC	NC	SWMUH-SS-8	0
127-18-4	Tetrachloroethene	ug/kg	100%	14	9920	0.001	No	SWMUH-SS-8	0
108-88-3	Toluene	ug/kg	100%	440	5450	0.08	No	SWMUH-SS-8	0
Pesticides									
72-55-9	4,4-DDE	ug/kg	100%	11	596	0.02	No	SWMUH-SS-3	0
50-29-3	4,4-DDT	ug/kg	25%	***12***	3.5	3.4	Yes	SWMUH-SS-3	0
319-85-7	Beta-BHC	ug/kg	50%	***9.4***	3.98	2.4	Yes	SWMUH-SS-3	0
60-57-1	Dieldrin	ug/kg	25%	***12***	2.38	5.0	Yes	SWMUH-SS-8	0
1031-07-8	Endosulfan sulfate	ug/kg	25%	14	35.8	0.4	No	SWMUH-SS-8	0
7421-93-4	Endrin aldehyde	ug/kg	25%	***12***	10.5	1.1	Yes	SWMUH-SS-8	0
53494-70-5	Endrin ketone	ug/kg	25%	***14***	10.1	1.4	Yes	SWMUH-SS-2	0
72-43-5	Methoxychlor	ug/kg	100%	8.7	19.9	0.4	No	SWMUH-SS-3	0
PCBs									
11097-69-1	Aroclor 1254	ug/kg	100%	***74***	0.332	223	Yes	SWMUH-SS-6	0
11096-82-5	Aroclor 1260	ug/kg	50%	***1700***	0.332	5120	Yes	SWMUH-SS-8	1
Total PCBs	Total PCBs	ug/kg	100%	***1700***	0.332	5120	Yes	SWMUH-SS-8	1

Concentrations in boldface italics exceed the ESV.
CAS - Chemical Abstract Service.
ESV - Ecological screening value
HQ - Hazard Quotient (Maximum concentration/ESV)
NV - No value identified
NC - Not calculated due to lack of screening value
Total PCBs is the sum of Aroclor 1254 and Aroclor 1260.
(a) Only chemicals with at least one positively detected result are reported.
(b) Frequency of detection
(c) Maximum detected concentration for each chemical, after duplicates have been averaged.
Complete summary statistics presented in Appendix B.

Table 4-7
Groundwater Ecological Screening Evaluation - Maximum Concentration from SERA Wells
BASF North Works Facility
Wyandotte, Michigan
Screening Ecological Risk Assessment

CAS	Chemical (a)	Units	FOD (b)	Maximum Detected Concentration (c)	Ecological Screening Value	Maximum HQ	Does Maximum Detection Exceed ESV?	Location of Maximum Detection	Background (Inorganics Only)
Inorganics									
7440-36-0	Antimony	ug/L	11%	60	240	0.3	No	RFI-MW8, WHI6-2S	NA
7440-38-2	Arsenic	ug/L	61%	***397***	150	2.6	Yes	RFI-MW12	45.1
7440-39-3	Barium	ug/L	100%	***3700***	438	8.4	Yes	RFI-MW7I	136.5
7440-41-7	Beryllium	ug/L	27%	***5***	2.400	2.1	Yes	[illegible] MW10I, RFI-MW11, RFI-MW12, RFI-MW12F, RFI-MW22, RFI-MW22, RFI-MW4, RFI-MW5, RFI-MW7F, RFI-MW7I, RFI-MW8, RFI-MW9, WHI6-1S, WHI6-2F, WHI6-2S	NA
7440-43-9	Cadmium	ug/L	42%	1.2	2.2	0.5	No	RFI-MW10I	NA
7440-47-3	Chromium	ug/L	35%	***90.4***	74	1.2	Yes	RFI-MW12	36.88
7440-48-4	Cobalt	ug/L	42%	22.6	100	0.2	No	WHI6-2S	5.76
7440-50-8	Copper	ug/L	32%	***75***	9	8.3	Yes	WHI6-2S	12.5
7439-92-1	Lead	ug/L	24%	***41.6***	10.3	4.0	Yes	WHI6-2S	34.22
7439-97-6	Mercury	ug/L	98%	***10.7***	0.77	13.9	Yes	RFI-MW10F	0.0387
7440-02-0	Nickel	ug/L	64%	***307***	52	5.9	Yes	RFI-MW12	43.63
7782-49-2	Selenium	ug/L	39%	***8.7***	5	1.7	Yes	RFI-MW12, RFI-MW7F	6.77
7440-28-0	Thallium	ug/L	31%	***46.1***	7.2	6.4	Yes	RFI-MW7I	8.29
57-12-5	Total Cyanide	ug/L	85%	***2000***	5.2	384.6	Yes	RFI-MW10I	NA
7440-62-2	Vanadium	ug/L	39%	***477***	12	39.8	Yes	RFI-MW22	25
7440-66-6	Zinc	ug/L	52%	***552***	118	4.7	Yes	WHI6-2S	83.72
SVOCs									
92-52-4	1,1-Biphenyl	ug/L	4%	2.2	13	0.2	No	RFI-MW8I	NA
123-91-1	1,4-Dioxane	ug/L	23%	180	22000	0.01	No	RFI-MW12	NA
105-67-9	2,4-Dimethylphenol	ug/L	17%	3.8	380	0.01	No	RFI-MW8I	NA
91-57-6	2-Methylnaphthalene	ug/L	24%	25	330	0.1	No	RFI-MW8I	NA
95-48-7	2-Methylphenol	ug/L	8%	5.9	82	0.1	No	RFI-MW10I	NA
108-39-4	3-Methylphenol	ug/L	44%	***810***	71	11.4	Yes	RFI-MW10I	NA
106-44-5	4-Methylphenol	ug/L	44%	***810***	25	32.4	Yes	RFI-MW10I	NA
65794-96-9	3-Methylphenol & 4-Methylphenol	ug/L	36%	***250***	25	10.0	Yes	RFI-MW10I	
83-32-9	Acenaphthene	ug/L	51%	3	38	0.1	No	RFI-MW9I	NA
208-96-8	Acenaphthylene	ug/L	14%	11	4840	0.002	No	RFI-MW9I	NA
98-86-2	Acetophenone	ug/L	18%	0.64	NV	NC	NC	CMS-MW-2	NA
120-12-7	Anthracene	ug/L	12%	***6.3***	0.035	180.0	Yes	WHI6-2S	NA
100-52-7	Benzaldehyde	ug/L	10%	0.91	NV	NC	NC	RFI-MW9	NA
56-55-3	Benzo(a)anthracene	ug/L	2%	***7.8***	0.025	312.0	Yes	WHI6-2S	NA
50-32-8	Benzo(a)pyrene	ug/L	1%	***5.6***	0.014	400.0	Yes	WHI6-2S	NA
205-99-2	Benzo(b)fluoranthene	ug/L	4%	8	9.07	0.9	No	WHI6-2S	NA
191-24-2	Benzo(ghi)perylene	ug/L	4%	4.1	7.64	0.5	No	WHI6-2S	NA
207-08-9	Benzo(k)fluoranthene	ug/L	4%	2.4	9.07	0.3	No	WHI6-2S	NA
111-44-4	Bis(2-Chloroethyl) Ether	ug/L	26%	***92***	0.79	116.5	Yes	RFI-MW22	NA
108-60-1	Bis(2-Chloroisopropyl) Ether	ug/L	20%	9.4	NV	NC	NC	RFI-MW7F	NA
117-81-7	Bis(2-Ethylhexyl) Phthalate	ug/L	37%	10	25	0.4	No	CMS-MW-2, RFI-MW4, RFI-MW5, RFI-MW7F, RFI-MW9, WHI6-1S, WHI6-2F	NA
85-68-7	Butyl Benzyl Phthalate	ug/L	5%	1.2	67	0.02	No	WHI6-4S	
105-60-2	Caprolactam	ug/L	23%	500	NV	NC	NC	RFI-MW10F	NA
86-74-8	Carbazole	ug/L	6%	***6.7***	4	1.7	Yes	RFI-MW8I	NA
218-01-9	Chrysene	ug/L	2%	***9.1***	9.07	1.0	Yes	WHI6-2S	NA
132-64-9	Dibenzofuran	ug/L	13%	***5.8***	4	1.5	Yes	WHI6-2S	NA
84-74-2	Di-N-Butyl Phthalate	ug/L	5%	0.63	9.7	0.1	No	RFI-MW11F	
117-84-0	Di-N-Octyl Phthalate	ug/L	8%	1.6	30	0.1	No	WHI6-4S	
206-44-0	Fluoranthene	ug/L	15%	***27***	1.9	14.2	Yes	WHI6-2S	NA
86-73-7	Fluorene	ug/L	16%	7.7	12	0.6	No	RFI-MW9I	NA
193-39-5	Indeno(1,2,3-cd)pyrene	ug/L	4%	3.5	4.31	0.8	No	WHI6-2S	NA
91-20-3	Naphthalene	ug/L	32%	***1600***	13	123.1	Yes	RFI-MW10F	
87-86-5	Pentachlorophenol	ug/L	17%	3	4	0.8	No	RFI-MW8F	NA
85-01-8	Phenanthrene	ug/L	40%	***22***	2.4	9.2	Yes	WHI6-2S	NA
108-95-2	Phenol	ug/L	40%	***880***	450	2.0	Yes	RFI-MW12	NA
129-00-0	Pyrene	ug/L	14%	***23***	0.3	76.7	Yes	WHI6-2S	NA
VOCs									
75-34-3	1,1-Dichloroethane	ug/L	5%	39	740	0.1	No	RFI-MW8F	NA
75-35-4	1,1-Dichloroethene	ug/L	6%	4.9	130	0.04	No	RFI-MW8F	NA
107-06-2	1,2-Dichloroethane	ug/L	22%	0.32	2000	0.0002	No	RFI-MW6, RFI-MW6	NA
78-87-5	1,2-Dichloropropane	ug/L	13%	13	230	0.1	No	RFI-MW7F	NA
591-78-6	2-Hexanone	ug/L	13%	0.89	99	0.01	No	RFI-MW8I	NA
108-10-1	4-Methyl-2-Pentanone	ug/L	17%	16	170	0.1	No	RFI-MW10I, RFI-MW10I	NA
67-64-1	Acetone	ug/L	44%	***2200***	1700	1.3	Yes	RFI-MW22	NA
71-43-2	Benzene	ug/L	29%	***2000***	200	10.0	Yes	RFI-MW22, RFI-MW22	NA
75-15-0	Carbon Disulfide	ug/L	33%	***23***	15	1.5	Yes	RFI-MW10I	NA
108-90-7	Chlorobenzene	ug/L	8%	***930***	47	19.8	Yes	RFI-MW22	NA
75-00-3	Chloroethane	ug/L	2%	0.89	1100	0.001	No	RFI-MW8F	
67-66-3	Chloroform	ug/L	6%	0.585	630	0.001	No	RFI-MW9F	NA
74-87-3	Chloromethane	ug/L	38%	0.3	NV	NC	NC	WHI6-2F	NA
156-59-2	Cis-1,2-Dichloroethene	ug/L	2%	12	620	0.02	No	RFI-MW22	NA
110-82-7	Cyclohexane	ug/L	22%	2.8	NV	NC	NC	RFI-MW12F	NA
100-41-4	Ethylbenzene	ug/L	11%	***120***	18	6.7	Yes	RFI-MW22	NA
98-82-8	Isopropylbenzene	ug/L	6%	6.3	NV	NC	NC	RFI-MW8I	
79-20-9	Methyl Acetate	ug/L	3%	5.4	NV	NC	NC	RFI-MW12F	NA

Table 4-7
Groundwater Ecological Screening Evaluation - Maximum Concentration from SERA Wells
BASF North Works Facility
Wyandotte, Michigan
Screening Ecological Risk Assessment

CAS	Chemical (a)	Units	FOD (b)	Maximum Detected Concentration (c)	Ecological Screening Value	Maximum HQ	Does Maximum Detection Exceed ESV?	Location of Maximum Detection	Background (Inorganics Only)
78-93-3	Methyl Ethyl Ketone	ug/L	49%	46	2200	0.02	No	RFI-MW22	NA
108-87-2	Methylcyclohexane	ug/L	9%	2.3	NV	NC	NC	RFI-MW12F	NA
75-09-2	Methylene Chloride	ug/L	13%	38	1500	0.03	No	RFI-MW22	NA
100-42-5	Styrene	ug/L	3%	2.1	160	0.01	No	RFI-MW10F	NA
127-18-4	Tetrachloroethene	ug/L	4%	2.5	190	0.01	No	RFI-MW9F	NA
108-88-3	Toluene	ug/L	39%	76	270	0.3	No	RFI-MW22	NA
79-01-6	Trichloroethene	ug/L	5%	0.34	200	0.002	No	RFI-MW9F	NA
75-01-4	Vinyl Chloride	ug/L	7%	140	930	0.2	No	RFI-MW22	NA
1330-20-7	Xylenes	ug/L	16%	***84***	41	2.0	Yes	RFI-MW8I	NA

Concentrations in boldface italics exceed the ESV.
CAS - Chemical Abstract Service.
ESV - Ecological screening value
HQ - Hazard Quotient (Maximum concentration/ESV)
NV - No value identified
NC - Not calculated due to lack of screening value
(a) Only chemicals with at least one positively detected result are reported.
(b) Frequency of detection - Number of wells where detected : Number of wells where sampled
(c) Maximum detected concentration for each chemical, after duplicates have been averaged.

Table 4-8
Groundwater Ecological Screening - Individual Well Maximum Concentrations (b)
BASF North Works Facility
Wyandotte, Michigan
Screening Ecological Risk Assessment

CAS	Chemical (a)	Units	Ecological Screening Value	CMS-MW-2	RFI-MW10	RFI-MW10F	RFI-MW10I	RFI-MW11	RFI-MW11F	RFI-MW12	RFI-MW12F	RFI-MW22	RFI-MW4	RFI-MW5	RFI-MW6	RFI-MW7F
Inorganics																
7440-38-2	Arsenic	ug/L	150		15	82.2	**314**	6	29.7	**397**	6.1	110	106			
7440-39-3	Barium	ug/L	438	**618.5**	**1055**	179	65.9	197.5	39.3	117	435	137	311	**1080**	217	**604**
7440-41-7	Beryllium	ug/L	2.40	**5**		**5**	**5**	**5**		**5**	**5**	**5**	**5**	**5**	0.35	**5**
7440-43-9	Cadmium	ug/L	2.2				**1.2**			0.59		0.58				
7440-47-3	Chromium	ug/L	74	6.6		4.1	59.2	2.05		**90.4**		70.9		1.8		32.9
7440-50-8	Copper	ug/L	9	**25**		**25**	**30.3**	**25**		**25**	**37.5**	**35.4**				**43.4**
7439-92-1	Lead	ug/L	10.3	7.1		5.1	**14.7**		1.9		**18**	**14.7**				3
7439-97-6	Mercury	ug/L	0.77	**0.964**	0.028	**10.7**	**2.79**	0.0062	0.0096	**3.14**	**2.45**	0.0685	0.002	0.181	0.373	0.0522
7440-02-0	Nickel	ug/L	52	**67.1**	4.3	13.9	**197**	3.35	5	**307**	**167**	23.4		8.1	6.6	12.8
7782-49-2	Selenium	ug/L	5	**5.5**	2.45	5	**8.3**	3.1	5	**8.7**	**7.2**	**5.3**		**6.6**	**8.5**	**8.7**
7440-28-0	Thallium	ug/L	7.2		**8.2**	6.3		7.075	5.3	4.8	4.9					
57-12-5	Total Cyanide	ug/L	5.2	**15**	**13.55**	**480**	**2000**		**200**	**1000**	3.4	**1500**	**69**	4.45	**18**	3.8
7440-62-2	Vanadium	ug/L	12	**50**		**72.9**	**230**		3.1	**394**		**477**				
7440-66-6	Zinc	ug/L	118	41	20	20	**126**	11.65	12.3	24.5	20	50.4	15	20	20	20
SVOCs																
108-39-4	3-Methylphenol	ug/L	71	1.8575			**810**			**100**	19	17.1575		23	9.6	
106-44-5	4-Methylphenol	ug/L	25	1.86			**810**			**100**	19	20.25		23	9.6	
65794-96-9	3-Methylphenol & 4-Methylphenc	ug/L	25	2.3			**250**			**130**	**67**	**34**		**34**	15	1
98-86-2	Acetophenone	ug/L	NV	**0.64**												
120-12-7	Anthracene	ug/L	0.035	**0.37**										**0.1**		
100-52-7	Benzaldehyde	ug/L	NV	0.5675												
56-55-3	Benzo(a)anthracene	ug/L	0.025													
50-32-8	Benzo(a)pyrene	ug/L	0.014													
111-44-4	Bis(2-Chloroethyl) Ether	ug/L	0.79									**92**				
108-60-1	Bis(2-Chloroisopropyl) Ether	ug/L	NV	1.2										2.7	5.3	**9.4**
117-81-7	Bis(2-Ethylhexyl) Phthalate	ug/L	25	**10**	1.1			2.5	1.7		3.6		**10**	**10**		**10**
105-60-2	Caprolactam	ug/L	NV	2	1.3	**500**			2.3	250	36			34.5	2.1	40
86-74-8	Carbazole	ug/L	4						0.6							
218-01-9	Chrysene	ug/L	9.07													
132-64-9	Dibenzofuran	ug/L	4	1.3												
206-44-0	Fluoranthene	ug/L	1.9	0.2					0.69							
91-20-3	Naphthalene	ug/L	13	3.5		**1600**	**36**		6.1					7.35	1.2	
85-01-8	Phenanthrene	ug/L	2.4	**3.7**	0.51	**12**	**15**		0.6					0.53	0.48	1.2
108-95-2	Phenol	ug/L	450	25		20	**870**			**880**	410	35		31	17	
129-00-0	Pyrene	ug/L	0.3						**0.51**					0.22		
VOCs																
67-64-1	Acetone	ug/L	1700	46	1.5	51	140		10	120	330	**2200**		74	10	67
71-43-2	Benzene	ug/L	200	13		23	4.9		0.95		0.96	**2000**		0.91		
75-15-0	Carbon Disulfide	ug/L	15			3.2	**23**		0.52	**16**	1.3		0.39		0.75	
108-90-7	Chlorobenzene	ug/L	47	2.2								**930**				
74-87-3	Chloromethane	ug/L	NV	0.175		0.17		0.11						0.23		
110-82-7	Cyclohexane	ug/L	NV	0.145		0.48			0.51		**2.8**			0.24		0.13
100-41-4	Ethylbenzene	ug/L	18			0.3	0.51					**120**				
98-82-8	Isopropylbenzene	ug/L	NV													
79-20-9	Methyl Acetate	ug/L	NV								**5.4**					
108-87-2	Methylcyclohexane	ug/L	NV			0.56			0.56		**2.3**					
1330-20-7	Xylenes	ug/L	41			7.1	2.5				2	**53**				

Concentrations in boldface italics exceed the ESV.
Shading indicates maximum concentration for each chemical.
Only groundwater COIs shown.
CAS - Chemical Abstract Service.
ESV - Ecological screening value
HQ - Hazard Quotient (Maximum concentration/ESV)
NV - No value identified
NE - Not evaluated due to lack of screening value
(a) Only chemicals with at least one positively detected result are reported.
(b) Maximum detected concentration for each chemical, after duplicates have been averaged.

Table 4-8
Groundwater Ecological Screening - Individual Well Maximum Concentratio
BASF North Works Facility
Wyandotte, Michigan
Screening Ecological Risk Assessment

CAS	Chemical (a)	Units	Ecological Screening Value	RFI-MW7I	RFI-MW8	RFI-MW8F	RFI-MW8I	RFI-MW9	RFI-MW9F	RFI-MW9I	WHI6-1F	WHI6-1S	WHI6-2F	WHI6-2S	WHI6-4F	WHI6-4S
Inorganics																
7440-38-2	Arsenic	ug/L	150	7.1	10		10	21.5	15.2	14.1	18.7	7.6	45.2	24.6	93	23.4
7440-39-3	Barium	ug/L	438	**3700**	**1090**	**673**	**742**	149	200	107	**549**	**677**	205	396	**2650**	**2670**
7440-41-7	Beryllium	ug/L	2.40	**5**	**5**			**5**		0.36		**5**	**5**	**5**		
7440-43-9	Cadmium	ug/L	2.2	0.59	0.91		0.57	0.45						0.78	0.61	0.51
7440-47-3	Chromium	ug/L	74	7.4	5.9		7.6	4.1	2.7	2.3		2.2		**77**		
7440-50-8	Copper	ug/L	9			6.5	**30.3**		**25**	**25**	2.3	8.5		**75**	**25**	
7439-92-1	Lead	ug/L	10.3			2.5	**29.2**			1.8		5.9		**41.6**		
7439-97-6	Mercury	ug/L	0.77	0.0031	0.0064	**1.6**	**1.69**	0.0036	0.422	**0.922**	0.0051	0.0374	0.0194	0.151	0.0012	0.0074
7440-02-0	Nickel	ug/L	52	1.5	7.1	22.1	30.6	2.4	2.9	24.4	1.6	7.4	1.8	**82.3**	2.1	19.2
7782-49-2	Selenium	ug/L	5		5	3.8			4.4	2.8	2.7	2.5		5		
7440-28-0	Thallium	ug/L	7.2	**46.1**	**16.1**			5.6		5.15	6.2	7.2	**10.4**	**10**	**10**	**8**
57-12-5	Total Cyanide	ug/L	5.2	**210**				**6.3**	**6.9**	**34**	**36**	**23.25**	**34**		**20**	
7440-62-2	Vanadium	ug/L	12		2.4	4	**50**		**50**	**25.5**		3.6	2.7	**106**		
7440-66-6	Zinc	ug/L	118	20	20	11.2	86.4			20	24.3	104	6.7	**552**	20	
SVOCs																
108-39-4	3-Methylphenol	ug/L	71				**120**			37				2.9		
106-44-5	4-Methylphenol	ug/L	25				**120**			**37**				2.9		
65794-96-9	3-Methylphenol & 4-Methylphenc	ug/L	25			**39**	20			**34**			1			
98-86-2	Acetophenone	ug/L	NV													
120-12-7	Anthracene	ug/L	0.035			**2**	**2.6**			**4.6**				**6.3**		
100-52-7	Benzaldehyde	ug/L	NV					**0.91**								
56-55-3	Benzo(a)anthracene	ug/L	0.025											**7.8**		
50-32-8	Benzo(a)pyrene	ug/L	0.014											**5.6**		
111-44-4	Bis(2-Chloroethyl) Ether	ug/L	0.79								**30**	**5.5**	**16**	**15**	**6.8**	**6.6**
108-60-1	Bis(2-Chloroisopropyl) Ether	ug/L	NV										1.7		0.95	
117-81-7	Bis(2-Ethylhexyl) Phthalate	ug/L	25			2.3		**10**	2.3		4	**10**	**10**	6		3.5
105-60-2	Caprolactam	ug/L	NV	1.1			8.4	1.5	25							
86-74-8	Carbazole	ug/L	4			3.6	**6.7**							2.8		
218-01-9	Chrysene	ug/L	9.07											**9.1**		
132-64-9	Dibenzofuran	ug/L	4			3.7	**5.3**			**4.9**				**5.8**		
206-44-0	Fluoranthene	ug/L	1.9			1.8	**2.6**		0.215	**4.6**				**27**		
91-20-3	Naphthalene	ug/L	13			**97**	**100**		1.5	**99**		0.38		6.9		
85-01-8	Phenanthrene	ug/L	2.4	0.43		**7.8**	**9.1**		0.475	**8.6**				**22**		
108-95-2	Phenol	ug/L	450			200	250		2	270			17			
129-00-0	Pyrene	ug/L	0.3			**1.3**	**2.1**		0.23	**3.5**				**23**		
VOCs																
67-64-1	Acetone	ug/L	1700			88	38	1.8	2.5	19			50	10		
71-43-2	Benzene	ug/L	200			2.8	2.3			1.6						
75-15-0	Carbon Disulfide	ug/L	15	1.1		3.2	6.2			2.9	0.71	0.76	0.57	0.33		0.31
108-90-7	Chlorobenzene	ug/L	47													
74-87-3	Chloromethane	ug/L	NV				0.25	0.22			0.22		**0.3**			0.21
110-82-7	Cyclohexane	ug/L	NV	0.13		1.3	1			0.37			0.5			
100-41-4	Ethylbenzene	ug/L	18			17	**20**			0.22						
98-82-8	Isopropylbenzene	ug/L	NV			6	**6.3**			0.89						
79-20-9	Methyl Acetate	ug/L	NV				3.1			0.96						
108-87-2	Methylcyclohexane	ug/L	NV				1.4			0.57			0.56			
1330-20-7	Xylenes	ug/L	41			**77**	**84**			15						

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Shading indicates maximum concentration for each chemical.
Only groundwater COIs shown.
CAS - Chemical Abstract Service.
ESV - Ecological screening value
HQ - Hazard Quotient (Maximum concentration/ESV)
NV - No value identified
NE - Not evaluated due to lack of screening value
(a) Only chemicals with at least one positively detected result are reported.
(b) Maximum detected concentration for each chemical, after duplicates have bee

Table 4-9
Constituents Retained as Preliminary Ecological COIs Based on Screening Evaluation
BASF North Works Facility
Wyandotte, Michigan
Screening Ecological Risk Assessment

Parameter	CAS No.	Surface Soil Ecological HQs by Area				HQs for Groundwater COIs
		AOC 6	AOC 7A	SWMU G	SWMU H	
Inorganics						
Antimony	7440-36-0	3.0		9.6	**64.1**	
Arsenic	7440-38-2	1.9	3.5	5.6	1.3	2.6
Barium	7440-39-3					8.4
Beryllium	7440-41-7					2.1
Cadmium	7440-43-9	3.9	2.1	6.4	7.5	
Chromium	7440-47-3		1.1	1.3	2.5	1.2
Cobalt	7440-48-4					
Copper	7440-50-8	8.2	6.9	**17.6**	9.8	8.3
Lead	7439-92-1	**17.5**	**30.5**	**21.6**	**17.3**	4.0
Mercury	7439-97-6	**21.0**	**48.0**	**54.0**	**11.0**	**13.9**
Nickel	7440-02-0	1.8	2.3	1.9	5.1	5.9
Selenium	7782-49-2	**22.8**	**61.6**	**15.9**		1.7
Silver	7440-22-4		2.5			
Thallium	7440-28-0				**28.1**	6.4
Tin	7440-31-5				**15.0**	
Total Cyanide	57-12-5		4.3			**384.6**
Vanadium	7440-62-2	2.4	5.3	3.8	3.6	**39.8**
Zinc	7440-66-6	**35.5**	**28.7**	**50.6**	**24.6**	4.7
Semivolatile Organic Compounds						
Anthracene	120-12-7					**180.0**
Benzo(a)anthracene	56-55-3	2.9				**312.0**
Benzo(a)pyrene	50-32-8	7.2		2.4		**400.0**
Chrysene	218-01-9	3.4				1.0
Fluoranthene	206-44-0					**14.2**
Naphthalene	91-20-3	**12.6**		8.1	5.5	**123.1**
Phenanthrene	85-01-8					9.2
Pyrene	129-00-0					**76.7**
2,4-Dimethylphenol	105-67-9			5.7		
Bis(2-Chloroethyl) ether	111-44-4					**116.5**
Bis(2-Ethylhexyl) phthalate	117-81-7					
Carbazole	86-74-8					1.7
Dibenzofuran	132-64-9					1.5
3-Methylphenol	108-39-4					**11.4**
4-Methylphenol	106-44-5					**32.4**
3-Methylphenol & 4-Methylphenol	65794-96-9					10.0
Pentachlorophenol	87-86-5			**344.4**		
Phenol	108-95-2					2.0
Volatile Organic Compounds						
Acetone	67-64-1					1.3
Benzene	71-43-2					10.0
Carbon disulfide	75-15-0					1.5
Chlorobenzene	108-90-7					**19.8**
Ethylbenzene	100-41-4					6.7
Xylenes	1330-20-7					2.0

Table 4-9
Constituents Retained as Preliminary Ecological COIs Based on Screening Evaluation
BASF North Works Facility
Wyandotte, Michigan
Screening Ecological Risk Assessment

Parameter	CAS No.	Surface Soil Ecological HQs by Area				HQs for Groundwater COIs
		AOC 6	AOC 7A	SWMU G	SWMU H	
Pesticides						
4,4-DDT	50-29-3			4.4	3.4	
Beta-BHC	319-85-7				2.4	
Dieldrin	60-57-1				5.0	
Endrin aldehyde	7421-93-4				1.1	
Endrin ketone	53494-70-5				1.4	
Polychlorinated Biphenyls						
Aroclor 1254	11097-69-1				**222.9**	
Aroclor 1260	11096-82-5			**3313.3**	**5120.5**	
Total PCBs	Total PCBs			**3313.3**	**5120.5**	

Notes:
COIs with HQ > 10 are presented in boldface text.
COIs with HQ > 100 are shaded.
Only COI HQs (i.e., HQ > 1) presented.

Table 4-10
Constituents Retained as Preliminary Ecological COIs Due to Lack of Screening Values
BASF North Works Facility
Wyandotte, Michigan
Screening Ecological Risk Assessment

Parameter	CAS No.	Surface Soil COIs by Area			Groundwater COIs
		AOC 6	SWMU G	SWMU H	
Semivolatile Organic Compounds					
Bis(2-Chloroisopropyl) ether	108-60-1				X
Acetophenone	98-86-2				X
Benzaldehyde	100-52-7	X			X
Carbazole	86-74-8	X		X	
Dibenzofuran	132-64-9	X	X	X	
Volatile Organic Compounds					
1,2,4-Trimethylbenzene	95-63-6	X		X	
1,3,5-Trimethylbenzene	108-67-8	X		X	
4-Isopropyltoluene	99-87-6	X		X	
Caprolactam	105-60-2				X
Chloromethane	74-87-3				X
Cyclohexane	110-82-7				X
Isopropylbenzene	98-82-8	X		X	X
m-Xylene & p-Xylene	MPXYLENE	X		X	
Methyl acetate	79-20-9				X
Methylcyclohexane	108-87-2				X
n-Butylbenzene	104-51-8			X	
n-Propylbenzene	103-65-1	X		X	
o-Xylene	95-47-6	X		X	
sec-Butylbenzene	135-98-8	X		X	
tert-Butylbenzene	98-06-6	X			

Table 4-11
Results of Background Evaluation for Surface Soil
BASF North Works Facility
Wyandotte, Michigan
Screening Ecological Risk Assessment

Chemical	AOC 6	AOC 7A	SWMU G	SWMU H
Antimony	NA	--	NA	NA
Arsenic	NA	**Yes**	NA	NA
Barium	--	--	--	--
Beryllium	--	--	--	--
Cadmium	NA	**Yes**	NA	NA
Chromium	--	No	NA	NA
Cobalt	--	--	--	--
Copper	NA	No	NA	NA
Total Cyanide	--	No	--	--
Lead	NA	**Yes**	NA	NA
Mercury	NA	No	NA	NA
Nickel	NA	**Yes**	NA	NA
Selenium	NA	NA	NA	--
Silver	--	NA	--	--
Thallium	--	--	--	NA
Tin	--	--	--	NA
Vanadium	NA	**Yes**	NA	NA
Zinc	NA	**Yes**	NA	NA

Notes:
Inorganic constituents consistent with background ("Yes") are indicated in boldface text and shaded.
NA - Indicates statistical analysis not run due to low frequency of detection (i.e., <50%)
-- = Not a COI in that area; no background statistics completed.
Only results for COI in each AOC/SWMU are shown.

Table 4-12
Preliminary Ecological Constituents of Interest (COI)
BASF North Works Facility
Wyandotte, Michigan
Screening Ecological Risk Assessment

Parameter	CAS No.	Surface Soil COIs by Area				Groundwater COIs
		AOC 6	AOC 7A	SWMU G	SWMU H	
Inorganics						
Antimony	7440-36-0	X		X	X	
Arsenic	7440-38-2	X		X	X	X
Barium	7440-39-3					X
Cadmium	7440-43-9	X		X	X	
Chromium	7440-47-3		X	X	X	X
Cobalt	7440-48-4					
Copper	7440-50-8	X	X	X	X	X
Lead	7439-92-1	X		X	X	X
Mercury	7439-97-6	X	X	X	X	X
Nickel	7440-02-0	X		X	X	X
Selenium	7782-49-2	X	X	X		X
Silver	7440-22-4		X			
Thallium	7440-28-0				X	X
Tin	7440-31-5				X	
Total Cyanide	57-12-5		X			X
Vanadium	7440-62-2	X		X	X	X
Zinc	7440-66-6	X		X	X	X
Semivolatile Organic Compounds						
Anthracene	120-12-7					X
Benzo(a)anthracene	56-55-3	X				X
Benzo(a)pyrene	50-32-8	X		X		X
Chrysene	218-01-9	X				X
Fluoranthene	206-44-0					X
Naphthalene	91-20-3	X		X	X	X
Pyrene	129-00-0					X
2,4-Dimethylphenol	105-67-9			X		
Bis(2-Chloroethyl) ether	111-44-4					X
Bis(2-Ethylhexyl) phthalate	117-81-7					
3-Methylphenol	108-39-4					X
4-Methylphenol	106-44-5					X
Pentachlorophenol	87-86-5			X		
Volatile Organic Compounds						
Benzene	71-43-2					X
Chlorobenzene	108-90-7					X
Pesticides						
4,4-DDT	50-29-3			X	X	
Beta-BHC	319-85-7				X	
Dieldrin	60-57-1				X	
Endrin aldehyde	7421-93-4				X	
Endrin ketone	53494-70-5				X	
Methoxychlor	72-43-5					

Table 4-12
Preliminary Ecological Constituents of Interest (COI)
BASF North Works Facility
Wyandotte, Michigan
Screening Ecological Risk Assessment

Parameter	CAS No.	Surface Soil COIs by Area				Groundwater COIs
		AOC 6	AOC 7A	SWMU G	SWMU H	
Polychlorinated Biphenyls						
Aroclor 1254	11097-69-1				X	
Aroclor 1260	11096-82-5			X	X	
Total PCBs	Total PCBs			X	X	

"X" indicates maximum detected concentration exceeded ecological screening value.

Table 4-13
Results of Food Chain Modeling Using Maximum Exposure Point Concentrations: AOC 6
BASF North Works Facility
Wyandotte, Michigan
Screening Ecological Risk Assessment

COI	HQs for Food Web using NOAELs				HQs for Food Web using LOAELs			
	American Robin	Raccoon	Short-Tailed Shrew	Eastern Cottontail	American Robin	Raccoon	Short-Tailed Shrew	Eastern Cottontail
Inorganics								
Antimony	9.2E-01	5.5E-02	1.5E-01	8.3E-03	9.2E-02	5.5E-03	1.5E-02	8.3E-04
Arsenic	1.5E-01	1.6E-01	3.9E-01	4.1E-02	1.9E-02	1.0E-01	2.4E-01	2.6E-02
Cadmium	2.8E-01	3.2E-01	**1.2E+00**	2.3E-02	6.5E-02	3.2E-02	1.2E-01	2.3E-03
Copper	3.3E-01	1.3E-01	3.8E-01	3.8E-02	1.1E-01	7.8E-02	2.3E-01	2.3E-02
Lead	**1.9E+00**	3.8E-01	**1.2E+00**	4.0E-02	9.7E-01	2.0E-01	6.2E-01	2.1E-02
Mercury	**8.6E+00**	2.5E-03	6.9E-03	5.6E-04	8.6E-01	2.5E-04	6.9E-04	5.6E-05
Nickel	1.6E-01	3.9E-01	**1.4E+00**	2.2E-02	5.9E-02	2.0E-01	6.8E-01	1.1E-02
Selenium	1.3E-01	1.4E-01	4.1E-01	5.1E-02	6.4E-02	9.5E-02	2.8E-01	3.4E-02
Vanadium	3.8E-01	1.8E-02	3.6E-02	2.3E-03	1.9E-01	9.0E-03	1.8E-02	1.1E-03
Zinc	3.4E-01	1.7E-01	5.9E-01	3.1E-02	1.2E-01	4.4E-02	1.5E-01	7.9E-03
Semivolatile Organic Compounds								
Benzo(a)anthracene	2.3E-02	**2.1E+00**	**3.3E+00**	2.2E-02	2.3E-03	4.3E-01	6.8E-01	4.5E-03
Benzo(a)pyrene	1.5E-02	**1.6E+00**	**2.1E+00**	5.6E-02	1.5E-03	3.2E-01	4.2E-01	1.1E-02
Chrysene	3.5E-02	**3.2E+00**	**5.1E+00**	2.3E-02	3.5E-03	6.5E-01	1.0E+00	4.7E-03
Naphthalene	1.8E-02	4.6E-03	8.0E-03	5.3E-03	1.8E-03	9.1E-04	1.6E-03	1.1E-03
Benzaldehyde	NC	NC	NC	NC	NC	NC	NC	NC
Carbazole	2.5E-01	1.8E-02	5.9E-02	2.7E-04	2.5E-02	1.8E-03	5.9E-03	2.7E-05
Dibenzofuran	NC	2.8E-01	8.8E-01	2.5E-04	NC	2.8E-02	8.8E-02	2.5E-05

Only COI from maximum exposure point screening shown.
NC - Not calculated either because no TRV available.
HQ > 1 shown in boldface text.
HQ > 10 are shaded.

Table 4-14
Results of Food Chain Modeling Using Maximum Exposure Point Concentrations: AOC 7
BASF North Works Facility
Wyandotte, Michigan
Screening Ecological Risk Assessmen

COI	HQs for Food Web using NOAELs				HQs for Food Web using LOAELs			
	American Robin	Raccoon	Short-Tailed Shrew	Eastern Cottontail	American Robin	Raccoon	Short-Tailed Shrew	Eastern Cottontail
Inorganics								
Chromium	1.9E-01	1.2E-01	3.7E-01	1.6E-02	3.3E-02	3.0E-02	9.1E-02	4.0E-03
Copper	2.8E-01	1.1E-01	3.2E-01	3.6E-02	9.5E-02	6.7E-02	1.9E-01	2.1E-02
Mercury	**2.0E+01**	5.7E-03	1.6E-02	1.3E-03	**2.0E+00**	5.7E-04	1.6E-03	1.3E-04
Selenium	3.1E-01	3.2E-01	8.8E-01	1.5E-01	1.5E-01	2.1E-01	5.8E-01	1.0E-01
Silver	3.8E-01	9.2E-02	2.9E-01	1.2E-03	3.8E-02	9.2E-03	2.9E-02	1.2E-04
Total Cyanide	**6.6E+00**	2.6E-03	8.1E-03	1.2E-04	6.6E-01	2.6E-04	8.1E-04	1.2E-05
Vanadium	NC	NC	NC	NC	NC	NC	NC	NC

Only COI from maximum exposure point screening shown
NC - Not calculated either because no TRV available
HQ > 1 shown in boldface text
HQ > 10 are shaded.

Table 4-15
Results of Food Chain Modeling Using Maximum Exposure Point Concentrations: SWMU (
BASF North Works Facility
Wyandotte, Michigan
Screening Ecological Risk Assessmen

COI	HQs for Food Web using NOAELs				HQs for Food Web using LOAELs			
	American Robin	Raccoon	Short-Tailed Shrew	Eastern Cottontail	American Robin	Raccoon	Short-Tailed Shrew	Eastern Cottontail
Inorganics								
Antimony	**3.0E+00**	1.8E-01	4.8E-01	2.6E-02	3.0E-01	1.8E-02	4.8E-02	2.6E-03
Arsenic	4.0E-01	4.1E-01	9.5E-01	1.2E-01	5.1E-02	2.6E-01	5.9E-01	7.6E-02
Cadmium	4.2E-01	4.8E-01	**1.8E+00**	3.0E-02	9.6E-02	4.8E-02	1.8E-01	3.0E-03
Chromium	2.2E-01	1.4E-01	4.2E-01	1.9E-02	3.8E-02	3.4E-02	1.1E-01	4.6E-03
Copper	6.5E-01	2.6E-01	8.2E-01	5.5E-02	2.2E-01	1.6E-01	4.9E-01	3.3E-02
Lead	**2.3E+00**	4.6E-01	**1.4E+00**	4.7E-02	**1.2E+00**	2.4E-01	7.5E-01	2.5E-02
Mercury	**2.2E+01**	6.5E-03	1.8E-02	1.4E-03	**2.2E+00**	6.5E-04	1.8E-03	1.4E-04
Nickel	1.7E-01	4.0E-01	**1.4E+00**	2.2E-02	6.1E-02	2.0E-01	7.0E-01	1.1E-02
Selenium	9.5E-02	1.1E-01	3.2E-01	3.4E-02	4.7E-02	7.2E-02	2.1E-01	2.3E-02
Vanadium	6.0E-01	2.8E-02	5.7E-02	3.5E-03	3.0E-01	1.4E-02	2.8E-02	1.8E-03
Zinc	4.0E-01	2.0E-01	6.6E-01	3.8E-02	1.4E-01	5.0E-02	1.7E-01	9.7E-03
Semivolatile Organic Compounds								
Benzo(a)pyrene	5.2E-03	5.3E-01	7.0E-01	1.9E-02	5.2E-04	1.1E-01	1.4E-01	3.9E-03
Naphthalene	1.2E-02	2.9E-03	5.2E-03	3.5E-03	1.2E-03	5.9E-04	1.0E-03	6.9E-04
2,4-Dimethylpheno	NC	NC	NC	NC	NC	NC	NC	NC
Dibenzofuran	NC	1.6E-01	4.9E-01	1.4E-04	NC	1.6E-02	4.9E-02	1.4E-05
Pentachloropheno	**9.4E+02**	**9.5E+01**	**2.2E+02**	3.7E-03	**9.4E+01**	**9.5E+00**	**2.2E+01**	3.7E-04
Pesticides								
4,4-DDT	**1.6E+01**	**4.5E+01**	**5.9E+01**	7.0E-05	**1.6E+00**	**8.9E+00**	**1.2E+01**	1.4E-05
Polychlorinated Biphenyls								
Total PCBs	1.2E-01	6.0E-01	7.9E-01	5.4E-03	1.2E-02	1.2E-01	1.6E-01	1.1E-03

Only COI from maximum exposure point screening shown
NC - Not calculated either because no TRV available
HQ > 1 shown in boldface text
HQ > 10 are shaded.

Table 4-16
Results of Food Chain Modeling Using Maximum Exposure Point Concentrations: SWMU I
BASF North Works Facility
Wyandotte, Michigan
Screening Ecological Risk Assessmen

COI	HQs for Food Web using NOAELs				HQs for Food Web using LOAELs			
	American Robin	Raccoon	Short-Tailed Shrew	Eastern Cottontail	American Robin	Raccoon	Short-Tailed Shrew	Eastern Cottontail
Inorganics								
Antimony	**2.0E+01**	**1.2E+00**	**3.2E+00**	1.6E-01	**2.0E+00**	1.2E-01	3.2E-01	1.6E-02
Arsenic	1.0E-01	1.1E-01	2.7E-01	2.7E-02	1.3E-02	6.8E-02	1.7E-01	1.7E-02
Cadmium	4.7E-01	5.4E-01	**2.0E+00**	3.3E-02	1.1E-01	5.4E-02	2.0E-01	3.3E-03
Chromium	4.2E-01	2.6E-01	8.1E-01	3.6E-02	7.2E-02	6.6E-02	2.0E-01	8.9E-03
Copper	3.8E-01	1.5E-01	4.5E-01	4.2E-02	1.3E-01	9.1E-02	2.7E-01	2.5E-02
Lead	**1.9E+00**	3.8E-01	**1.2E+00**	4.0E-02	9.6E-01	2.0E-01	6.2E-01	2.1E-02
Mercury	**4.5E+00**	1.3E-03	3.6E-03	2.9E-04	4.5E-01	1.3E-04	3.6E-04	2.9E-05
Nickel	4.5E-01	**1.1E+00**	3.8E+00	5.0E-02	1.6E-01	5.3E-01	**1.9E+00**	2.5E-02
Thallium	6.0E-02	**1.8E+00**	**4.9E+00**	1.0E-01	6.0E-03	1.8E-01	4.9E-01	1.0E-02
Tin	2.5E-01	4.2E-02	1.1E-01	7.3E-03	9.9E-02	2.8E-02	7.5E-02	4.9E-03
Vanadium	5.7E-01	2.7E-02	5.4E-02	3.4E-03	2.8E-01	1.3E-02	2.7E-02	1.7E-03
Zinc	3.0E-01	1.5E-01	5.2E-01	2.5E-02	1.1E-01	3.8E-02	1.3E-01	6.4E-03
Semivolatile Organic Compounds								
Naphthalene	8.0E-03	2.0E-03	3.5E-03	2.3E-03	8.0E-04	4.0E-04	7.0E-04	4.7E-04
Carbazole	1.3E-02	9.1E-04	2.9E-03	1.4E-05	1.3E-03	9.1E-05	2.9E-04	1.4E-06
Dibenzofuran	NC	2.3E-02	7.1E-02	2.1E-05	NC	2.3E-03	7.1E-03	2.1E-06
Pesticides								
4,4-DDT	**1.2E+01**	**3.5E+01**	**4.5E+01**	5.4E-05	**1.2E+00**	**6.9E+00**	**9.1E+00**	1.1E-05
Beta-BHC	5.8E-02	1.5E-02	4.8E-02	3.4E-05	1.4E-02	7.4E-03	2.4E-02	1.7E-05
Dieldrin	1.0E-01	5.5E-01	**1.1E+00**	7.8E-03	1.9E-03	2.7E-01	5.7E-01	3.9E-03
Endrin aldehyde	8.6E-01	**2.5E+00**	**6.6E+00**	2.4E-04	8.6E-02	2.5E-01	6.6E-01	2.4E-05
Endrin ketone	**1.0E+00**	**2.9E+00**	**7.7E+00**	2.8E-04	1.0E-01	2.9E-01	7.7E-01	2.8E-05
Polychlorinated Biphenyls								
Total PCBs	1.9E-01	9.2E-01	**1.2E+00**	8.4E-03	1.9E-02	1.8E-01	2.5E-01	1.7E-03

Only COI from maximum exposure point screening shown
NC - Not calculated either because no TRV available
HQ > 1 shown in boldface text
HQ > 10 are shaded.

Table 4-17
Results of Food Chain Modeling Using Average Exposure Point Concentrations: AOC 7A
BASF North Works Facility
Wyandotte, Michigan
Screening Ecological Risk Assessment

COI	HQs for Food Web using NOAELs	HQs for Food Web using LOAELs
	American Robin	American Robin
Inorganics		
Mercury	**5.2E+00**	5.2E-01

Only COI from maximum exposure point screening shown.
NC - Not calculated either because maximum LOAEL HQ < 1.
HQ > 1 shown in boldface text.
HQ > 10 are shaded.

Table 4-18
Results of Food Chain Modeling Using Average Exposure Point Concentrations: SWMU G
BASF North Works Facility
Wyandotte, Michigan
Screening Ecological Risk Assessment

COI	HQs for Food Web using NOAELs			HQs for Food Web using LOAELs		
	American Robin	Raccoon	Short-Tailed Shrew	American Robin	Raccoon	Short-Tailed Shrew
Inorganics						
Lead	8.6E-01	NC	NC	4.3E-01	NC	NC
Mercury	**3.2E+00**	NC	NC	3.2E-01	NC	NC
Semivolatile Organic Compounds						
Pentachlorophenol	**6.4E+01**	**6.5E+00**	**1.5E+01**	**6.4E+00**	6.5E-01	**1.5E+00**
Pesticides						
4,4-DDT	**2.9E+00**	**8.1E+00**	**1.1E+01**	2.9E-01	**1.6E+00**	**2.1E+00**

Only COI from maximum exposure point screening shown.
NC - Not calculated either because maximum LOAEL HQ < 1.
HQ > 1 shown in boldface text.
HQ > 10 are shaded.

Table 4-19
Results of Food Chain Modeling Using Average Exposure Point Concentrations: SWMU H
BASF North Works Facility
Wyandotte, Michigan
Screening Ecological Risk Assessment

COI	HQs for Food Web using NOAELs			HQs for Food Web using LOAELs		
	American Robin	Raccoon	Short-Tailed Shrew	American Robin	Raccoon	Short-Tailed Shrew
Inorganics						
Antimony	**8.1E+00**	NC	NC	8.1E-01	NC	NC
Nickel	NC	NC	**1.6E+00**	NC	NC	8.2E-01
Pesticides						
4,4-DDT	**7.1E+00**	**2.0E+01**	**2.6E+01**	7.1E-01	**4.0E+00**	**5.2E+00**

Only COI from maximum exposure point screening shown.
NC - Not calculated either because maximum LOAEL HQ < 1.
HQ > 1 shown in boldface text.
HQ > 10 are shaded.

Table 4-20
Ecological Constituents of Interest (COI)
BASF North Works Facility
Wyandotte, Michigan
Screening Ecological Risk Assessment

Parameter	CAS No.	Surface Soil COIs by Area		
		AOC 7A	SWMU G	SWMU H
Inorganics				
Antimony	7440-36-0			X
Lead	7439-92-1		X	
Mercury	7439-97-6	X	X	
Nickel	7440-02-0			X
Semivolatile Organic Compounds				
2-Methylnaphthalene	91-57-6			
Chrysene	218-01-9			
Pentachlorophenol	87-86-5		X	
Pesticides				
4,4-DDT	50-29-3		X	X

Table 5-1
Tier 2 Evaluation of Groundwater Surface Water Interface (GSI) Pathway
Initial Soil Screening Matrix
BASF North Works Facility
Wyandotte, MI

Chemical	Units	FOD	Part 201 Risk Criteria Exceeded = GSI Protection	Maximum Detected Concentration (ug/kg)	Mean Calculated Concentration (ug/kg)	Does Max Concentration Exceed GSIPC?	Does Mean Soil Concentration Exceed GSIPC?	Chemical Consistent with Background?	Does Site-Wide Maximum Groundwater Concentration Exceed GSI?	Comment	Continue to Evaluate the Soil to GW Pathway?	Basis?
AOC 1												
BENZENE	ug/kg	1 : 48 : 52	2.40E+02	3.80E+02	4.17E+01	YES	NO	NA	YES	Low FOD thus eliminated from further consideration	No	1
ETHYLBENZENE	ug/kg	1 : 49 : 53	3.60E+02	3.00E+02	3.96E+01	NO	NO	NA	YES	Pathway Incomplete. Low FOD. This AOC/SWMU is not upgradient of GSI exceedance(s) for groundwater	No	1
TOLUENE	ug/kg	2 : 39 : 53	2.80E+03	3.40E+01	2.07E+01	NO	NO	NA	NO	Absence of COI in groundwater indicates potential pathway is incomplete	No	1, 4
TOTAL XYLENES	ug/kg	1 : 39 : 53	7.00E+02	3.50E+01	2.04E+01	NO	NO	NA	YES	Pathway Incomplete. This AOC/SWMU is not upgradient of GSI exceedance(s) for groundwater	No	1, 5
AOC 2												
ACETONE	ug/kg	2 : 8 : 8	3.40E+04	1.00E+02	3.91E+01	NO	NO	NA	YES	Pathway Incomplete. This AOC/SWMU is not upgradient of GSI exceedance(s) for groundwater	No	2, 5
ARSENIC	ug/kg	10 : 10 : 10	2.30E+04	4.11E+04	1.81E+04	YES	NO	YES	YES	COI for groundwater at RFI-MW-4, CMS-MW-16	No	2, 3
BARIUM	ug/kg	8 : 8 : 8	2.90E+05	7.89E+04	4.37E+04	NO	NO	YES	YES	COI for groundwater at RFI-MW-5	No	2, 3
BENZENE	ug/kg	1 : 8 : 8	2.40E+02	2.70E+01	6.00E+00	NO	NO	NA	YES	COI for groundwater at CMS-MW-16	No	2
CADMIUM	ug/kg	8 : 8 : 8	2.70E+03	3.50E+03	7.44E+02	YES	NO	YES	YES	Pathway Incomplete. This AOC/SWMU is not upgradient of GSI exceedance(s) for groundwater	No	2, 3, 5
CHROMIUM	ug/kg	8 : 8 : 8	3.30E+03	1.01E+05	3.36E+04	YES	YES	NO	YES	COI for groundwater at CMS-MW-16, RFI-MW-15, RFI-MW-16, RFI-MW-4, RFI-MW-5, RFI-MW-6, WHI6-2S	Yes	Not Eliminated
COPPER	ug/kg	8 : 8 : 8	5.20E+04	2.44E+04	1.51E+04	NO	NO	YES	YES	COI for groundwater at RFI-MW-15, RFI-MW-4, RFI-MW-5, RFI-MW-6, WHI6-2S	No	2, 3
DIBENZOFURAN	ug/kg	4 : 8 : 8	1.70E+03	7.80E+02	2.66E+02	NO	NO	NA	YES	COI for groundwater at WHI6-2S	No	2
ETHYLBENZENE	ug/kg	1 : 8 : 8	3.60E+02	4.90E+00	3.30E+00	NO	NO	NA	YES	Pathway Incomplete. This AOC/SWMU is not upgradient of GSI exceedance(s) for groundwater	No	2, 5
FLUORANTHENE	ug/kg	6 : 8 : 8	5.50E+03	2.70E+03	6.69E+02	NO	NO	NA	YES	COI for groundwater at WHI6-2S	No	2
LEAD	ug/kg	8 : 8 : 8	1.80E+06	9.01E+04	2.22E+04	NO	NO	YES	YES	COI for groundwater at WHI6-2S	No	2, 3
MERCURY	ug/kg	5 : 8 : 8	1.00E+02	1.71E+04	2.40E+03	YES	YES	NO	YES	COI for groundwater at WHI6-2S/2F, RFI-MW-4, RFI-MW-5, RFI-MW-6, RFI-MW-15, CMS-MW-16	Yes	Not Eliminated
METHYLENE CHLORIDE	ug/kg	1 : 8 : 8	9.40E+02	2.70E+01	6.00E+00	NO	NO	NA	YES	Pathway Incomplete. This AOC/SWMU is not upgradient of GSI exceedance(s) for groundwater	No	2, 5
NAPHTHALENE	ug/kg	4 : 8 : 8	8.70E+02	2.50E+03	6.69E+02	YES	NO	NA	YES	Pathway Incomplete. This AOC/SWMU is not upgradient of GSI exceedance(s) for groundwater	No	2, 5
NICKEL	ug/kg	8 : 8 : 8	5.40E+04	1.33E+04	9.82E+03	NO	NO	YES	YES	COI for groundwater at WHI6-2S, RFI-MW15	No	2, 3
PHENANTHRENE	ug/kg	6 : 8 : 8	5.30E+03	1.20E+03	5.10E+02	NO	NO	NA	YES	COI for groundwater at WHI6-2S	No	2
SELENIUM	ug/kg	1 : 8 : 8	4.00E+02	7.60E+02	3.81E+02	YES	NO	NO	YES	COI for groundwater at RFI-MW-5, RFI-MW-6, CMS-MW-16	No	2
TOLUENE	ug/kg	2 : 8 : 8	2.80E+03	4.30E+01	9.10E+00	NO	NO	NA	NO	Absence of COI in groundwater indicates potential pathway is incomplete	No	2, 4
TOTAL CYANIDE	ug/kg	6 : 8 : 8	2.00E+02	4.60E+04	1.04E+04	YES	YES	NO	YES	COI for groundwater at RFI-MW-15, RFI-MW-16, RFI-MW-4, RFI-MW-5, RFI-MW-6, CMS-MW-16, WHI6-2F	Yes	Not Eliminated
Total XYLENES	ug/kg	1 : 8 : 8	7.00E+02	6.10E+00	3.40E+00	NO	NO	NA	YES	Pathway Incomplete. This AOC/SWMU is not upgradient of GSI exceedance(s) for groundwater	No	2, 5
VANADIUM	ug/kg	7 : 8 : 8	1.90E+05	5.34E+04	1.74E+04	NO	NO	YES	YES	COI for groundwater at RFI-MW-15, RFI-MW-16, CMS-MW-16, WHI6-2S	No	2, 3
ZINC	ug/kg	8 : 8 : 8	1.20E+05	9.66E+05	1.80E+05	YES	YES	NO	YES	Pathway Incomplete. This AOC/SWMU is not upgradient of GSI exceedance(s) for groundwater	No	5
AOC 4												
ARSENIC	ug/kg	2 : 2 : 2	2.30E+04	2.05E+04	1.75E+04	NO	NO	NA	YES	COI for groundwater at RFI-MW-4, WHI6-4F	No	2
BARIUM	ug/kg	2 : 2 : 2	2.90E+05	3.35E+04	2.30E+04	NO	NO	NA	YES	COI for groundwater at WHI6-4F,WHI6-4S, RFI-MW-3	No	2
BENZENE	ug/kg	2 : 2 : 2	2.40E+02	6.80E+05	4.65E+05	YES	YES	NA	YES	COI for groundwater at WHI6-3F	Yes	Not Eliminated
CADMIUM	ug/kg	2 : 2 : 2	2.70E+03	1.40E+03	1.40E+03	NO	NO	NA	YES	Pathway Incomplete. This AOC/SWMU is not upgradient of GSI exceedance(s) for groundwater	No	2, 5
CHROMIUM	ug/kg	2 : 2 : 2	3.30E+03	1.20E+03	9.65E+02	NO	NO	NA	YES	COI for groundwater at WHI6-2S, RFI-MW4, RFI-MW3	No	2
COPPER	ug/kg	2 : 2 : 2	5.20E+04	3.70E+03	3.55E+03	NO	NO	NA	YES	COI for groundwater at WHI6-2S, P26N, RFI-MW-3, RFI-MW-4	No	2
DIBENZOFURAN	ug/kg	2 : 2 : 2	1.70E+03	5.90E+06	3.32E+06	YES	YES	NA	YES	COI for groundwater at WHI6-2S	Yes	Not Eliminated
FLUORANTHENE	ug/kg	2 : 2 : 2	5.50E+03	1.40E+07	7.80E+06	YES	YES	NA	YES	COI for groundwater at WHI6-2S	Yes	Not Eliminated
FLUORENE	ug/kg	2 : 2 : 2	5.30E+03	9.50E+06	5.35E+06	YES	YES	NA	NO	Absence of COI in groundwater indicates potential pathway is incomplete	No	4
LEAD	ug/kg	2 : 2 : 2	1.80E+06	8.28E+04	6.59E+04	NO	NO	NA	YES	COI for groundwater at WHI6-2S, RFI-MW-3	No	2
MERCURY	ug/kg	2 : 2 : 2	1.00E+02	6.20E+02	3.75E+02	YES	YES	NA	YES	COI for groundwater at WHI6-2S, WHI6-2F, WHI6-4S, RFI-MW4, P26N	Yes	Not Eliminated
NAPHTHALENE	ug/kg	2 : 2 : 2	8.70E+02	4.80E+07	2.70E+07	YES	YES	NA	YES	Pathway Incomplete. This AOC/SWMU is not upgradient of GSI exceedance(s) for groundwater	No	5
PHENANTHRENE	ug/kg	2 : 2 : 2	5.30E+03	2.30E+07	1.29E+07	YES	YES	NA	YES	COI for groundwater at WHI6-2S	Yes	Not Eliminated
PHENOL	ug/kg	1 : 2 : 2	4.20E+03	2.30E+06	1.43E+06	YES	YES	NA	YES	Pathway Incomplete. This AOC/SWMU is not upgradient of GSI exceedance(s) for groundwater	No	5
SELENIUM	ug/kg	2 : 2 : 2	4.00E+02	3.60E+03	3.10E+03	YES	YES	NA	YES	Pathway Incomplete. This AOC/SWMU is not upgradient of GSI exceedance(s) for groundwater	No	5
STYRENE	ug/kg	2 : 2 : 2	2.20E+03	2.40E+05	1.68E+05	YES	YES	NA	NO	Absence of COI in groundwater indicates potential pathway is incomplete	No	4
THALLIUM	ug/kg	2 : 2 : 2	1.40E+03	1.40E+04	1.06E+04	YES	YES	NA	YES	COI for groundwater at WHI6-2S, WHI6-2F,WHI6-4S, WHI6-4F	Yes	Not Eliminated
TOLUENE	ug/kg	2 : 2 : 2	2.80E+03	5.90E+05	3.90E+05	YES	YES	NA	NO	Absence of COI in groundwater indicates potential pathway is incomplete	No	4
TOTAL CYANIDE	ug/kg	2 : 2 : 2	2.00E+02	1.90E+04	1.50E+04	YES	YES	NA	YES	COI for groundwater at CMS-MW4, P26N, RFI-MW-3, RFI-MW-4, WHI6-2F,WHI6-3S, WHI6-3F, WHI6-4F	Yes	Not Eliminated
Total METHYLPHENOL	ug/kg	2 : 2 : 2	1.40E+03	9.90E+06	5.46E+06	YES	YES	NA	NO	Absence of COI in groundwater indicates potential pathway is incomplete	No	4
Total XYLENES	ug/kg	1 : 2 : 2	7.00E+02	2.40E+05	1.63E+05	YES	YES	NA	YES	Pathway Incomplete. This AOC/SWMU is not upgradient of GSI exceedance(s) for groundwater	No	5
ZINC	ug/kg	2 : 2 : 2	1.20E+05	1.14E+05	1.08E+05	NO	NO	NA	YES	COI for groundwater at WHI6-2S	No	2, 5
AOC 7A												
ARSENIC	ug/kg	14 : 14 : 14	2.30E+04	6.24E+04	1.77E+04	YES	NO	YES	YES	COI for groundwater at CMS-MW2	No	2, 3
BARIUM	ug/kg	14 : 14 : 14	2.90E+05	1.48E+05	6.59E+04	NO	NO	YES	YES	COI for groundwater at CMS-MW2	No	2, 3
BERYLLIUM	ug/kg	2:14:14	3.00E+04	9.30E+02	3.91E+02	NO	NO	NO	NO	Absence of COI in groundwater indicates potential pathway is incomplete	No	2, 4
CADMIUM	ug/kg	12 : 14 : 14	2.70E+03	7.50E+02	3.37E+02	NO	NO	YES	YES	Pathway Incomplete. This AOC/SWMU is not upgradient of GSI exceedance(s) for groundwater	No	2, 3, 5
CHROMIUM	ug/kg	14 : 14 : 14	3.30E+03	2.91E+04	1.61E+04	YES	YES	NO	YES	COI for groundwater at RFI-MW22, RFI-MW23	Yes	Not Eliminated
COBALT	ug/kg	2 : 14 : 14	2.00E+03	9.70E+03	3.77E+03	YES	YES	NO	NO	Absence of COI in groundwater indicates potential pathway is incomplete	No	4
COPPER	ug/kg	14 : 14 : 14	5.20E+04	3.70E+04	2.13E+04	NO	NO	NO	YES	COI for groundwater at RFI-MW22, RFI-MW23	No	2
LEAD	ug/kg	14 : 14 : 14	1.80E+06	3.35E+05	7.15E+04	NO	NO	NO	YES	COI for groundwater at RFI-MW22	No	2
MERCURY	ug/kg	11 : 14 : 14	1.00E+02	4.80E+03	1.27E+03	YES	YES	NO	YES	COI for groundwater at RFI-MW22, CMS-MW2	Yes	Not Eliminated
NICKEL	ug/kg	13 : 14 : 14	5.40E+04	3.18E+04	1.44E+04	NO	NO	NO	YES	COI for groundwater at RFI-MW22, CMS-MW2	No	2
SELENIUM	ug/kg	4 : 14 : 14	4.00E+02	1.70E+03	5.83E+02	YES	YES	NO	YES	COI for groundwater at RFI-MW22, CMS-MW2	Yes	Not Eliminated
SILVER	ug/kg	1:14:14	5.00E+02	1.00E+04	1.31E+03	YES	YES	NO	YES	Pathway Incomplete. This AOC/SWMU is not upgradient of GSI exceedance(s) for groundwater	No	5
TOTAL CYANIDE	ug/kg	15 : 19 : 19	2.00E+02	5.70E+03	1.66E+03	YES	YES	NO	YES	COI for groundwater at RFI-MW22, RFI-MW-23, CMS-MW2	Yes	Not Eliminated
VANADIUM	ug/kg	14 : 14 : 14	1.90E+05	4.13E+04	2.25E+04	NO	NO	YES	YES	COI for groundwater at RFI-MW22	No	2, 3
ZINC	ug/kg	14 : 14 : 14	1.20E+05	1.90E+05	6.66E+04	YES	NO	YES	YES	Pathway Incomplete. This AOC/SWMU is not upgradient of GSI exceedance(s) for groundwater	No	2, 3, 5
RFIMW 07												
1,1,1-TRICHLOROETHANE	ug/kg	2 : 6 : 6	4.00E+03	3.70E+01	1.42E+01	NO	NO	NA	NO	Absence of COI in groundwater indicates potential pathway is incomplete	No	2, 4
1,1-DICHLOROETHANE	ug/kg	1 : 5 : 6	1.50E+04	1.20E+01	6.20E+00	NO	NO	NA	NO	Absence of COI in groundwater indicates potential pathway is incomplete	No	2, 4
2,4-DIMETHYLPHENOL	ug/kg	1 : 1 : 6	7.60E+03	1.70E+02	1.70E+02	NO	NO	NA	NO	Absence of COI in groundwater indicates potential pathway is incomplete	No	2, 4
ACENAPHTHENE	ug/kg	1 : 4 : 6	4.40E+03	3.70E+02	3.06E+02	NO	NO	NA	NO	Absence of COI in groundwater indicates potential pathway is incomplete	No	2, 4
ACETONE	ug/kg	5 : 6 : 6	3.40E+04	1.60E+02	7.91E+01	NO	NO	NA	YES	Pathway Incomplete. This AOC/SWMU is not upgradient of GSI exceedance(s) for groundwater	No	2, 5
DIBENZOFURAN	ug/kg	1 : 6 : 6	1.70E+03	4.90E+02	4.80E+02	NO	NO	NA	YES	Pathway Incomplete. This AOC/SWMU is not upgradient of GSI exceedance(s) for groundwater	No	2, 5
ETHYLBENZENE	ug/kg	2 : 6 : 6	3.60E+02	2.60E+01	1.10E+01	NO	NO	NA	YES	COI for groundwater at RFI-MW-7	Yes	Not Eliminated
FLUORANTHENE	ug/kg	1 : 6 : 6	5.50E+03	2.40E+03	7.98E+02	NO	NO	NA	YES	Pathway Incomplete. This AOC/SWMU is not upgradient of GSI exceedance(s) for groundwater	No	2, 5
FLUORENE	ug/kg	1 : 3 : 6	5.30E+03	2.83E+02	3.14E+02	NO	NO	NA	NO	Absence of COI in groundwater indicates potential pathway is incomplete	No	2, 4
METHYL ETHYL KETONE	ug/kg	2 : 3 : 6	4.40E+04	3.40E+01	3.03E+01	NO	NO	NA	NO	Absence of COI in groundwater indicates potential pathway is incomplete	No	2, 4
METHYLENE CHLORIDE	ug/kg	1 : 3 : 6	9.40E+02	4.25E+00	4.78E+00	NO	NO	NA	YES	Pathway Incomplete. This AOC/SWMU is not upgradient of GSI exceedance(s) for groundwater	No	2, 5
NAPHTHALENE	ug/kg	2 : 6 : 6	8.70E+02	9.65E+02	5.93E+02	YES	NO	NA	YES	COI for groundwater at RFI-MW-7	No	2
PHENANTHRENE	ug/kg	2 : 6 : 6	5.30E+03	2.42E+03	9.22E+02	NO	NO	NA	YES	COI for groundwater at RFI-MW-7	No	2
PHENOL	ug/kg	2 : 6 : 6	4.20E+03	1.10E+04	2.23E+03	YES	NO	NA	YES	COI for groundwater at RFI-MW-7	No	2
TOLUENE	ug/kg	1 : 5 : 6	2.80E+03	7.80E+00	6.38E+00	NO	NO	NA	NO	Absence of COI in groundwater indicates potential pathway is incomplete	No	2, 4
Total METHYLPHENOL	ug/kg	2 : 6 : 6	1.40E+03	4.30E+03	2.06E+03	YES	YES	NA	NO	Absence of COI in groundwater indicates potential pathway is incomplete	No	4
Total XYLENES	ug/kg	3 : 6 : 6	7.00E+02	9.80E+01	3.11E+01	NO	NO	NA	YES	Absence of COI in groundwater indicates potential pathway is incomplete	No	2

Table 5-1
Tier 2 Evaluation of Groundwater Surface Water Interface (GSI) Pathway
Initial Soil Screening Matrix
BASF North Works Facility
Wyandotte, MI

Chemical	Units	FOD	Part 201 Risk Criteria Exceeded = GSI Protection	Maximum Detected Concentration (ug/kg)	Mean Calculated Concentration (ug/kg)	Does Max Concentration Exceed GSIPC?	Does Mean Soil Concentration Exceed GSIPC?	Chemical Consistent with Background?	Does Site-Wide Maximum Groundwater Concentration Exceed GSI?	Comment	Continue to Evaluate the Soil to GW Pathway?	Basis?
RFIMW 08												
ACETONE	ug/kg	10 : 10 : 10	3.40E+04	5.20E+01	3.65E+01	NO	NO	NA	YES	Pathway Incomplete. This AOC/SWMU is not upgradient of GSI exceedance(s) for groundwater	No	2, 5
FLUORANTHENE	ug/kg	3:10:10	5.50E+03	1.70E+03	4.22E+02	NO	NO	NA	YES	COI for groundwater at RFI-MW-8I, RFI-MW-8F	No	2
FLUORENE	ug/kg	1 : 1 : 10	5.30E+03	1.50E+02	1.50E+02	NO	NO	NA	NO	Absence of COI in groundwater indicates potential pathway is incomplete	No	2, 4
METHYL ETHYL KETONE	ug/kg	5 : 5 : 10	4.40E+04	1.60E+01	1.27E+01	NO	NO	NA	NO	Absence of COI in groundwater indicates potential pathway is incomplete	No	2, 4
PHENANTHRENE	ug/kg	3 :10:10	5.30E+03	1.30E+03	4.20E+02	NO	NO	NA	YES	COI for groundwater at RFI-MW-8I, RFI-MW-8F	No	2
TOLUENE	ug/kg	1 : 2 : 10	2.80E+03	2.90E+00	2.85E+00	NO	NO	NA	NO	Absence of COI in groundwater indicates potential pathway is incomplete	No	2, 4
SWMU F												
1,2-DICHLOROPROPANE	ug/kg	9 : 10 : 10	1.80E+02	7.00E+04	4.84E+03	YES	YES	NA	YES	COI for groundwater at RFI-MW6, RFI-MW7F	Yes	Not Eliminated
2,4-DIMETHYLPHENOL	ug/kg	1 : 10 : 10	7.60E+03	2.20E+04	5.14E+03	YES	NO	NA	NO	Absence of COI in groundwater indicates potential pathway is incomplete	No	2, 4
2-BUTANONE	ug/kg	1 : 1 : 10	4.40E+04	1.70E+01	1.70E+01	NO	NO	NA	NO	Absence of COI in groundwater indicates potential pathway is incomplete	No	2, 4
ACENAPHTHENE	ug/kg	1 : 5 : 10	4.40E+03	4.40E+02	2.94E+02	NO	NO	NA	NO	Absence of COI in groundwater indicates potential pathway is incomplete	No	2, 4
ACETONE	ug/kg	9 : 10 : 10	3.40E+04	1.90E+05	4.53E+04	YES	YES	NA	YES	Pathway Incomplete. This AOC/SWMU is not upgradient of GSI exceedance(s) for groundwater	No	5
ANTIMONY	ug/kg	3:10:10	1.40E+03	1.60E+04	2.08E+03	YES	YES	NO	YES	Pathway Incomplete. This AOC/SWMU is not upgradient of GSI exceedance(s) for groundwater	No	5
ARSENIC	ug/kg	10 : 10 : 10	2.30E+04	6.39E+04	2.32E+04	YES	YES	NO	YES	Pathway Incomplete. This AOC/SWMU is not upgradient of GSI exceedance(s) for groundwater	No	5
BARIUM	ug/kg	10 : 10 : 10	2.90E+05	4.91E+05	1.08E+05	YES	NO	NO	YES	COI for groundwater at RFI-MW7I, RFI-MW7F	No	2
BENZENE	ug/kg	1 : 9 : 10	2.40E+02	2.00E+03	7.86E+02	YES	YES	NA	YES	Pathway Incomplete. This AOC/SWMU is not upgradient of GSI exceedance(s) for groundwater	No	5
BIS(2-CHLOROISOPROPYL)ETHER	ug/kg	6 : 10 : 10	3.00E+02	2.80E+04	5.78E+03	YES	YES	NA	YES	Pathway Incomplete. This AOC/SWMU is not upgradient of GSI exceedance(s) for groundwater	No	5
BUTYL BENZYL PHTHALATE	ug/kg	1 : 6 : 10	1.30E+04	1.00E+03	4.80E+02	NO	NO	NA	NO	Absence of COI in groundwater indicates potential pathway is incomplete	No	2, 4
CADMIUM	ug/kg	10 : 10 : 10	2.70E+03	7.30E+03	1.20E+03	YES	NO	NO	YES	Pathway Incomplete. This AOC/SWMU is not upgradient of GSI exceedance(s) for groundwater	No	2, 5
CHROMIUM	ug/kg	10 : 10 : 10	3.30E+03	1.30E+05	2.38E+04	YES	YES	YES	YES	COI for groundwater at RFI-MW7F, RFI-MW7	No	3
COBALT	ug/kg	1 : 10 : 10	2.00E+03	4.05E+04	8.12E+03	YES	YES	NO	NO	Absence of COI in groundwater indicates potential pathway is incomplete	No	4
COPPER	ug/kg	10 : 10 : 10	5.20E+04	7.71E+06	7.93E+05	YES	YES	NO	YES	COI for groundwater at RFI-MW7F, RFI-MW7	Yes	Not Eliminated
DIBENZOFURAN	ug/kg	2 : 5 : 10	1.70E+03	3.70E+02	2.58E+02	NO	NO	NA	YES	Pathway Incomplete. This AOC/SWMU is not upgradient of GSI exceedance(s) for groundwater	No	2, 5
DI-N-OCTYL PHTHALATE	ug/kg	1:10:10	1.10E+04	1.50E+04	3.79E+03	YES	NO	NA	NO	Absence of COI in groundwater indicates potential pathway is incomplete	No	2, 4
FLUORANTHENE	ug/kg	5 : 7 : 10	5.50E+03	4.50E+03	1.42E+03	NO	NO	NA	YES	Pathway Incomplete. This AOC/SWMU is not upgradient of GSI exceedance(s) for groundwater	No	2, 5
FLUORENE	ug/kg	2 : 5 : 10	5.30E+03	7.80E+02	3.50E+02	NO	NO	NA	NO	Absence of COI in groundwater indicates potential pathway is incomplete	No	2, 4
LEAD	ug/kg	10 : 10 : 10	1.80E+06	8.76E+05	1.09E+05	NO	NO	YES	YES	Pathway Incomplete. This AOC/SWMU is not upgradient of GSI exceedance(s) for groundwater	No	2, 3, 5
MERCURY	ug/kg	6 : 10 : 10	1.00E+02	2.11E+04	2.90E+03	YES	YES	NO	YES	COI for groundwater at RFI-MW6, RFI-MW7, RFI-MW-7F, RFI-MW-7I	Yes	Not Eliminated
METHYL ETHYL KETONE	ug/kg	1 : 1 : 10	4.40E+04	1.70E+01	1.70E+01	NO	NO	NA	NO	Absence of COI in groundwater indicates potential pathway is incomplete	No	2, 4
NAPHTHALENE	ug/kg	4 : 6 : 10	8.70E+02	4.50E+02	2.57E+02	NO	NO	NA	YES	COI for groundwater at RFI-MW7	No	2
NICKEL	ug/kg	9 : 10 : 10	5.40E+04	1.70E+05	2.82E+04	YES	NO	NO	YES	Pathway Incomplete. This AOC/SWMU is not upgradient of GSI exceedance(s) for groundwater	No	2, 5
PENTACHLOROPHENOL	ug/kg	2 : 10 : 20	1.70E+04	6.40E+01	1.16E+01	NO	NO	NA	YES	Pathway Incomplete. This AOC/SWMU is not upgradient of GSI exceedance(s) for groundwater	No	2, 5
PHENANTHRENE	ug/kg	4 : 7 : 10	5.30E+03	6.00E+03	1.59E+03	YES	NO	NA	YES	COI for groundwater at RFI-MW-7	No	2
PHENOL	ug/kg	2 : 7 : 10	4.20E+03	6.40E+03	1.71E+03	YES	NO	NA	YES	COI for groundwater at RFI-MW-7	No	2
SELENIUM	ug/kg	5:10:10	4.00E+02	6.30E+03	1.62E+03	YES	YES	NO	YES	COI for groundwater at RFI-MW6, RFI-MW-7F	Yes	Not Eliminated
SILVER	ug/kg	1:10:10	5.00E+02	1.05E+04	1.86E+03	YES	YES	NO	NO	Absence of COI in groundwater indicates potential pathway is incomplete	No	4, 5
TOLUENE	ug/kg	7:10:10	2.80E+03	1.10E+05	2.42E+04	YES	YES	NA	NO	Absence of COI in groundwater indicates potential pathway is incomplete	No	4
TOTAL CYANIDE	ug/kg	8 : 10 : 10	2.00E+02	5.10E+03	2.20E+03	YES	YES	NO	YES	COI for groundwater at RFI-MW6, RFI-MW-7, RFI-MW-7I	Yes	Not Eliminated
Total METHYLPHENOL	ug/kg	4 : 10 : 10	1.40E+03	4.41E+04	1.33E+04	YES	YES	NA	NO	Absence of COI in groundwater indicates potential pathway is incomplete	No	4
Total XYLENES	ug/kg	1 : 2 : 10	7.00E+02	1.22E+01	1.16E+01	NO	NO	NA	YES	Pathway Incomplete. This AOC/SWMU is not upgradient of GSI exceedance(s) for groundwater	No	2, 5
VANADIUM	ug/kg	9 : 10 : 10	1.90E+05	2.33E+04	1.60E+04	NO	NO	YES	YES	Pathway Incomplete. This AOC/SWMU is not upgradient of GSI exceedance(s) for groundwater	No	2, 3, 5
ZINC	ug/kg	9 : 10 : 10	1.20E+05	1.00E+06	1.63E+05	YES	YES	YES	YES	Pathway Incomplete. This AOC/SWMU is not upgradient of GSI exceedance(s) for groundwater	No	3, 5
SWMU G												
2,4-DIMETHYLPHENOL	ug/kg	1 : 1 : 10	7.60E+03	5.70E+01	5.70E+01	NO	NO	NA	NO	Absence of COI in groundwater indicates potential pathway is incomplete	No	2, 4
ACENAPHTHENE	ug/kg	2 : 2 : 10	4.40E+03	4.30E+01	4.05E+01	NO	NO	NA	NO	Absence of COI in groundwater indicates potential pathway is incomplete	No	2, 4
ANTIMONY	ug/kg	1:10:10	1.40E+03	2.60E+03	6.17E+02	YES	NO	NO	YES	COI for groundwater at PM4NA, PM1NA, WHI9-2F	No	2
ARSENIC	ug/kg	10 : 10 : 10	2.30E+04	1.01E+05	2.67E+04	YES	YES	NO	YES	COI for groundwater at PM4NA, PM1NA	Yes	Not Eliminated
BARIUM	ug/kg	10 : 10 : 10	2.90E+05	1.66E+05	8.97E+04	NO	NO	NO	YES	COI for groundwater at WHI9-2S	No	2
BERYLLIUM	ug/kg	1:10:10	3.00E+04	2.00E+03	4.68E+02	NO	NO	NO	NO	Absence of COI in groundwater indicates potential pathway is incomplete	No	2, 4
CADMIUM	ug/kg	10 : 10 : 10	2.70E+03	2.30E+03	7.90E+02	NO	NO	NO	YES	COI for groundwater at PM1NA, WHI9-2F	No	2
CHROMIUM	ug/kg	10 : 10 : 10	3.30E+03	3.36E+04	1.55E+04	YES	YES	YES	YES	COI for groundwater at PM4NA, PM1NA, WHI9-2F	No	3
COBALT	ug/kg	1 : 10 : 10	2.00E+03	1.01E+04	3.68E+03	YES	YES	NO	NO	Absence of COI in groundwater indicates potential pathway is incomplete	No	4
COPPER	ug/kg	10 : 10 : 10	5.20E+04	9.53E+04	3.39E+04	YES	NO	NO	YES	COI for groundwater at PM1NA, WHI9-2F	No	2
DIBENZOFURAN	ug/kg	8 : 9 : 10	1.70E+03	4.30E+02	1.93E+02	NO	NO	NA	YES	Pathway Incomplete. This AOC/SWMU is not upgradient of GSI exceedance(s) for groundwater	No	2, 5
DIETHYL PHTHALATE	ug/kg	1 : 1 : 10	2.20E+03	1.00E+02	1.00E+02	NO	NO	NA	NO	Absence of COI in groundwater indicates potential pathway is incomplete	No	2, 4
FLUORANTHENE	ug/kg	9 : 10 : 10	5.50E+03	3.80E+03	1.14E+03	NO	NO	NA	YES	Pathway Incomplete. This AOC/SWMU is not upgradient of GSI exceedance(s) for groundwater	No	2, 5
FLUORENE	ug/kg	3 : 9 : 10	5.30E+03	2.50E+02	1.77E+02	NO	NO	NA	NO	Absence of COI in groundwater indicates potential pathway is incomplete	No	2, 4
LEAD	ug/kg	10 : 10 : 10	1.80E+06	2.38E+05	7.33E+04	NO	NO	NO	YES	COI for groundwater at PM1NA, WHI9-2F	No	2
MERCURY	ug/kg	8 : 10 : 10	1.00E+02	5.40E+03	7.69E+02	YES	YES	NO	YES	COI for groundwater at PM1NA, PM4NA, WHI9-2F/2S	Yes	Not Eliminated
NAPHTHALENE	ug/kg	8 : 9 : 10	8.70E+02	8.10E+02	3.52E+02	NO	NO	NA	YES	Pathway Incomplete. This AOC/SWMU is not upgradient of GSI exceedance(s) for groundwater	No	2, 5
NICKEL	ug/kg	10 : 10 : 10	5.40E+04	2.56E+04	1.34E+04	NO	NO	YES	YES	COI for groundwater at PM1NA, PM4NA	No	2, 3
PENTACHLOROPHENOL	ug/kg	3:10:20	1.70E+04	6.20E+02	1.29E+02	NO	NO	NA	YES	Pathway Incomplete. This AOC/SWMU is not upgradient of GSI exceedance(s) for groundwater	No	2, 5
PHENANTHRENE	ug/kg	10 : 10 : 10	5.30E+03	1.90E+03	8.07E+02	NO	NO	NA	YES	Pathway Incomplete. This AOC/SWMU is not upgradient of GSI exceedance(s) for groundwater	No	2, 5
SELENIUM	ug/kg	1 : 10 : 10	4.00E+02	4.40E+02	3.14E+02	YES	NO	NO	YES	Pathway Incomplete. This AOC/SWMU is not upgradient of GSI exceedance(s) for groundwater	No	2, 5
TOTAL CYANIDE	ug/kg	1 : 10 : 10	2.00E+02	6.60E+02	1.99E+02	YES	NO	NO	YES	COI for groundwater at PM1NA	No	2
Total METHYLPHENOL	ug/kg	1 : 7 : 10	1.40E+03	5.88E+02	5.83E+02	NO	NO	NA	NO	Absence of COI in groundwater indicates potential pathway is incomplete	No	2, 4
VANADIUM	ug/kg	10 : 10 : 10	1.90E+05	2.97E+04	1.30E+04	NO	NO	YES	YES	COI for groundwater at PM1NA, PM4NA, WHI9-2F	No	2, 3
ZINC	ug/kg	10 : 10 : 10	1.20E+05	3.35E+05	1.09E+05	YES	NO	NO	YES	COI for groundwater at PM4NA, WHI9-2F	No	2

Table 5-1
Tier 2 Evaluation of Groundwater Surface Water Interface (GSI) Pathway
Initial Soil Screening Matrix
BASF North Works Facility
Wyandotte, MI

Chemical	Units	FOD	Part 201 Risk Criteria Exceeded = GSI Protection	Maximum Detected Concentration (ug/kg)	Mean Calculated Concentration (ug/kg)	Does Max Concentration Exceed GSIPC?	Does Mean Soil Concentration Exceed GSIPC?	Chemical Consistent with Background?	Does Site-Wide Maximum Groundwater Concentration Exceed GSI?	Comment	Continue to Evaluate the Soil to GW Pathway?	Basis?
SWMU H												
1,1-DICHLOROETHANE	ug/kg	1 : 17 : 21	1.50E+04	4.30E+01	1.79E+01	NO	NO	NA	NO	COI for groundwater at AOC5-MIP-07, AOC-MIP-08, AOC-MIP-13	No	2, 4
1,2,4-TRIMETHYLBENZENE	ug/kg	7 : 10 : 10	5.70E+02	5.80E+02	1.24E+02	YES	NO	NA	NO	Absence of COI in groundwater indicates potential pathway is incomplete	No	2, 4
1,2-DICHLOROBENZENE	ug/kg	1 : 18 : 21	3.60E+02	6.80E+02	6.75E+01	YES	NO	NA	NO	Absence of COI in groundwater indicates potential pathway is incomplete	No	2, 4
1,2-DICHLOROETHANE	ug/kg	7:17:21	1.20E+02	1.30E+02	3.36E+01	YES	NO	NA	YES	COI for groundwater at AOC5-MIP-07, AOC-MIP-08, AOC-MIP-13	No	2
1,2-DICHLOROPROPANE	ug/kg	17 : 21 : 21	1.80E+02	5.00E+07	2.40E+06	YES	YES	NA	YES	COI for groundwater at AOC5-MIP-07, AOC5-MIP-08, AOC5-MIP-13, AOC5-MIP-17, AOC5-MIP-25	Yes	Not Eliminated
1,3,5-TRIMETHYLBENZENE	ug/kg	2 : 10 : 10	1.10E+03	1.70E+02	6.12E+01	NO	NO	NA	NO	Absence of COI in groundwater indicates potential pathway is incomplete	No	2, 4
2,4-DIMETHYLPHENOL	ug/kg	1 : 20 : 21	7.60E+03	8.30E+03	7.35E+02	YES	NO	NA	NO	Absence of COI in groundwater indicates potential pathway is incomplete	No	2, 4
2-BUTANONE	ug/kg	1 : 2 : 21	4.40E+04	3.10E+01	3.10E+01	NO	NO	NA	NO	Absence of COI in groundwater indicates potential pathway is incomplete	No	2, 4
ACENAPHTHENE	ug/kg	5 : 20 : 21	4.40E+03	6.70E+03	6.26E+02	YES	NO	NA	NO	Absence of COI in groundwater indicates potential pathway is incomplete	No	2, 4
ACETONE	ug/kg	16 : 18 : 21	3.40E+04	1.60E+03	4.64E+02	NO	NO	NA	YES	COI for groundwater at AOC5-MIP-13, AOC5-MIP-17, AOC5-MIP-25	No	2
ANTIMONY	ug/kg	5 : 21 : 21	9.40E+04	1.73E+04	3.39E+03	NO	NO	NO	YES	Pathway Incomplete. This AOC/SWMU is not upgradient of GSI exceedance(s) for groundwater	No	2, 5
ARSENIC	ug/kg	21 : 21 : 21	2.30E+04	1.16E+05	1.81E+04	YES	NO	YES	YES	Pathway Incomplete. This AOC/SWMU is not upgradient of GSI exceedance(s) for groundwater	No	2, 3, 5
BARIUM	ug/kg	21:21:21	2.90E+05	2.23E+05	8.63E+04	NO	NO	YES	YES	COI for groundwater at RFI-MW-8/8I/8F	No	2, 3
BENZENE	ug/kg	7 : 18 : 21	2.40E+02	7.80E+02	6.03E+01	YES	NO	NA	YES	Pathway Incomplete. This AOC/SWMU is not upgradient of GSI exceedance(s) for groundwater	No	2, 5
BERYLLIUM	ug/kg	3 : 21 : 21	3.00E+04	9.10E+02	3.66E+02	NO	NO	NO	NO	Absence of COI in groundwater indicates potential pathway is incomplete	No	2, 4
BIS(2-CHLOROETHYL) ETHER	ug/kg	3 : 20 : 21	3.00E+02	1.20E+04	9.07E+02	YES	YES	NA	YES	COI for groundwater at AOC5-MIP-07, AOC5-MIP-08, AOC5-MIP-13, AOC5-MIP-17, AOC5-MIP-25	Yes	Not Eliminated
BIS(2-CHLOROISOPROPYL) ETHER	ug/kg	9 : 21 : 21	3.00E+02	1.40E+06	7.46E+04	YES	YES	NA	YES	COI for groundwater at AOC5-MIP-07, AOC5-MIP-08, AOC5-MIP-17, AOC5-MIP-25	Yes	Not Eliminated
CADMIUM	ug/kg	20 : 21 : 21	2.70E+03	4.20E+03	8.54E+02	YES	NO	YES	YES	Pathway Incomplete. This AOC/SWMU is not upgradient of GSI exceedance(s) for groundwater	No	2, 3, 5
CARBAZOLE	ug/kg	4 : 4 : 10	1.10E+03	5.50E+01	4.55E+01	NO	NO	NA	NO	Absence of COI in groundwater indicates potential pathway is incomplete	No	2, 4
CHLOROBENZENE	ug/kg	2 : 18 : 21	9.40E+02	8.30E+02	6.12E+01	NO	NO	NA	YES	Pathway Incomplete. This AOC/SWMU is not upgradient of GSI exceedance(s) for groundwater	No	2, 5
CHLOROFORM	ug/kg	7 : 17 : 21	1.50E+03	1.20E+02	2.51E+01	NO	NO	NA	YES	COI for groundwater at AOC5-MIP-25	No	2
CHROMIUM	ug/kg	21 : 21 : 21	3.30E+03	1.95E+05	3.90E+04	YES	YES	NO	YES	COI for groundwater at RFI-MW-8	Yes	Not Eliminated
COBALT	ug/kg	16 : 21 : 21	2.00E+03	1.37E+04	7.18E+03	YES	YES	NO	NO	Absence of COI in groundwater indicates potential pathway is incomplete	No	4
COPPER	ug/kg	21 : 21 : 21	5.20E+04	2.21E+05	3.41E+04	YES	NO	NO	YES	COI for groundwater at RFI-MW-8/8I	No	2
DIBENZOFURAN	ug/kg	7 : 20 : 21	1.70E+03	4.20E+03	4.93E+02	YES	NO	NA	YES	COI for groundwater at RFI-MW-8I	No	2
ETHYLBENZENE	ug/kg	8 : 8 : 21	3.60E+02	4.70E+02	5.23E+01	YES	NO	NA	YES	COI for groundwater at RFI-MW-8I	No	2
FLUORANTHENE	ug/kg	13 : 20 : 21	5.50E+03	1.10E+04	1.08E+03	YES	NO	NA	YES	COI for groundwater at RFI-MW-8I/8F	No	2
FLUORENE	ug/kg	4 : 20 : 21	5.30E+03	5.40E+03	5.68E+02	YES	NO	NA	NO	Absence of COI in groundwater indicates potential pathway is incomplete	No	2, 4
LEAD	ug/kg	21 : 21 : 21	1.80E+06	4.33E+05	5.59E+04	NO	NO	YES	YES	Pathway Incomplete. This AOC/SWMU is not upgradient of GSI exceedance(s) for groundwater	No	2, 3, 5
MERCURY	ug/kg	15 : 21 : 21	1.00E+02	5.29E+04	2.90E+03	YES	YES	NO	YES	COI for groundwater at RFI-MW-8/8I/8F	Yes	Not Eliminated
NAPHTHALENE	ug/kg	12 : 20 : 31	8.70E+02	1.60E+04	1.10E+03	YES	YES	NA	YES	COI for groundwater at RFI-MW-8I/8F	Yes	Not Eliminated
NICKEL	ug/kg	21 : 21 : 21	5.40E+04	9.34E+04	2.75E+04	YES	NO	NO	YES	Pathway Incomplete. This AOC/SWMU is not upgradient of GSI exceedance(s) for groundwater	No	2, 5
PENTACHLOROPHENOL	ug/kg	4 : 11 : 32	1.70E+04	3.00E+02	5.24E+01	NO	NO	NA	YES	COI for groundwater at RFI-MW-8F	No	2
PHENANTHRENE	ug/kg	13 : 20 : 21	5.20E+03	2.00E+04	1.36E+03	YES	NO	NA	YES	COI for groundwater at RFI-MW-8I/8F	No	2
PHENOL	ug/kg	2 : 17 : 21	4.20E+03	2.70E+02	1.94E+02	NO	NO	NA	YES	COI for groundwater at RFI-MW-8I	No	2
SELENIUM	ug/kg	2 : 21 : 21	4.00E+02	1.40E+03	4.18E+02	YES	YES	NO	YES	Pathway Incomplete. This AOC/SWMU is not upgradient of GSI exceedance(s) for groundwater	No	5
SILVER	ug/kg	2 : 21 : 21	5.00E+02	2.17E+04	1.66E+03	YES	YES	NO	YES	Pathway Incomplete. This AOC/SWMU is not upgradient of GSI exceedance(s) for groundwater	No	5
TETRACHLOROETHENE	ug/kg	3 : 17 : 21	2.20E+02	4.10E+01	1.68E+01	NO	NO	NA	NO	Absence of COI in groundwater indicates potential pathway is incomplete	No	2, 4
THALLIUM	ug/kg	4 : 21 : 21	1.40E+03	1.60E+03	7.84E+02	YES	NO	NO	YES	COI for groundwater at RFI-MW-8	No	2
TOLUENE	ug/kg	10 : 20 : 21	2.80E+03	5.80E+03	5.84E+02	YES	NO	NA	NO	Absence of COI in groundwater indicates potential pathway is incomplete	No	2, 4
TOTAL CYANIDE	ug/kg	4 : 11 : 11	2.00E+02	1.60E+04	2.34E+03	YES	YES	NO	YES	Pathway Incomplete. This AOC/SWMU is not upgradient of GSI exceedance(s) for groundwater	No	5
TOTAL XYLENES	ug/kg	10 : 18 : 21	2.80E+03	7.40E+02	1.14E+02	NO	NO	NA	YES	COI for groundwater at RFI-MW-8I/8F	No	2
VANADIUM	ug/kg	21 : 21 : 21	1.90E+05	5.09E+04	2.62E+04	NO	NO	NO	YES	Pathway Incomplete. This AOC/SWMU is not upgradient of GSI exceedance(s) for groundwater	No	2, 5
ZINC	ug/kg	21 : 21 : 21	1.20E+05	6.28E+05	1.12E+05	YES	NO	YES	YES	COI for groundwater at RFI-MW-8	No	2, 3

Basis:

1) low frequency of detection (less than 5% assuming a minimum of 20 samples and detection limits are not elevated)
2) no exceedance of GSIPC for soil (based on the mean COI concentration in each area
3) exceedance of the GSIPC but, in the case of inorganics, consistency with background conditions
4) absence of COI in groundwater facility-wide, or
5) absence of GSI exceedance in groundwater at a well downgradient of the AOC/SWMU

Table 5-2
Tier 2 Evaluation of Groundwater Surface Water Interface (GSI) Pathway
Preliminary Groundwater COIs
BASF North Works Facility
Wyandotte, MI

AREA	Chemical	Maximum Concentration (ug/L)	Mean Concentration (ug/L)	GSI (ug/L)	Additional Evaluation?
RFI-MW13	1,2-DICHLOROETHANE	22	22	6	Yes: F& T
P15N	1,2-DICHLOROPROPANE	66.3	66.3	9.1	Yes: F& T
RFI-MW6	1,2-DICHLOROPROPANE	9.95	9.4625	9.1	Yes: F& T
RFI-MW12	1,4-DIOXANE	180	118.3333	34	Yes: F& T
RFI-MW16	1,4-DIOXANE	39	39	34	Yes: F& T
WHI6-3F	1,4-DIOXANE	160	74.8333	34	Yes: F& T
RFI-MW10I	3-METHYLPHENOL	810	810	71	Yes: F& T
RFI-MW12	3-METHYLPHENOL	100	100	71	Yes: F& T
RFI-MW8I	3-METHYLPHENOL	120	120	71	Yes: F& T
RFI-MW10I	3-METHYLPHENOL & 4-METHYLPHENOL	250	223.3333	71	Yes: F& T
RFI-MW12	3-METHYLPHENOL & 4-METHYLPHENOL	130	113.3333	71	Yes: F& T
RFI-MW10I	4-METHYLPHENOL	810	810	71	Yes: F& T
RFI-MW12	4-METHYLPHENOL	100	100	71	Yes: F& T
RFI-MW8I	4-METHYLPHENOL	120	120	71	Yes: F& T
RFI-MW21	ACETONE	2100	2100	1700	Yes: F& T
P35NR	ANTIMONY	6.7	6.7	2	No; Background Well
PM4NA	ANTIMONY	13	13	2	Yes; Background
RFI-MW10F	ANTIMONY	6.6	4.9167	2	Yes; Background
RFI-MW10I	ANTIMONY	7.4	6.05	2	Yes; Background
RFI-MW11	ANTIMONY	3.125	3.125	2	Yes; Background
RFI-MW12	ANTIMONY	6.9	5.9	2	Yes; Background
RFI-MW28	ANTIMONY	31.025	30.2563	2	No; Background Well
RFI-MW8	ANTIMONY	60	37.5	2	Yes; Background
RFI-MW9F	ANTIMONY	31.025	30.2563	2	Yes; Background
WHI2-3S	ANTIMONY	7.8	2.81	2	No; Background Well
WHI3-3S	ANTIMONY	5.7	2.63	2	No; Background Well
WHI4-2S	ANTIMONY	5.5	3.775	2	No; Background Well
WHI6-2S	ANTIMONY	60	30.5125	2	Yes; Background
WHI9-2F	ANTIMONY	3.6	3.6	2	Yes; Background
CMS-MW-16	ARSENIC	273	273	50	Yes; Background
P-34-N	ARSENIC	51.4	51.4	50	Yes; Background
P36N	ARSENIC	77	77	50	Yes; Background
PM1NA	ARSENIC	565	565	50	Yes; Background
PM4NA	ARSENIC	300	300	50	Yes; Background
RFI-MW10F	ARSENIC	82.2	57.375	50	Yes; Background
RFI-MW10I	ARSENIC	314	203	50	Yes; Background
RFI-MW12	ARSENIC	397	348.75	50	Yes; Background
RFI-MW22	ARSENIC	110	105	50	Yes; Background
RFI-MW4	ARSENIC	106	72.8625	50	Yes; Background
WHI1-3S	ARSENIC	88	88	50	Yes; Background
CMS-MW-12	BARIUM	618.5	501.125	440	Yes; Background
RFI-MW10	BARIUM	1055	982.75	440	Yes; Background
RFI-MW3	BARIUM	1450	1450	440	Yes; Background
RFI-MW5	BARIUM	1080	991.625	440	Yes; Background
RFI-MW7F	BARIUM	604	491.75	440	Yes; Background
RFI-MW7I	BARIUM	3700	2605	440	Yes; Background
RFI-MW8	BARIUM	1090	1065	440	Yes; Background
RFI-MW8I	BARIUM	742	616	440	Yes; Background
WHI6-1S	BARIUM	677	551.125	440	Yes; Background
WHI6-4F	BARIUM	2650	734.9	440	Yes; Background
WHI6-4S	BARIUM	2670	1698.5	440	Yes; Background
CMS-MW-13S	BENZENE	66	66	12	Yes: F& T
CMS-MW-16	BENZENE	21	21	12	Yes: F& T
GTI SB-16	BENZENE	68	68	12	Yes: F& T
P26N	BENZENE	150	50.35	12	Yes: F& T
RFI-MW10F	BENZENE	23	15.225	12	Yes: F& T
RFI-MW22	BENZENE	2000	1875	12	Yes: F& T
WHI1-3S	BENZENE	681	681	12	Yes: F& T
WHI6-3F	BENZENE	18	17	12	Yes: F& T
BG-MW-1	BERYLLIUM	5	2.5375	2.4	No; Background Well
P35NR	BERYLLIUM	5	3.3333	2.4	No; Background Well
RFI-MW10F	BERYLLIUM	5	2.55	2.4	Yes; Background
RFI-MW10I	BERYLLIUM	5	2.5375	2.4	Yes; Background

Table 5-2
Tier 2 Evaluation of Groundwater Surface Water Interface (GSI) Pathway
Preliminary Groundwater COIs
BASF North Works Facility
Wyandotte, MI

AREA	Chemical	Maximum Concentration (ug/L)	Mean Concentration (ug/L)	GSI (ug/L)	Additional Evaluation?
RFI-MW11	BERYLLIUM	5	2.5375	2.4	Yes; Background
RFI-MW12	BERYLLIUM	5	2.55	2.4	Yes; Background
RFI-MW12F	BERYLLIUM	5	2.55	2.4	Yes; Background
RFI-MW22	BERYLLIUM	5	3.35	2.4	Yes; Background
RFI-MW4	BERYLLIUM	5	2.5375	2.4	Yes; Background
RFI-MW5	BERYLLIUM	5	2.6188	2.4	Yes; Background
RFI-MW7I	BERYLLIUM	5	2.605	2.4	Yes; Background
RFI-MW8	BERYLLIUM	5	2.5375	2.4	Yes; Background
RFI-MW9	BERYLLIUM	5	2.5375	2.4	Yes; Background
WHI3-1S	BERYLLIUM	5	3.75	2.4	No; Background Well
WHI3-3S	BERYLLIUM	5	2.5375	2.4	No; Background Well
WHI6-1S	BERYLLIUM	5	2.55	2.4	Yes; Background
WHI6-2F	BERYLLIUM	5	2.5375	2.4	Yes; Background
CMS-MW-4	BIS(2-CHLOROETHYL) ETHER	730	730	15	Yes: F& T
P26N	BIS(2-CHLOROETHYL) ETHER	310	170.3333	15	Yes: F& T
RFI-MW22	BIS(2-CHLOROETHYL) ETHER	92	86	15	Yes: F& T
WHI6-1F	BIS(2-CHLOROETHYL) ETHER	30	16.75	15	Yes: F& T
WHI6-3F	BIS(2-CHLOROETHYL) ETHER	730	600	15	Yes: F& T
PM3NB	BIS(2-CHLOROISOPROPYL) ETHER	39	39	15	Yes: F& T
P36N	BIS(2-ETHYLHEXYL) PHTHALATE	102	102	32	Yes: F& T
WHI2-2S	CADMIUM	8	8	2.2	Yes; Background
WHI9-2F	CADMIUM	2.9	2.9	2.2	Yes; Background
CMS-MW-19	CHLORIDE	538000	424500	125000	Yes; F&T (1)
CMS-MW-4	CHLORIDE	1950000	1950000	125000	Yes; F&T (1)
ENSR BG-MW-1	CHLORIDE	180000	180000	125000	Yes; F&T (1)
P26N	CHLORIDE	26800000	26800000	125000	Yes; F&T (1)
PM4NA	CHLORIDE	22000000	22000000	125000	Yes; F&T (1)
RFI-MW1	CHLORIDE	18500000	18500000	125000	Yes; F&T (1)
RFI-MW10	CHLORIDE	927000	896000	125000	Yes; F&T (1)
RFI-MW10F	CHLORIDE	592000	534500	125000	Yes; F&T (1)
RFI-MW10I	CHLORIDE	2510000	2250000	125000	Yes; F&T (1)
RFI-MW11	CHLORIDE	168000	157000	125000	Yes; F&T (1)
RFI-MW11F	CHLORIDE	558000	524500	125000	Yes; F&T (1)
RFI-MW12	CHLORIDE	11600000	10420000	125000	Yes; F&T (1)
RFI-MW12F	CHLORIDE	941000	844000	125000	Yes; F&T (1)
RFI-MW13	CHLORIDE	19000000	19000000	125000	Yes; F&T (1)
RFI-MW14	CHLORIDE	50300000	50300000	125000	Yes; F&T (1)
RFI-MW15	CHLORIDE	11000000	11000000	125000	Yes; F&T (1)
RFI-MW22	CHLORIDE	3720000	3605000	125000	Yes; F&T (1)
RFI-MW26	CHLORIDE	1200000	1200000	125000	Yes; F&T (1)
RFI-MW4	CHLORIDE	2400000	2400000	125000	Yes; F&T (1)
RFI-MW4	CHLORIDE	2390000	2390000	125000	Yes; F&T (1)
RFI-MW5	CHLORIDE	8050000	6355000	125000	Yes; F&T (1)
RFI-MW6	CHLORIDE	3110000	3087500	125000	Yes; F&T (1)
RFI-MW7	CHLORIDE	5200000	5200000	125000	Yes; F&T (1)
RFI-MW7F	CHLORIDE	993000	847500	125000	Yes; F&T (1)
RFI-MW7I	CHLORIDE	28200000	28200000	125000	Yes; F&T (1)
RFI-MW7I	CHLORIDE	24900000	24900000	125000	Yes; F&T (1)
RFI-MW8	CHLORIDE	3045000	3045000	125000	Yes; F&T (1)
RFI-MW8	CHLORIDE	2900000	2900000	125000	Yes; F&T (1)
RFI-MW8F	CHLORIDE	455000	194066.6667	125000	Yes; F&T (1)
RFI-MW8I	CHLORIDE	415000	415000	125000	Yes; F&T (1)
RFI-MW9	CHLORIDE	6590000	6220000	125000	Yes; F&T (1)
RFI-MW9F	CHLORIDE	140000	140000	125000	Yes; F&T (1)
RFI-MW9I	CHLORIDE	3360000	3265000	125000	Yes; F&T (1)
WHI4-1S	CHLORIDE	140000	140000	125000	Yes; F&T (1)
WHI6-1F	CHLORIDE	1080000	1080000	125000	Yes; F&T (1)
WHI6-1F	CHLORIDE	9510000	9510000	125000	Yes; F&T (1)
WHI6-1S	CHLORIDE	5211000	5211000	125000	Yes; F&T (1)
WHI6-1S	CHLORIDE	14800000	14800000	125000	Yes; F&T (1)
WHI6-2F	CHLORIDE	598000	598000	125000	Yes; F&T (1)
WHI6-2F	CHLORIDE	504000	504000	125000	Yes; F&T (1)
WHI6-2S	CHLORIDE	500000	484000	125000	Yes; F&T (1)

Table 5-2
Tier 2 Evaluation of Groundwater Surface Water Interface (GSI) Pathway
Preliminary Groundwater COIs
BASF North Works Facility
Wyandotte, MI

AREA	Chemical	Maximum Concentration (ug/L)	Mean Concentration (ug/L)	GSI (ug/L)	Additional Evaluation?
WHI6-3F	CHLORIDE	1975000	1562500	125000	Yes; F&T (1)
WHI6-3S	CHLORIDE	49900000	49900000	125000	Yes; F&T (1)
WHI6-4F	CHLORIDE	472000	472000	125000	Yes; F&T (1)
WHI6-4F	CHLORIDE	765000	765000	125000	Yes; F&T (1)
WHI6-4S	CHLORIDE	3570000	3570000	125000	Yes; F&T (1)
WHI6-4S	CHLORIDE	3780000	3780000	125000	Yes; F&T (1)
WHI9-2F	CHLORIDE	200000	200000	125000	Yes; F&T (1)
RFI-MW22	CHLOROBENZENE	930	877.5	47	Yes: F& T
CMS-MW-16	CHROMIUM	63.8	63.8	11	Yes; Background
P-34-N	CHROMIUM	18.25	18.25	11	Yes; Background
P35N	CHROMIUM	23.9	23.9	11	No; Background Well
PM1NA	CHROMIUM	70	70	11	Yes; Background
PM4NA	CHROMIUM	41	41	11	Yes; Background
RFI-MW10I	CHROMIUM	59.2	21.225	11	Yes; Background
RFI-MW12	CHROMIUM	90.4	77.725	11	Yes; Background
RFI-MW13	CHROMIUM	54	54	11	Yes; Background
RFI-MW15	CHROMIUM	250	250	11	Yes; Background
RFI-MW16	CHROMIUM	23.8	23.8	11	Yes; Background
RFI-MW22	CHROMIUM	70.9	67.625	11	Yes; Background
RFI-MW24	CHROMIUM	951	291.8667	11	No; Background Well
RFI-MW25	CHROMIUM	701.25	701.25	11	Yes; Background
RFI-MW26	CHROMIUM	91.5	91.5	11	Yes; Background
RFI-MW3	CHROMIUM	76.25	76.25	11	Yes; Background
RFI-MW7F	CHROMIUM	32.9	20.175	11	Yes; Background
WHI1-3S	CHROMIUM	122	122	11	Yes; Background
WHI2-2S	CHROMIUM	62	62	11	Yes; Background
WHI3-1S	CHROMIUM	37.3	14.0625	11	No; Background Well
WHI6-2S	CHROMIUM	77	34.15	11	Yes; Background
BG-MW-1	COPPER	25	12.625	9	No; Background Well
CMS-MW-23	COPPER	25	14.2	9	Yes; Background
P26N	COPPER	10.4	9.35	9	Yes; Background
P-34-N	COPPER	24.25	24.25	9	Yes; Background
P35N	COPPER	25	25	9	No; Background Well
PM1NA	COPPER	39.5	39.5	9	Yes; Background
RFI-MW10F	COPPER	25	14.325	9	Yes; Background
RFI-MW10I	COPPER	30.3	12.3	9	Yes; Background
RFI-MW11	COPPER	25	15.625	9	Yes; Background
RFI-MW12	COPPER	25	12.125	9	Yes; Background
RFI-MW12F	COPPER	37.5	23.325	9	Yes; Background
RFI-MW15	COPPER	19	19	9	Yes; Background
RFI-MW16	COPPER	11.5	11.5	9	Yes; Background
RFI-MW22	COPPER	35.4	31.125	9	Yes; Background
RFI-MW24	COPPER	21.7	10.325	9	No; Background Well
RFI-MW25	COPPER	22.5	22.5	9	Yes; Background
RFI-MW3	COPPER	62.75	62.75	9	Yes; Background
RFI-MW7F	COPPER	43.4	21.3667	9	Yes; Background
RFI-MW8I	COPPER	30.3	14.9333	9	Yes; Background
RFI-MW9F	COPPER	25	15.625	9	Yes; Background
RFI-MW9I	COPPER	25	15.625	9	Yes; Background
WHI1-3S	COPPER	38	38	9	Yes; Background
WHI2-2S	COPPER	118	118	9	Yes; Background
WHI2-3S	COPPER	25	13.45	9	No; Background Well
WHI3-1S	COPPER	27.5	12.45	9	No; Background Well
WHI3-3S	COPPER	25	13.05	9	No; Background Well
WHI4-1S	COPPER	19	19	9	Yes; Background
WHI4-2S	COPPER	25	10.05	9	No; Background Well
WHI6-2S	COPPER	75	29.725	9	Yes; Background
WHI6-4F	COPPER	25	15.625	9	Yes; Background
WHI9-2F	COPPER	83	83	9	Yes; Background
RFI-MW8I	DIBENZOFURAN	5.3	4.7	4	Yes: F& T
WHI6-2S	DIBENZOFURAN	5.8	5.2	4	Yes: F& T
RFI-MW22	ETHYLBENZENE	120	108.5	18	Yes: F& T
RFI-MW23	FLUORANTHENE	4.5	4.5	1.6	Yes: F& T

Table 5-2
Tier 2 Evaluation of Groundwater Surface Water Interface (GSI) Pathway
Preliminary Groundwater COIs
BASF North Works Facility
Wyandotte, MI

AREA	Chemical	Maximum Concentration (ug/L)	Mean Concentration (ug/L)	GSI (ug/L)	Additional Evaluation?
RFI-MW8I	FLUORANTHENE	2.6	2	1.6	Yes: F& T
RFI-MW9I	FLUORANTHENE	4.6	2.1067	1.6	Yes: F& T
WHI6-2S	FLUORANTHENE	27	8.295	1.6	Yes: F& T
P-34-N	LEAD	21.25	21.25	10	Yes; Background
P35N	LEAD	65.2	65.2	10	No; Background Well
PM1NA	LEAD	44.25	44.25	10	Yes; Background
RFI-MW3	LEAD	36.25	36.25	10	Yes; Background
RFI-MW8I	LEAD	29.2	10.7333	10	Yes; Background
WHI1-3S	LEAD	13	13	10	Yes; Background
WHI2-2S	LEAD	239	239	10	Yes; Background
WHI3-1S	LEAD	42.5	17.3875	10	No; Background Well
WHI4-2S	LEAD	83.5	31.72	10	No; Background Well
WHI6-2S	LEAD	41.6	16.125	10	Yes; Background
WHI9-2F	LEAD	140	140	10	Yes; Background
BG-MW-1	MERCURY	0.0154	0.0106	0.0013	No; Background Well
CMS-MW-16	MERCURY	1.6	1.6	0.0013	Yes; Background
CMS-MW-30	MERCURY	0.964	0.6578	0.0013	Yes; Background
CMS-MW-8	MERCURY	3.9	3.9	0.0013	Yes; Background
ENSR BG-MW-1	MERCURY	0.0162	0.0099	0.0013	Yes; Background
P26N	MERCURY	0.0075	0.0038	0.0013	Yes; Background
P35NR	MERCURY	0.0036	0.0024	0.0013	No; Background Well
PM1NA	MERCURY	0.55	0.55	0.0013	Yes; Background
PM4NA	MERCURY	0.0526	0.0526	0.0013	Yes; Background
RFI-MW1	MERCURY	0.0283	0.0283	0.0013	Yes; Background
RFI-MW10	MERCURY	0.028	0.0081	0.0013	Yes; Background
RFI-MW10F	MERCURY	10.7	7.041	0.0013	Yes; Background
RFI-MW10I	MERCURY	2.79	2.2791	0.0013	Yes; Background
RFI-MW11	MERCURY	0.0062	0.0018	0.0013	Yes; Background
RFI-MW11F	MERCURY	0.0096	0.008	0.0013	Yes; Background
RFI-MW12	MERCURY	3.14	1.2735	0.0013	Yes; Background
RFI-MW12F	MERCURY	2.45	1.4352	0.0013	Yes; Background
RFI-MW13	MERCURY	0.0554	0.0554	0.0013	Yes; Background
RFI-MW15	MERCURY	0.00306	0.0031	0.0013	Yes; Background
RFI-MW2	MERCURY	0.00416	0.0042	0.0013	Yes; Background
RFI-MW22	MERCURY	0.0685	0.0505	0.0013	Yes; Background
RFI-MW24	MERCURY	0.005	0.0022	0.0013	No; Background Well
RFI-MW26	MERCURY	0.0197	0.0197	0.0013	Yes; Background
RFI-MW28	MERCURY	0.0088	0.0029	0.0013	No; Background Well
RFI-MW5	MERCURY	0.181	0.1175	0.0013	Yes; Background
RFI-MW6	MERCURY	0.373	0.3413	0.0013	Yes; Background
RFI-MW7	MERCURY	0.121	0.121	0.0013	Yes; Background
RFI-MW7F	MERCURY	0.0522	0.0181	0.0013	Yes; Background
RFI-MW7I	MERCURY	0.0031	0.002	0.0013	Yes; Background
RFI-MW8	MERCURY	0.0064	0.0024	0.0013	Yes; Background
RFI-MW8F	MERCURY	1.6	0.3687	0.0013	Yes; Background
RFI-MW8I	MERCURY	1.69	1.3883	0.0013	Yes; Background
RFI-MW9F	MERCURY	0.422	0.2852	0.0013	Yes; Background
RFI-MW9I	MERCURY	0.922	0.7707	0.0013	Yes; Background
WHI2-2S	MERCURY	33.4	33.4	0.0013	Yes; Background
WHI2-3S	MERCURY	0.00185	0.0014	0.0013	No; Background Well
WHI3-1S	MERCURY	0.0404	0.0261	0.0013	No; Background Well
WHI3-2S	MERCURY	0.0644	0.0644	0.0013	Yes; Background
WHI4-1S	MERCURY	0.0673	0.0673	0.0013	Yes; Background
WHI4-2S	MERCURY	0.196	0.0752	0.0013	No; Background Well
WHI6-1F	MERCURY	0.0051	0.0026	0.0013	Yes; Background
WHI6-1S	MERCURY	0.0374	0.0165	0.0013	Yes; Background
WHI6-2F	MERCURY	0.0194	0.0129	0.0013	Yes; Background
WHI6-2S	MERCURY	0.151	0.0553	0.0013	Yes; Background
WHI6-4S	MERCURY	0.0074	0.0038	0.0013	Yes; Background
WHI9-2F	MERCURY	0.757	0.757	0.0013	Yes; Background
WHI9-2S	MERCURY	0.0411	0.0411	0.0013	Yes; Background
CMS-MW-13F	NAPHTHALENE	19	19	13	Yes: F& T
RFI-MW10F	NAPHTHALENE	1600	1060	13	Yes: F& T

Table 5-2
Tier 2 Evaluation of Groundwater Surface Water Interface (GSI) Pathway
Preliminary Groundwater COIs
BASF North Works Facility
Wyandotte, MI

AREA	Chemical	Maximum Concentration (ug/L)	Mean Concentration (ug/L)	GSI (ug/L)	Additional Evaluation?
RFI-MW10I	NAPHTHALENE	36	21.175	13	Yes: F& T
RFI-MW8F	NAPHTHALENE	97	22.458	13	Yes: F& T
RFI-MW8I	NAPHTHALENE	100	88.6667	13	Yes: F& T
RFI-MW9I	NAPHTHALENE	99	31.6	13	Yes: F& T
P-34-N	NICKEL	67.5	67.5	52	Yes; Background
PM1NA	NICKEL	70	70	52	Yes; Background
PM4NA	NICKEL	53	53	52	Yes; Background
RFI-MW10I	NICKEL	197	102.35	52	Yes; Background
RFI-MW12	NICKEL	307	260	52	Yes; Background
RFI-MW12F	NICKEL	167	111.525	52	Yes; Background
RFI-MW15	NICKEL	1500	1500	52	Yes; Background
RFI-MW24	NICKEL	214	101.65	52	No; Background Well
RFI-MW25	NICKEL	90	90	52	Yes; Background
RFI-MW3	NICKEL	100	100	52	Yes; Background
RFI-MW8F	PENTACHLOROPHENOL	3	2.3667	1.8	Yes: F& T
CMS-MW-33	PHENANTHRENE	3.7	2.5929	2.4	Yes: F& T
RFI-MW10F	PHENANTHRENE	12	6.425	2.4	Yes: F& T
RFI-MW10I	PHENANTHRENE	15	8.05	2.4	Yes: F& T
RFI-MW8F	PHENANTHRENE	7.8	4.602	2.4	Yes: F& T
RFI-MW8I	PHENANTHRENE	9.1	6.6667	2.4	Yes: F& T
RFI-MW9I	PHENANTHRENE	8.6	7.875	2.4	Yes: F& T
WHI6-2S	PHENANTHRENE	22	8.0725	2.4	Yes: F& T
RFI-MW10I	PHENOL	870	512.5	210	Yes: F& T
RFI-MW12	PHENOL	880	645	210	Yes: F& T
RFI-MW12F	PHENOL	410	277.5	210	Yes: F& T
RFI-MW16	PHENOL	350	350	210	Yes: F& T
CMS-MW-16	SELENIUM	6	6	5	Yes; Background
RFI-MW10I	SELENIUM	8.3	6.225	5	Yes; Background
RFI-MW12	SELENIUM	8.7	5.45	5	Yes; Background
RFI-MW16	SELENIUM	7.05	7.05	5	Yes; Background
RFI-MW6	SELENIUM	8.5	6.8	5	Yes; Background
RFI-MW7F	SELENIUM	8.7	6.75	5	Yes; Background
WHI1-3S	SELENIUM	7	7	5	Yes; Background
WHI3-1S	SELENIUM	11.6	8.075	5	No; Background Well
BG-MW-1	THALLIUM	5.15	3.5022	1.2	No; Background Well
P26N	THALLIUM	7.6	6.9	1.2	Yes; Background
P35N	THALLIUM	6.2	6.2	1.2	No; Background Well
RFI-MW1	THALLIUM	7.65	7.65	1.2	Yes; Background
RFI-MW10	THALLIUM	8.2	5.1375	1.2	Yes; Background
RFI-MW10F	THALLIUM	6.3	5.4333	1.2	Yes; Background
RFI-MW11	THALLIUM	7.075	5.5188	1.2	Yes; Background
RFI-MW11F	THALLIUM	5.3	4.4625	1.2	Yes; Background
RFI-MW12	THALLIUM	4.8	3.575	1.2	Yes; Background
RFI-MW12F	THALLIUM	4.9	3.625	1.2	Yes; Background
RFI-MW13	THALLIUM	7.8	7.8	1.2	Yes; Background
RFI-MW15	THALLIUM	9.6	9.6	1.2	Yes; Background
RFI-MW26	THALLIUM	10.1	10.1	1.2	Yes; Background
RFI-MW28	THALLIUM	12.8	10.375	1.2	No; Background Well
RFI-MW7I	THALLIUM	46.1	24.325	1.2	Yes; Background
RFI-MW8	THALLIUM	16.1	8	1.2	Yes; Background
RFI-MW9	THALLIUM	5.6	5.15	1.2	Yes; Background
RFI-MW9I	THALLIUM	5.15	4.1667	1.2	Yes; Background
WHI2-3S	THALLIUM	5.8	3.0592	1.2	No; Background Well
WHI3-3S	THALLIUM	5.8	3.6418	1.2	No; Background Well
WHI6-1F	THALLIUM	6.2	4.7625	1.2	Yes; Background
WHI6-1S	THALLIUM	7.2	5.825	1.2	Yes; Background
WHI6-2F	THALLIUM	10.4	6.5	1.2	Yes; Background
WHI6-2S	THALLIUM	10	5.5125	1.2	Yes; Background
WHI6-4F	THALLIUM	10	6.675	1.2	Yes; Background
WHI6-4S	THALLIUM	8	5.7625	1.2	Yes; Background
CMS-MW-16	TOTAL CYANIDE	980	980	5.2	Yes; F&T (1)
CMS-MW-38	TOTAL CYANIDE	15	15	5.2	Yes; F&T (1)
CMS-MW-4	TOTAL CYANIDE	39	39	5.2	Yes; F&T (1)

Table 5-2
Tier 2 Evaluation of Groundwater Surface Water Interface (GSI) Pathway
Preliminary Groundwater COIs
BASF North Works Facility
Wyandotte, MI

AREA	Chemical	Maximum Concentration (ug/L)	Mean Concentration (ug/L)	GSI (ug/L)	Additional Evaluation?
P26N	TOTAL CYANIDE	120	109	5.2	Yes; F&T (1)
P-34-N	TOTAL CYANIDE	20	20	5.2	Yes; F&T (1)
PM1NA	TOTAL CYANIDE	68	68	5.2	Yes; F&T (1)
RFI-MW10	TOTAL CYANIDE	13.55	13.55	5.2	Yes; F&T (1)
RFI-MW10F	TOTAL CYANIDE	480	480	5.2	Yes; F&T (1)
RFI-MW10I	TOTAL CYANIDE	2000	2000	5.2	Yes; F&T (1)
RFI-MW11F	TOTAL CYANIDE	200	200	5.2	Yes; F&T (1)
RFI-MW12	TOTAL CYANIDE	1000	1000	5.2	Yes; F&T (1)
RFI-MW16	TOTAL CYANIDE	390	390	5.2	Yes; F&T (1)
RFI-MW22	TOTAL CYANIDE	1500	1500	5.2	Yes; F&T (1)
RFI-MW24	TOTAL CYANIDE	1100	1100	5.2	No; Background Well
RFI-MW25	TOTAL CYANIDE	440	440	5.2	Yes; F&T (1)
RFI-MW27	TOTAL CYANIDE	48	48	5.2	Yes; F&T (1)
RFI-MW28	TOTAL CYANIDE	33	33	5.2	No; Background Well
RFI-MW4	TOTAL CYANIDE	69	69	5.2	Yes; F&T (1)
RFI-MW6	TOTAL CYANIDE	18	18	5.2	Yes; F&T (1)
RFI-MW7I	TOTAL CYANIDE	210	210	5.2	Yes; F&T (1)
RFI-MW9	TOTAL CYANIDE	6.3	6.3	5.2	Yes; F&T (1)
RFI-MW9F	TOTAL CYANIDE	6.9	6.9	5.2	Yes; F&T (1)
RFI-MW9I	TOTAL CYANIDE	34	34	5.2	Yes; F&T (1)
WHI2-3S	TOTAL CYANIDE	44	44	5.2	No; Background Well
WHI3-1S	TOTAL CYANIDE	140	140	5.2	No; Background Well
WHI3-3S	TOTAL CYANIDE	6.2	6.2	5.2	No; Background Well
WHI6-1F	TOTAL CYANIDE	36	36	5.2	Yes; F&T (1)
WHI6-1S	TOTAL CYANIDE	23.25	23.25	5.2	Yes; F&T (1)
WHI6-2F	TOTAL CYANIDE	34	34	5.2	Yes; F&T (1)
WHI6-3F	TOTAL CYANIDE	100	85	5.2	Yes; F&T (1)
WHI6-3S	TOTAL CYANIDE	25	25	5.2	Yes; F&T (1)
WHI6-4F	TOTAL CYANIDE	20	20	5.2	Yes; F&T (1)
RFI-MW22	TOTAL XYLENES	53	44.75	35	Yes: F& T
RFI-MW8I	TOTAL XYLENES	84	56.6667	35	Yes: F& T
CMS-MW-16	VANADIUM	52.8	52.8	12	Yes; Background
CMS-MW-42	VANADIUM	50	17.7125	12	Yes; Background
P15N	VANADIUM	13	13	12	Yes; Background
P26N	VANADIUM	43.7	40.4	12	Yes; Background
P-34-N	VANADIUM	32.5	32.5	12	Yes; Background
P35N	VANADIUM	15.2	15.2	12	No; Background Well
PM1NA	VANADIUM	49.5	49.5	12	Yes; Background
PM4NA	VANADIUM	66	66	12	Yes; Background
RFI-MW10F	VANADIUM	72.9	51.175	12	Yes; Background
RFI-MW10I	VANADIUM	230	108.45	12	Yes; Background
RFI-MW12	VANADIUM	394	354.5	12	Yes; Background
RFI-MW16	VANADIUM	190	190	12	Yes; Background
RFI-MW22	VANADIUM	477	447.25	12	Yes; Background
RFI-MW25	VANADIUM	33.5	33.5	12	Yes; Background
RFI-MW3	VANADIUM	70	70	12	Yes; Background
RFI-MW8I	VANADIUM	50	33.3333	12	Yes; Background
RFI-MW9F	VANADIUM	50	24.75	12	Yes; Background
RFI-MW9I	VANADIUM	25.5	14.425	12	Yes; Background
WHI1-3S	VANADIUM	477	477	12	Yes; Background
WHI2-2S	VANADIUM	77	77	12	Yes; Background
WHI3-1S	VANADIUM	39.6	15.1875	12	No; Background Well
WHI6-2S	VANADIUM	106	45.675	12	Yes; Background
WHI9-2F	VANADIUM	52	52	12	Yes; Background
RFI-MW22	VINYL CHLORIDE	140	122.5	15	Yes: F& T
RFI-MW27	ZINC	178	178	120	Yes; Background
RFI-MW3	ZINC	182.75	182.75	120	Yes; Background
WHI2-2S	ZINC	666	666	120	Yes; Background
WHI6-2S	ZINC	552	198.475	120	Yes; Background

Notes:
(1) No background concentration was calculated for chloride or total cyanide, therefore these were moved directly to a fate and transport evaluation.
Well considered a background well

Table 5-3
Tier 2 Evaluation of Groundwater Surface Water Interface (GSI) Pathway
Groundwater: Inorganic GSI Exceedances compared to Background Concentrations
BASF North Works Facility
Wyandotte, MI

AREA	Chemical	Maximum Concentration (ug/L)	Mean Concentration (ug/L)	GSI (ug/L)	90th Percentile Background Concentration (ug/L)	Maximum Concentration Exceed Background?	Mean Concentration Exceed Background?	Do both Max and Mean exceed background? Therefore, require F&T?
PM4NA	ANTIMONY	13	13	2	NA	NA	NA	Requires F&T calcs.
RFI-MW10F	ANTIMONY	6.6	4.9167	2	NA	NA	NA	Requires F&T calcs.
RFI-MW10I	ANTIMONY	7.4	6.05	2	NA	NA	NA	Requires F&T calcs.
RFI-MW11	ANTIMONY	3.125	3.125	2	NA	NA	NA	Requires F&T calcs.
RFI-MW12	ANTIMONY	6.9	5.9	2	NA	NA	NA	Requires F&T calcs.
RFI-MW8	ANTIMONY	60	37.5	2	NA	NA	NA	Requires F&T calcs.
RFI-MW9F	ANTIMONY	31.025	30.2563	2	NA	NA	NA	Requires F&T calcs.
WHI6-2S	ANTIMONY	60	30.5125	2	NA	NA	NA	Requires F&T calcs.
WHI9-2F	ANTIMONY	3.6	3.6	2	NA	NA	NA	Requires F&T calcs.
CMS-MW-16	ARSENIC	273	273	50	45.1	YES	YES	YES
P-34-N	ARSENIC	51.4	51.4	50	45.1	YES	YES	YES
P36N	ARSENIC	77	77	50	45.1	YES	YES	YES
PM1NA	ARSENIC	565	565	50	45.1	YES	YES	YES
PM4NA	ARSENIC	300	300	50	45.1	YES	YES	YES
RFI-MW10F	ARSENIC	82.2	57.375	50	45.1	YES	YES	YES
RFI-MW10I	ARSENIC	314	203	50	45.1	YES	YES	YES
RFI-MW12	ARSENIC	397	348.75	50	45.1	YES	YES	YES
RFI-MW22	ARSENIC	110	105	50	45.1	YES	YES	YES
RFI-MW4	ARSENIC	106	72.8625	50	45.1	YES	YES	YES
WHI1-3S	ARSENIC	88	88	50	45.1	YES	YES	YES
CMS-MW-12	BARIUM	618.5	501.125	440	136.5	YES	YES	YES
RFI-MW10	BARIUM	1055	982.75	440	136.5	YES	YES	YES
RFI-MW3	BARIUM	1450	1450	440	136.5	YES	YES	YES
RFI-MW5	BARIUM	1080	991.625	440	136.5	YES	YES	YES
RFI-MW7F	BARIUM	604	491.75	440	136.5	YES	YES	YES
RFI-MW7I	BARIUM	3700	2605	440	136.5	YES	YES	YES
RFI-MW8	BARIUM	1090	1065	440	136.5	YES	YES	YES
RFI-MW8I	BARIUM	742	616	440	136.5	YES	YES	YES
WHI6-1S	BARIUM	677	551.125	440	136.5	YES	YES	YES
WHI6-4F	BARIUM	2650	734.9	440	136.5	YES	YES	YES
WHI6-4S	BARIUM	2670	1698.5	440	136.5	YES	YES	YES
RFI-MW10F	BERYLLIUM	5	2.55	2.4	NA	NA	NA	Requires F&T calcs.
RFI-MW10I	BERYLLIUM	5	2.5375	2.4	NA	NA	NA	Requires F&T calcs.
RFI-MW11	BERYLLIUM	5	2.5375	2.4	NA	NA	NA	Requires F&T calcs.
RFI-MW12	BERYLLIUM	5	2.55	2.4	NA	NA	NA	Requires F&T calcs.
RFI-MW12F	BERYLLIUM	5	2.55	2.4	NA	NA	NA	Requires F&T calcs.
RFI-MW22	BERYLLIUM	5	3.35	2.4	NA	NA	NA	Requires F&T calcs.
RFI-MW4	BERYLLIUM	5	2.5375	2.4	NA	NA	NA	Requires F&T calcs.
RFI-MW5	BERYLLIUM	5	2.6188	2.4	NA	NA	NA	Requires F&T calcs.
RFI-MW7I	BERYLLIUM	5	2.605	2.4	NA	NA	NA	Requires F&T calcs.
RFI-MW8	BERYLLIUM	5	2.5375	2.4	NA	NA	NA	Requires F&T calcs.
RFI-MW9	BERYLLIUM	5	2.5375	2.4	NA	NA	NA	Requires F&T calcs.
WHI6-1S	BERYLLIUM	5	2.55	2.4	NA	NA	NA	Requires F&T calcs.
WHI6-2F	BERYLLIUM	5	2.5375	2.4	NA	NA	NA	Requires F&T calcs.
WHI2-2S	CADMIUM	8	8	2.2	NA	NA	NA	Requires F&T calcs.
WHI9-2F	CADMIUM	2.9	2.9	2.2	NA	NA	NA	Requires F&T calcs.
CMS-MW-16	CHROMIUM	63.8	63.8	11	36.88	YES	YES	YES
P-34-N	CHROMIUM	18.25	18.25	11	36.88	NO	NO	NO
PM1NA	CHROMIUM	70	70	11	36.88	YES	YES	YES
PM4NA	CHROMIUM	41	41	11	36.88	YES	YES	YES
RFI-MW10I	CHROMIUM	59.2	21.225	11	36.88	YES	NO	NO
RFI-MW12	CHROMIUM	90.4	77.725	11	36.88	YES	YES	YES
RFI-MW13	CHROMIUM	54	54	11	36.88	YES	YES	YES
RFI-MW15	CHROMIUM	250	250	11	36.88	YES	YES	YES
RFI-MW16	CHROMIUM	23.8	23.8	11	36.88	NO	NO	NO
RFI-MW22	CHROMIUM	70.9	67.625	11	36.88	YES	YES	YES
RFI-MW25	CHROMIUM	701.25	701.25	11	36.88	YES	YES	YES
RFI-MW26	CHROMIUM	91.5	91.5	11	36.88	YES	YES	YES
RFI-MW3	CHROMIUM	76.25	76.25	11	36.88	YES	YES	YES
RFI-MW7F	CHROMIUM	32.9	20.175	11	36.88	NO	NO	NO
WHI1-3S	CHROMIUM	122	122	11	36.88	YES	YES	YES
WHI2-2S	CHROMIUM	62	62	11	36.88	YES	YES	YES
WHI6-2S	CHROMIUM	77	34.15	11	36.88	YES	NO	NO
CMS-MW-23	COPPER	25	14.2	9	12.5	YES	YES	YES
P26N	COPPER	10.4	9.35	9	12.5	NO	NO	NO
P-34-N	COPPER	24.25	24.25	9	12.5	YES	YES	YES
PM1NA	COPPER	39.5	39.5	9	12.5	YES	YES	YES
RFI-MW10F	COPPER	25	14.325	9	12.5	YES	YES	YES
RFI-MW10I	COPPER	30.3	12.3	9	12.5	YES	NO	NO
RFI-MW11	COPPER	25	15.625	9	12.5	YES	YES	YES
RFI-MW12	COPPER	25	12.125	9	12.5	YES	NO	NO
RFI-MW12F	COPPER	37.5	23.325	9	12.5	YES	YES	YES
RFI-MW15	COPPER	19	19	9	12.5	YES	YES	YES
RFI-MW16	COPPER	11.5	11.5	9	12.5	NO	NO	NO
RFI-MW22	COPPER	35.4	31.125	9	12.5	YES	YES	YES
RFI-MW25	COPPER	22.5	22.5	9	12.5	YES	YES	YES
RFI-MW3	COPPER	62.75	62.75	9	12.5	YES	YES	YES
RFI-MW7F	COPPER	43.4	21.3667	9	12.5	YES	YES	YES
RFI-MW8I	COPPER	30.3	14.9333	9	12.5	YES	YES	YES
RFI-MW9F	COPPER	25	15.625	9	12.5	YES	YES	YES
RFI-MW9I	COPPER	25	15.625	9	12.5	YES	YES	YES
WHI1-3S	COPPER	38	38	9	12.5	YES	YES	YES
WHI2-2S	COPPER	118	118	9	12.5	YES	YES	YES
WHI4-1S	COPPER	19	19	9	12.5	YES	YES	YES
WHI6-2S	COPPER	75	29.725	9	12.5	YES	YES	YES
WHI6-4F	COPPER	25	15.625	9	12.5	YES	YES	YES
WHI9-2F	COPPER	83	83	9	12.5	YES	YES	YES
P-34-N	LEAD	21.25	21.25	10	34.22	NO	NO	NO
PM1NA	LEAD	44.25	44.25	10	34.22	YES	YES	YES

Table 5-3
Tier 2 Evaluation of Groundwater Surface Water Interface (GSI) Pathway
Groundwater: Inorganic GSI Exceedances compared to Background Concentrations
BASF North Works Facility
Wyandotte, MI

AREA	Chemical	Maximum Concentration (ug/L)	Mean Concentration (ug/L)	GSI (ug/L)	90th Percentile Background Concentration (ug/L)	Maximum Concentration Exceed Background?	Mean Concentration Exceed Background?	Do both Max and Mean exceed background? Therefore, require F&T?
RFI-MW3	LEAD	36.25	36.25	10	34.22	YES	YES	YES
RFI-MW8I	LEAD	29.2	10.7333	10	34.22	NO	NO	NO
WHI1-3S	LEAD	13	13	10	34.22	NO	NO	NO
WHI2-2S	LEAD	239	239	10	34.22	YES	YES	YES
WHI6-2S	LEAD	41.6	16.125	10	34.22	YES	NO	NO
WHI9-2F	LEAD	140	140	10	34.22	YES	YES	YES
CMS-MW-16	MERCURY	1.6	1.6	0.0013	0.0387	YES	YES	YES
CMS-MW-2	MERCURY	0.964	0.6578	0.0013	0.0387	YES	YES	YES
CMS-MW-8	MERCURY	3.9	3.9	0.0013	0.0387	YES	YES	YES
ENSR BG-MW-1	MERCURY	0.0162	0.0099	0.0013	0.0387	NO	NO	NO
P26N	MERCURY	0.0075	0.0038	0.0013	0.0387	NO	NO	NO
PM1NA	MERCURY	0.55	0.55	0.0013	0.0387	YES	YES	YES
PM4NA	MERCURY	0.0526	0.0526	0.0013	0.0387	YES	YES	YES
RFI-MW1	MERCURY	0.0283	0.0283	0.0013	0.0387	NO	NO	NO
RFI-MW10	MERCURY	0.028	0.0081	0.0013	0.0387	NO	NO	NO
RFI-MW10F	MERCURY	10.7	7.041	0.0013	0.0387	YES	YES	YES
RFI-MW10I	MERCURY	2.79	2.2791	0.0013	0.0387	YES	YES	YES
RFI-MW11	MERCURY	0.0062	0.0018	0.0013	0.0387	NO	NO	NO
RFI-MW11F	MERCURY	0.0096	0.008	0.0013	0.0387	NO	NO	NO
RFI-MW12	MERCURY	3.14	1.2735	0.0013	0.0387	YES	YES	YES
RFI-MW12F	MERCURY	2.45	1.4352	0.0013	0.0387	YES	YES	YES
RFI-MW13	MERCURY	0.0554	0.0554	0.0013	0.0387	YES	YES	YES
RFI-MW15	MERCURY	0.00306	0.0031	0.0013	0.0387	NO	NO	NO
RFI-MW2	MERCURY	0.00416	0.0042	0.0013	0.0387	NO	NO	NO
RFI-MW22	MERCURY	0.0685	0.0505	0.0013	0.0387	YES	YES	YES
RFI-MW26	MERCURY	0.0197	0.0197	0.0013	0.0387	NO	NO	NO
RFI-MW5	MERCURY	0.181	0.1175	0.0013	0.0387	YES	YES	YES
RFI-MW6	MERCURY	0.373	0.3413	0.0013	0.0387	YES	YES	YES
RFI-MW7	MERCURY	0.121	0.121	0.0013	0.0387	YES	YES	YES
RFI-MW7F	MERCURY	0.0522	0.0181	0.0013	0.0387	YES	NO	NO
RFI-MW7I	MERCURY	0.0031	0.002	0.0013	0.0387	NO	NO	NO
RFI-MW8	MERCURY	0.0064	0.0024	0.0013	0.0387	NO	NO	NO
RFI-MW8F	MERCURY	1.6	0.3687	0.0013	0.0387	YES	YES	YES
RFI-MW8I	MERCURY	1.69	1.3883	0.0013	0.0387	YES	YES	YES
RFI-MW9F	MERCURY	0.422	0.2852	0.0013	0.0387	YES	YES	YES
RFI-MW9I	MERCURY	0.922	0.7707	0.0013	0.0387	YES	YES	YES
WHI2-2S	MERCURY	33.4	33.4	0.0013	0.0387	YES	YES	YES
WHI3-2S	MERCURY	0.0644	0.0644	0.0013	0.0387	YES	YES	YES
WHI4-1S	MERCURY	0.0673	0.0673	0.0013	0.0387	YES	YES	YES
WHI6-1F	MERCURY	0.0051	0.0026	0.0013	0.0387	NO	NO	NO
WHI6-1S	MERCURY	0.0374	0.0165	0.0013	0.0387	NO	NO	NO
WHI6-2F	MERCURY	0.0194	0.0129	0.0013	0.0387	NO	NO	NO
WHI6-2S	MERCURY	0.151	0.0553	0.0013	0.0387	YES	YES	YES
WHI6-4S	MERCURY	0.0074	0.0038	0.0013	0.0387	NO	NO	NO
WHI9-2F	MERCURY	0.757	0.757	0.0013	0.0387	YES	YES	YES
WHI9-2S	MERCURY	0.0411	0.0411	0.0013	0.0387	YES	YES	YES
P-34-N	NICKEL	67.5	67.5	52	43.63	YES	YES	YES
PM1NA	NICKEL	70	70	52	43.63	YES	YES	YES
PM4NA	NICKEL	53	53	52	43.63	YES	YES	YES
RFI-MW10I	NICKEL	197	102.35	52	43.63	YES	YES	YES
RFI-MW12	NICKEL	307	260	52	43.63	YES	YES	YES
RFI-MW12F	NICKEL	167	111.525	52	43.63	YES	YES	YES
RFI-MW15	NICKEL	1500	1500	52	43.63	YES	YES	YES
RFI-MW25	NICKEL	90	90	52	43.63	YES	YES	YES
RFI-MW3	NICKEL	100	100	52	43.63	YES	YES	YES
CMS-MW-16	SELENIUM	6	6	5	6.77	NO	NO	NO
RFI-MW10I	SELENIUM	8.3	6.225	5	6.77	YES	NO	NO
RFI-MW12	SELENIUM	8.7	5.45	5	6.77	YES	NO	NO
RFI-MW16	SELENIUM	7.05	7.05	5	6.77	YES	YES	YES
RFI-MW6	SELENIUM	8.5	6.8	5	6.77	YES	YES	YES
RFI-MW7F	SELENIUM	8.7	6.75	5	6.77	YES	NO	NO
WHI1-3S	SELENIUM	7	7	5	6.77	YES	YES	YES
P26N	THALLIUM	7.6	6.9	1.2	8.29	NO	NO	NO
RFI-MW1	THALLIUM	7.65	7.65	1.2	8.29	NO	NO	NO
RFI-MW10	THALLIUM	8.2	5.1375	1.2	8.29	NO	NO	NO
RFI-MW10F	THALLIUM	6.3	5.4333	1.2	8.29	NO	NO	NO
RFI-MW11	THALLIUM	7.075	5.5188	1.2	8.29	NO	NO	NO
RFI-MW11F	THALLIUM	5.3	4.4625	1.2	8.29	NO	NO	NO
RFI-MW12	THALLIUM	4.8	3.575	1.2	8.29	NO	NO	NO
RFI-MW12F	THALLIUM	4.9	3.625	1.2	8.29	NO	NO	NO
RFI-MW13	THALLIUM	7.8	7.8	1.2	8.29	NO	NO	NO
RFI-MW15	THALLIUM	9.6	9.6	1.2	8.29	YES	YES	YES
RFI-MW26	THALLIUM	10.1	10.1	1.2	8.29	YES	YES	YES
RFI-MW7I	THALLIUM	46.1	24.325	1.2	8.29	YES	YES	YES
RFI-MW8	THALLIUM	16.1	8	1.2	8.29	YES	NO	NO
RFI-MW9	THALLIUM	5.6	5.15	1.2	8.29	NO	NO	NO
RFI-MW9I	THALLIUM	5.15	4.1667	1.2	8.29	NO	NO	NO
WHI6-1F	THALLIUM	6.2	4.7625	1.2	8.29	NO	NO	NO
WHI6-1S	THALLIUM	7.2	5.825	1.2	8.29	NO	NO	NO
WHI6-2F	THALLIUM	10.4	6.5	1.2	8.29	YES	NO	NO
WHI6-2S	THALLIUM	10	5.5125	1.2	8.29	YES	NO	NO
WHI6-4F	THALLIUM	10	6.675	1.2	8.29	YES	NO	NO
WHI6-4S	THALLIUM	8	5.7625	1.2	8.29	NO	NO	NO
CMS-MW-16	VANADIUM	52.8	52.8	12	12	YES	YES	YES
CMS-MW-2	VANADIUM	50	17.7125	12	12	YES	YES	YES
P15N	VANADIUM	13	13	12	12	YES	YES	YES
P26N	VANADIUM	43.7	40.4	12	12	YES	YES	YES
P-34-N	VANADIUM	32.5	32.5	12	12	YES	YES	YES
PM1NA	VANADIUM	49.5	49.5	12	12	YES	YES	YES

Table 5-3
Tier 2 Evaluation of Groundwater Surface Water Interface (GSI) Pathway
Groundwater: Inorganic GSI Exceedances compared to Background Concentrations
BASF North Works Facility
Wyandotte, MI

AREA	Chemical	Maximum Concentration (ug/L)	Mean Concentration (ug/L)	GSI (ug/L)	90th Percentile Background Concentration (ug/L)	Maximum Concentration Exceed Background?	Mean Concentration Exceed Background?	Do both Max and Mean exceed background? Therefore, require F&T?
PM4NA	VANADIUM	66	66	12	12	YES	YES	YES
RFI-MW10F	VANADIUM	72.9	51.175	12	12	YES	YES	YES
RFI-MW10I	VANADIUM	230	108.45	12	12	YES	YES	YES
RFI-MW12	VANADIUM	394	354.5	12	12	YES	YES	YES
RFI-MW16	VANADIUM	190	190	12	12	YES	YES	YES
RFI-MW22	VANADIUM	477	447.25	12	12	YES	YES	YES
RFI-MW25	VANADIUM	33.5	33.5	12	12	YES	YES	YES
RFI-MW3	VANADIUM	70	70	12	12	YES	YES	YES
RFI-MW8I	VANADIUM	50	33.3333	12	12	YES	YES	YES
RFI-MW9F	VANADIUM	50	24.75	12	12	YES	YES	YES
RFI-MW9I	VANADIUM	25.5	14.425	12	12	YES	YES	YES
WHI1-3S	VANADIUM	477	477	12	12	YES	YES	YES
WHI2-2S	VANADIUM	77	77	12	12	YES	YES	YES
WHI6-2S	VANADIUM	106	45.675	12	12	YES	YES	YES
WHI9-2F	VANADIUM	52	52	12	12	YES	YES	YES
RFI-MW27	ZINC	178	178	120	83.72	YES	YES	YES
RFI-MW3	ZINC	182.75	182.75	120	83.72	YES	YES	YES
WHI2-2S	ZINC	666	666	120	83.72	YES	YES	YES
WHI6-2S	ZINC	552	198.475	120	83.72	YES	YES	YES

Table 5-4
Tier 2 Evaluation of Groundwater Surface Water Interface (GSI) Pathway
Downgradient Well Evaluation for Soil Exceedances
BASF North Works Facility
Wyandotte, MI

			Wells Near Downgradient to AOC/SWMU				Downgradient/Perimeter Wells						
Chemical (a)	MI Part 201 GSI Crtiteria (ug/L)	Back-ground (ug/L)	Nearby Well Coverage?	Location where detected in GW?	Nearby Wells Where Exceed GSI Criteria	Maximum Concentration in Nearby Well (ug/L)	Downgradient Well Coverage?	Location where detected in GW?	Maximum Concentration in Downgradient Well (ug/L)	Downgradient Wells Where Exceed GSI Criteria	Well With max Conc./Well Used Used as SurrOgate	Is Soil-to-Groundwater Pathway and Transport in Groundwater Suggested by Data?	Basis
AOC 2													
CHROMIUM	11	36.88	RFI-MW-15, RFI-MW-16, CMS-MW-16, WHI6-5S, WHI6-5F	CMS-MW-16, RFI-MW-15	CMS-MW-16, RFI-MW-15	250J	RFI-MW-4, RFI-MW-5, RFI-MW-6, CMS-MW-5, P40N	RFI-MW-5, RFI-MW-6	1.8J	None	RFI-MW-15	No	1
MERCURY	0.0013	0.0387	RFI-MW-15, RFI-MW-16, CMS-MW-16, WHI6-5S, WHI6-5F	CMS-MW-16	CMS-MW-16	1.6	RFI-MW-4, RFI-MW-5, RFI-MW-6, CMS-MW-5, P40N	RFI-MW-4, RFI-MW-5, RFI-MW-6	0.373	RFI-MW-6	CMS-MW-16	Yes	2
TOTAL CYANIDE	5.2	NA	RFI-MW-15, RFI-MW-16, CMS-MW-16, WHI6-5S, WHI6-5F	CMS-MW-16	CMS-MW-16	980	RFI-MW-4, RFI-MW-5, RFI-MW-6, CMS-MW-5, P40N	RFI-MW-4, RFI-MW-5, RFI-MW-6	69J	None	CMS-MW-16	No	1
AOC 4													
BENZENE	12	NA	P26N, CMS-MW-4, RFI-MW-14, WHI6-3S/F	P26N, WHI6-3F	P26N, WHI6-3F	150	RFI-MW-3, RFI-MW-4, WHI6-4S/F, WHI6-2S	None	Not Detected Above Detection Limits	None	P26N	No	1
DIBENZOFURAN	4	NA	P26N, CMS-MW-4, RFI-MW-14, WHI6-3S/F	Not Detected Above Detection Limits	None	NA	RFI-MW-3, RFI-MW-4, WHI6-4S/F, WHI6-2S	WHI6-2S	5.8J	WHI6-2S	WHI6-2S	Yes	2
FLUORANTHENE	1.6	NA	P26N, CMS-MW-4, RFI-MW-14, WHI6-3S/F	Not Detected Above Detection Limits	None	NA	RFI-MW-3, RFI-MW-4, WHI6-4S/F, WHI6-2S	WHI6-2S	27	WHI6-2S	WHI6-2S	Yes	2
MERCURY	0.0013	0.0387	P26N, CMS-MW-4, RFI-MW-14, WHI6-3S/F	P26N	P26N	0.0075	RFI-MW-3, RFI-MW-4, WHI6-4S/F, WHI6-2S	WHI6-4S/F, WHI6-2S, RFI-MW-4	0.151	WHI6-2S	WHI6-2S	Yes	2
PHENANTHRENE	2.4	NA	P26N, CMS-MW-4, RFI-MW-14, WHI6-3S/F	Not Detected Above Detection Limits	None	NA	RFI-MW-3, RFI-MW-4, WHI6-4S/F, WHI6-2S	WHI6-2S	22	WHI6-2S	WHI6-2S	No	3
THALLIUM	1.2	8.29	P26N, CMS-MW-4, RFI-MW-14, WHI6-3S/F	P26N	P26N	7.6	RFI-MW-3, RFI-MW-4, WHI6-4S/F, WHI6-2S	WHI6-2S/F, WHI6-4S/F	8.0J	WHI6-4S	NA, all conc. below background (8.29 ug/L)	No	4
TOTAL CYANIDE	5.2	NA	P26N, CMS-MW-4, RFI-MW-14, WHI6-3S/F	P26N, CMS-MW-4, WHI6-3S/F	None	120J	RFI-MW-3, RFI-MW-4, WHI6-4S/F, WHI6-2S	RFI-MW-4, WHI6-4F, WHI6-2F	69J	RFI-MW-4	P26N	Yes	2
AOC 7A													
CHROMIUM	11	36.88	CMS-MW-1, RFI-MW-23	RFI-MW-23 (1)	RFI-MW-23 (1)	18.75	RFI-MW22, CMS-MW-2, P30N	RFI-MW22, CMS-MW-2	70.9	RFI-MW22	RFI-MW22	No	4
MERCURY	0.0013	0.0387	CMS-MW-1, RFI-MW-23	Not Detected Above Detection Limits	NA	NA	RFI-MW22, CMS-MW-2, P30N	RFI-MW22, CMS-MW-2	0.389	RFI-MW22, CMS-MW-2	CMS-MW-2	No	3
SELENIUM	5	6.77	CMS-MW-1, RFI-MW-23	None	None	NA	RFI-MW22, CMS-MW-2, P30N	CMS-MW-2, RFI-MW22	5.5	CMS-MW2	NA, all conc. below background (6.77 ug/L)	No	4
TOTAL CYANIDE	5.2	NA	CMS-MW-1, RFI-MW-23	RFI-MW-23 (1)	None	1.4	RFI-MW22, CMS-MW-2, P30N	RFI-MW-22, CMS-MW2	15	None	RFI-MW-22	No	5
SWMU F													
1,2-DICHLOROPROPANE	9.1	NA	P16N, RFI-MW-17	No Data Available	NA	NA	CMS-MW-5, CMS-MW-6, RFI-MW-6, RFI-MW-7, P18N, WHI7-2F	RFI-MW6, RFI-MW7F	10J	RFI-MW6	RFI-MW6	Yes	7
COPPER	9	12.5	P16N, RFI-MW-17	No Data Available	NA	NA	CMS-MW-5, CMS-MW-6, RFI-MW-6, RFI-MW-7, P18N, WHI7-2F	RFI-MW7/7F	22.15	RFI-MW7/7F	RFI-MW7F	Yes	7
MERCURY	0.0013	0.0387	P16N, RFI-MW-17	No Data Available	NA	NA	CMS-MW-5, RFI-MW-6, CMS-MW-6, RFI-MW-7, P18N, WHI7-2F	RFI-MW6, RFI-MW7/F/I	0.373	RFI-MW6	RFI-MW6	Yes	7
SELENIUM	5	6.77	P16N, RFI-MW-17	No Data Available	NA	NA	CMS-MW-5, RFI-MW-6, CMS-MW-6, RFI-MW-7, P18N, WHI7-2F	RFI-MW6, RFI-MW7F	5.6	RFI-MW7F	RFI-MW7F	No	4
TOTAL CYANIDE	5.2	NA	P16N, RFI-MW-17	No Data Available	NA	NA	CMS-MW-5, RFI-MW-6, CMS-MW-6, RFI-MW-7, P18N, WHI7-2F	RFI-MW6, RFI-MW7/F/I	210	RFI-MW-7I	RFI-MW7I	Yes	7
SWMU G													
ARSENIC	50	45.1	CMS-MW-12, PM1NA, PM4NA, P6N, WHI9-5F, WHI9-4F, WHI9-3F, WHI9-2F/S	WHI9-2F (1), PM4NA(1), PM1NA(1)	PM1NA (1), PM4NA (1)	610	RFI-MW-9, RFI-MW-10, RFI-MW-19, CMS-MW8, CMS-MW-9	RFI-MW9/F/I, RFI-MW-10/I/F	314	RFI-MW-10I	PM1NA	Yes	2
MERCURY	0.0013	0.0387	CMS-MW-12, PM1NA, PM4NA, P6N, WHI9-5F, WHI9-4F, WHI9-3F, WHI9-2F/S	PM1NA, PM4NA, WHI9-2F/S	PM1NA, PM4NA, WHI9-2F/S	2	RFI-MW-9, RFI-MW-10, RFI-MW-19, CMW-MW8, CMS-MW-9	RFI-MW9/F/I, RFI-MW-10/I/F, CMS-MW8 (1)	10.7	RFI-MW10F	RFI-MW10F	Yes	2

Table 5-4
Tier 2 Evaluation of Groundwater Surface Water Interface (GSI) Pathway
Downgradient Well Evaluation for Soil Exceedances
BASF North Works Facility
Wyandotte, MI

Chemical (a)	MI Part 201 GSI Crtiteria (ug/L)	Back-ground (ug/L)	Nearby Well Coverage?	Location where detected in GW?	Nearby Wells Where Exceed GSI Criteria	Maximum Concentration in Nearby Well (ug/L)	Downgradient Well Coverage?	Location where detected in GW?	Maximum Concentration in Downgradient Well (ug/L)	Downgradient Wells Where Exceed GSI Criteria	Well With max Conc./Well Used Used as SurrOgate	Is Soil-to-Groundwater Pathway and Transport in Groundwater Suggested by Data?	Basis
SWMU H													
1.2-DICHLOROPROPANE	9.1	NA	AOC5-MIP-7, AOC5-MIP-8, AOC5-MIP-13, AOC5-MIP-17, AOC5-MIP-25, P43N, P1NB, PM1NB, WHI7-3F, P42N	AOC5-MIP-7, AOC5-MIP-8, AOC5-MIP-13, AOC5-MIP-17, AOC5-MIP-25,	AOC5-MIP-25	2400000	RFI-MW-8, CMS-MW-7, P18N	Not Detected Above Detection Limits	NA	NA	AOC-MIP-25	No	1
BIS(2-CHLOROETHYL)ETHER	1	NA	AOC5-MIP-7, AOC5-MIP-8, AOC5-MIP-13, AOC5-MIP-17, AOC5-MIP-25, P43N, P1NB, PM1NB, WHI7-3F, P42N	AOC5-MIP-7, AOC5-MIP-8, AOC5-MIP-13, AOC5-MIP-17, AOC5-MIP-25,	AOC5-MIP-8	140000	RFI-MW-8, CMS-MW-7, P18N	Not Detected Above Detection Limits	NA	NA	AOC5-MIP-8	No	1
BIS(2-CHLOROISOPROPYL)ETHER	1	NA	AOC5-MIP-7, AOC5-MIP-8, AOC5-MIP-13, AOC5-MIP-17, AOC5-MIP-25, P43N, P1NB, PM1NB, WHI7-3F, P42N	AOC5-MIP-7, AOC5-MIP-8, AOC5-MIP-13, AOC5-MIP-17, AOC5-MIP-25,	AOC5-MIP-25	485000	RFI-MW-8, CMS-MW-7, P18N	Not Detected Above Detection Limits	NA	NA	AOC5-MIP-25	No	1
CHROMIUM	11	36.88	AOC5-MIP-7, AOC5-MIP-8, AOC5-MIP-13, AOC5-MIP-17, AOC5-MIP-25, P43N, P1NB, PM1NB, WHI7-3F, P42N	No Data Available	NA	NA	RFI-MW-8, CMS-MW-7, P18N	RFI-MW-8/I	7.6	NA	NA, all conc. below background (36.88 ug/L)	No	4
MERCURY	0.0013	0.0387	AOC5-MIP-7, AOC5-MIP-8, AOC5-MIP-13, AOC5-MIP-17, AOC5-MIP-25, P43N, P1NB, PM1NB, WHI7-3F, P42N	No Data Available	NA	NA	RFI-MW-8, CMS-MW-7, P18N	RFI-MW-8/8I/8F	1.69J	RFI-MW-8I	RFI-MW-8I	Yes	7
NAPHTHALENE	13	NA	AOC5-MIP-7, AOC5-MIP-8, AOC5-MIP-13, AOC5-MIP-17, AOC5-MIP-25, P43N, P1NB, PM1NB, WHI7-3F, P42N	No Data Available	NA	NA	RFI-MW-8, CMS-MW-7, P18N	RFI-MW-8I/8F	100	RFI-MW-8I	RFI-MW-8I	Yes	7

Notes:
(1) Data from prior to 2006.
Basis
1) Concentrations far downgradient of soil exceedance decline below GSI.
2) Concentrations both near soil exceedance and further downgradient exceed GSI.
3) Concentrations in near downgradient wells are not detected. Concentrations that exceed the GSI further downgradient are not necessarily linked to soil exceedances.
4) Concentrations are below background concentrations.
5) Neither near nor far downgradient indicate concentrations exceed GSI.
6) Concentrations near downgradient of soil exceedance are greater than GSI. No data available further downgradient. Conservatively assumed that concentrations persist greater than GSI with distance from the soil exceedance.
7) Insufficient data. Assumed to require fate and transport calculations.

Table 5-5
Tier 2 Evaluation of Groundwater Surface Water Interface (GSI) Pathway
Groundwater: Fate and Transport Results for Inorganics
BASF North Works Facility
Wyandotte, MI

AREA	Chemical	Maximum Concentration (ug/L)	Mean Concentration (ug/L)	GSI (ug/L)	90th Percentile Background Concentration (ug/L)	Downgradient of	Approximate Distance to River or Property Line (feet)	Kd (2)	Will COI reach river above greater of {background, GSI}, ever?	Comments
CMS-MW-12	BARIUM	618.5	501.125	440	136.5	SWMU G, AOC 6	265	41	NO	
CMS-MW-16	ARSENIC	273	273	50	45.1	AOC 2	220	29	YES	
CMS-MW-16	CHROMIUM	63.8	63.8	11	36.88	AOC 2	220	1	YES	
CMS-MW-16	MERCURY	1.6	1.6	0.0013	0.0387	AOC 2	220	52	NO	Surrogate for AOC 2
CMS-MW-16	TOTAL CYANIDE	980	980	5.2	NA	AOC 2	220	9.9	YES	Surrogate for AOC 2
CMS-MW-16	VANADIUM	52.8	52.8	12	NA	AOC 2	220	1000	NO	
CMS-MW-2	CHLORIDE	538000	424500	125000	NA	NA	35	1	YES	
CMS-MW-2	COPPER	25	14.2	9	12.5	NA	35	360	NO	
CMS-MW-2	MERCURY	0.964	0.6578	0.0013	0.0387	NA	35	52	YES	Surrogate for AOC 7A
CMS-MW-2	TOTAL CYANIDE	15	15	5.2	NA	NA	35	9.9	YES	
CMS-MW-2	VANADIUM	50	17.7125	12	NA	NA	35	1000	NO	
CMS-MW-4	CHLORIDE	1950000	1950000	125000	NA	AOC 4	270	1	YES	
CMS-MW-4	TOTAL CYANIDE	39	39	5.2	NA	AOC 4	270	9.9	YES	
CMS-MW-8	MERCURY	3.9	3.9	0.0013	0.0387	NA	30	52	YES	
P15N	VANADIUM	13	13	12	NA	NA	(1)	1000	NA	
P26N	CHLORIDE	26800000	26800000	125000	NA	AOC 4	530	1	YES	
P26N	TOTAL CYANIDE	120	109	5.2	NA	AOC 4	530	9.9	YES	Surrogate for AOC 4
P26N	VANADIUM	43.7	40.4	12	NA	AOC 4	530	1000	NO	
P-34-N	ARSENIC	51.4	51.4	50	45.1	NA	(1)	29	NA	
P-34-N	COPPER	24.25	24.25	9	12.5	NA	(1)	360	NA	
P-34-N	NICKEL	67.5	67.5	52	43.63	NA	(1)	65	NA	
P-34-N	TOTAL CYANIDE	20	20	5.2	NA	NA	(1)	9.9	NA	
P-34-N	VANADIUM	32.5	32.5	12	NA	NA	(1)	1000	NA	
P36N	ARSENIC	77	77	50	45.1	NA	(1)	29	NA	
PM1NA	ARSENIC	565	565	50	45.1	SWMU G, AOC 6	265	29	NO	Surrogate for SWMU G
PM1NA	CHROMIUM	70	70	11	36.88	SWMU G, AOC 6	265	1	YES	
PM1NA	COPPER	39.5	39.5	9	12.5	SWMU G, AOC 6	265	360	NO	
PM1NA	LEAD	44.25	44.25	10	34.22	SWMU G, AOC 6	265	11000	NO	
PM1NA	MERCURY	0.55	0.55	0.0013	0.0387	SWMU G, AOC 6	265	52	NO	
PM1NA	NICKEL	70	70	52	43.63	SWMU G, AOC 6	265	65	NO	
PM1NA	TOTAL CYANIDE	68	68	5.2	NA	SWMU G, AOC 6	265	9.9	YES	
PM1NA	VANADIUM	49.5	49.5	12	NA	SWMU G, AOC 6	265	1000	NO	
PM4NA	ANTIMONY	13	13	2	NA	SWMU G, AOC 6	265	45	NO	
PM4NA	ARSENIC	300	300	50	45.1	SWMU G, AOC 6	265	29	NO	
PM4NA	CHLORIDE	22000000	22000000	125000	NA	SWMU G, AOC 6	265	1	YES	
PM4NA	CHROMIUM	41	41	11	36.88	SWMU G, AOC 6	265	1	YES	
PM4NA	MERCURY	0.0526	0.0526	0.0013	0.0387	SWMU G, AOC 6	265	52	NO	
PM4NA	NICKEL	53	53	52	43.63	SWMU G, AOC 6	265	65	NO	
PM4NA	VANADIUM	66	66	12	NA	SWMU G, AOC 6	265	1000	NO	
RFI-MW1	CHLORIDE	18500000	18500000	125000	NA	NA	45	1	YES	
RFI-MW10	BARIUM	1055	982.75	440	136.5	NA	55	41	YES	
RFI-MW10	CHLORIDE	927000	896000	125000	NA	NA	55	1	YES	
RFI-MW10	TOTAL CYANIDE	13.55	13.55	5.2	NA	NA	55	9.9	YES	
RFI-MW10F	ANTIMONY	6.6	4.9167	2	NA	NA	55	45	YES	
RFI-MW10F	ARSENIC	82.2	57.375	50	45.1	NA	55	29	YES	
RFI-MW10F	BERYLLIUM	5	2.55	2.4	NA	NA	55	790	NO	
RFI-MW10F	CHLORIDE	592000	534500	125000	NA	NA	55	1	YES	
RFI-MW10F	COPPER	25	14.325	9	12.5	NA	55	360	NO	
RFI-MW10F	MERCURY	10.7	7.041	0.0013	0.0387	NA	55	52	YES	Surrogate for SWMU G
RFI-MW10F	TOTAL CYANIDE	480	480	5.2	NA	NA	55	9.9	YES	
RFI-MW10F	VANADIUM	72.9	51.175	12	NA	NA	55	1000	NO	
RFI-MW10I	ANTIMONY	7.4	6.05	2	NA	NA	55	45	YES	
RFI-MW10I	ARSENIC	314	203	50	45.1	NA	55	29	YES	
RFI-MW10I	BERYLLIUM	5	2.5375	2.4	NA	NA	55	790	NO	
RFI-MW10I	CHLORIDE	2510000	2250000	125000	NA	NA	55	1	YES	
RFI-MW10I	MERCURY	2.79	2.2791	0.0013	0.0387	NA	55	52	YES	
RFI-MW10I	NICKEL	197	102.35	52	43.63	NA	55	65	YES	
RFI-MW10I	TOTAL CYANIDE	2000	2000	5.2	NA	NA	55	9.9	YES	
RFI-MW10I	VANADIUM	230	108.45	12	NA	NA	55	1000	NO	
RFI-MW11	ANTIMONY	3.125	3.125	2	NA	NA	70	45	YES	
RFI-MW11	BERYLLIUM	5	2.5375	2.4	NA	NA	70	790	NO	
RFI-MW11	CHLORIDE	168000	157000	125000	NA	NA	70	1	YES	
RFI-MW11	COPPER	25	15.625	9	12.5	NA	70	360	NO	
RFI-MW11F	CHLORIDE	558000	524500	125000	NA	NA	70	1	YES	
RFI-MW11F	TOTAL CYANIDE	200	200	5.2	NA	NA	70	9.9	YES	
RFI-MW12	ANTIMONY	6.9	5.9	2	NA	NA	50	45	YES	
RFI-MW12	ARSENIC	397	348.75	50	45.1	NA	50	29	YES	
RFI-MW12	BERYLLIUM	5	2.55	2.4	NA	NA	50	790	NO	
RFI-MW12	CHLORIDE	11600000	10420000	125000	NA	NA	50	1	YES	
RFI-MW12	CHROMIUM	90.4	77.725	11	36.88	NA	50	1	YES	
RFI-MW12	COPPER	25	12.125	9	12.5	NA	50	360	NO	
RFI-MW12	MERCURY	3.14	1.2735	0.0013	0.0387	NA	50	52	YES	
RFI-MW12	NICKEL	307	260	52	43.63	NA	50	65	YES	
RFI-MW12	TOTAL CYANIDE	1000	1000	5.2	NA	NA	50	9.9	YES	
RFI-MW12	VANADIUM	394	354.5	12	NA	NA	50	1000	NO	
RFI-MW12F	BERYLLIUM	5	2.55	2.4	NA	NA	50	790	NO	
RFI-MW12F	CHLORIDE	941000	844000	125000	NA	NA	50	1	YES	
RFI-MW12F	COPPER	37.5	23.325	9	12.5	NA	50	360	NO	
RFI-MW12F	MERCURY	2.45	1.4352	0.0013	0.0387	NA	50	52	YES	
RFI-MW12F	NICKEL	167	111.525	52	43.63	NA	50	65	YES	
RFI-MW13	CHLORIDE	19000000	19000000	125000	NA	NA	202	1	YES	
RFI-MW13	CHROMIUM	54	54	11	36.88	NA	202	1	YES	

Table 5-5
Tier 2 Evaluation of Groundwater Surface Water Interface (GSI) Pathway
Groundwater: Fate and Transport Results for Inorganics
BASF North Works Facility
Wyandotte, MI

AREA	Chemical	Maximum Concentration (ug/L)	Mean Concentration (ug/L)	GSI (ug/L)	90th Percentile Background Concentration (ug/L)	Downgradient of	Approximate Distance to River or Property Line (feet)	Kd (2)	Will COI reach river above greater of {background, GSI}, ever?	Comments
RFI-MW13	MERCURY	0.0554	0.0554	0.0013	0.0387	NA	202	52	NO	
RFI-MW14	CHLORIDE	50300000	50300000	125000	NA	AOC4	260	1	YES	
RFI-MW15	CHLORIDE	11000000	11000000	125000	NA	AOC 2	300	1	YES	
RFI-MW15	CHROMIUM	250	250	11	36.88	AOC 2	300	1	YES	Surrogate for AOC 2
RFI-MW15	COPPER	19	19	9	12.5	AOC 2	300	360	NO	
RFI-MW15	NICKEL	1500	1500	52	43.63	AOC 2	300	65	NO	
RFI-MW15	THALLIUM	9.6	9.6	1.2	8.29	AOC 2	300	71	YES	
RFI-MW16	SELENIUM	7.05	7.05	5	6.77	AOC 2	580	5	NO	
RFI-MW16	TOTAL CYANIDE	390	390	5.2	NA	AOC 2	580	9.9	YES	
RFI-MW16	VANADIUM	190	190	12	NA	AOC 2	580	1000	NO	
RFI-MW22	ARSENIC	110	105	50	45.1	AOC 7A	35	29	YES	
RFI-MW22	BERYLLIUM	5	3.35	2.4	NA	AOC 7A	35	790	NO	
RFI-MW22	CHLORIDE	3720000	3605000	125000	NA	AOC 7A	35	1	YES	
RFI-MW22	CHROMIUM	70.9	67.625	11	36.88	AOC 7A	35	1	YES	Surrogate for AOC 7A
RFI-MW22	COPPER	35.4	31.125	9	12.5	AOC 7A	35	360	NO	
RFI-MW22	MERCURY	0.0685	0.0505	0.0013	0.0387	AOC 7A	35	52	YES	
RFI-MW22	TOTAL CYANIDE	1500	1500	5.2	NA	AOC 7A	35	9.9	YES	Surrogate for AOC 7A
RFI-MW22	VANADIUM	477	447.25	12	NA	AOC 7A	35	1000	NO	
RFI-MW25	CHROMIUM	701.25	701.25	11	36.88	NA	(1)	1	NA	
RFI-MW25	NICKEL	90	90	52	43.63	NA	(1)	65	NA	
RFI-MW25	TOTAL CYANIDE	440	440	5.2	NA	NA	(1)	9.9	NA	
RFI-MW25	VANADIUM	33.5	33.5	12	NA	NA	(1)	1000	NA	
RFI-MW26	CHLORIDE	1200000	1200000	125000	NA	NA	(1)	1	NA	
RFI-MW26	CHROMIUM	91.5	91.5	11	36.88	NA	(1)	1	NA	
RFI-MW26	THALLIUM	10.1	10.1	1.2	8.29	NA	(1)	71	NA	
RFI-MW27	TOTAL CYANIDE	48	48	5.2	NA	NA	(1)	9.9	NA	
RFI-MW27	ZINC	178	178	120	83.72	NA	(1)	62	NA	
RFI-MW3	BARIUM	1450	1450	440	136.5	AOC 2, AOC 4	90	41	YES	
RFI-MW3	CHROMIUM	76.25	76.25	11	36.88	AOC 2, AOC 4	90	1	YES	
RFI-MW3	COPPER	62.75	62.75	9	12.5	AOC 2, AOC 4	90	360	NO	
RFI-MW3	LEAD	36.25	36.25	10	34.22	AOC 2, AOC 4	90	11000	NO	
RFI-MW3	NICKEL	100	100	52	43.63	AOC 2, AOC 4	90	65	YES	
RFI-MW3	VANADIUM	70	70	12	NA	AOC 2, AOC 4	90	1000	NO	
RFI-MW3	ZINC	182.75	182.75	120	83.72	AOC 2, AOC 4	90	62	YES	
RFI-MW4	ARSENIC	106	72.8625	50	45.1	AOC 2	50	29	YES	
RFI-MW4	BERYLLIUM	5	2.5375	2.4	NA	AOC 2	50	790	NO	
RFI-MW4	CHLORIDE	2400000	2400000	125000	NA	AOC 2	50	1	YES	
RFI-MW4	CHLORIDE	2390000	2390000	125000	NA	AOC 2	50	1	YES	
RFI-MW4	TOTAL CYANIDE	69	69	5.2	NA	AOC 2	50	9.9	YES	
RFI-MW5	BARIUM	1080	991.625	440	136.5	AOC 2	40	41	YES	
RFI-MW5	BERYLLIUM	5	2.6188	2.4	NA	AOC 2	40	790	NO	
RFI-MW5	CHLORIDE	8050000	6355000	125000	NA	AOC 2	40	1	YES	
RFI-MW5	MERCURY	0.181	0.1175	0.0013	0.0387	AOC 2	40	52	YES	
RFI-MW6	CHLORIDE	3110000	3087500	125000	NA	AOC 2	50	1	YES	
RFI-MW6	MERCURY	0.373	0.3413	0.0013	0.0387	AOC 2	50	52	YES	Surrogate for SWMU F
RFI-MW6	SELENIUM	8.5	6.8	5	6.77	AOC 2	50	5	YES	Surrogate for SWMU F
RFI-MW6	TOTAL CYANIDE	18	18	5.2	NA	AOC 2	50	9.9	YES	
RFI-MW7	CHLORIDE	5200000	5200000	125000	NA	SWMU F	125	1	YES	
RFI-MW7	MERCURY	0.121	0.121	0.0013	0.0387	SWMU F	125	52	YES	
RFI-MW7F	BARIUM	604	491.75	440	136.5	SWMU F	125	41	NO	
RFI-MW7F	CHLORIDE	993000	847500	125000	NA	SWMU F	125	1	YES	
RFI-MW7F	COPPER	43.4	21.3667	9	12.5	SWMU F	125	360	NO	Surrogate for SWMU F
RFI-MW7I	BARIUM	3700	2605	440	136.5	SWMU F	125	41	YES	
RFI-MW7I	BERYLLIUM	5	2.605	2.4	NA	SWMU F	125	790	NO	
RFI-MW7I	CHLORIDE	28200000	28200000	125000	NA	SWMU F	125	1	YES	
RFI-MW7I	CHLORIDE	24900000	24900000	125000	NA	SWMU F	125	1	YES	
RFI-MW7I	THALLIUM	46.1	24.325	1.2	8.29	SWMU F	125	71	YES	
RFI-MW7I	TOTAL CYANIDE	210	210	5.2	NA	SWMU F	125	9.9	YES	Surrogate for SWMU F
RFI-MW8	ANTIMONY	60	37.5	2	NA	RFIMW09	55	45	YES	
RFI-MW8	BARIUM	1090	1065	440	136.5	RFIMW09	55	41	YES	
RFI-MW8	BERYLLIUM	5	2.5375	2.4	NA	RFIMW09	55	790	NO	
RFI-MW8	CHLORIDE	3045000	3045000	125000	NA	RFIMW09	55	1	YES	
RFI-MW8	CHLORIDE	2900000	2900000	125000	NA	RFIMW09	55	1	YES	
RFI-MW8F	CHLORIDE	455000	194066.6667	125000	NA	RFIMW09	55	1	YES	
RFI-MW8F	MERCURY	1.6	0.3687	0.0013	0.0387	RFIMW09	55	52	YES	
RFI-MW8I	BARIUM	742	616	440	136.5	RFIMW09	55	41	YES	
RFI-MW8I	CHLORIDE	415000	415000	125000	NA	RFIMW09	55	1	YES	
RFI-MW8I	COPPER	30.3	14.9333	9	12.5	RFIMW09	55	360	NO	
RFI-MW8I	MERCURY	1.69	1.3883	0.0013	0.0387	RFIMW09	55	52	YES	Surrogate for SWMU H
RFI-MW8I	VANADIUM	50	33.3333	12	NA	RFIMW09	55	1000	NO	
RFI-MW9	BERYLLIUM	5	2.5375	2.4	NA	NA	70	790	NO	
RFI-MW9	CHLORIDE	6590000	6220000	125000	NA	NA	70	1	YES	
RFI-MW9	TOTAL CYANIDE	6.3	6.3	5.2	NA	NA	70	9.9	YES	
RFI-MW9F	ANTIMONY	31.025	30.2563	2	NA	NA	70	45	YES	
RFI-MW9F	CHLORIDE	140000	140000	125000	NA	NA	70	1	YES	
RFI-MW9F	COPPER	25	15.625	9	12.5	NA	70	360	NO	
RFI-MW9F	MERCURY	0.422	0.2852	0.0013	0.0387	NA	70	52	YES	
RFI-MW9F	TOTAL CYANIDE	6.9	6.9	5.2	NA	NA	70	9.9	YES	
RFI-MW9F	VANADIUM	50	24.75	12	NA	NA	70	1000	NO	
RFI-MW9I	CHLORIDE	3360000	3265000	125000	NA	NA	70	1	YES	
RFI-MW9I	COPPER	25	15.625	9	12.5	NA	70	360	NO	
RFI-MW9I	MERCURY	0.922	0.7707	0.0013	0.0387	NA	70	52	YES	

Table 5-5
Tier 2 Evaluation of Groundwater Surface Water Interface (GSI) Pathway
Groundwater: Fate and Transport Results for Inorganics
BASF North Works Facility
Wyandotte, MI

AREA	Chemical	Maximum Concentration (ug/L)	Mean Concentration (ug/L)	GSI (ug/L)	90th Percentile Background Concentration (ug/L)	Downgradient of	Approximate Distance to River or Property Line (feet)	Kd (2)	Will COI reach river above greater of {background, GSI}, ever?	Comments
RFI-MW9I	TOTAL CYANIDE	34	34	5.2	NA	NA	70	9.9	YES	
RFI-MW9I	VANADIUM	25.5	14.425	12	NA	NA	70	1000	NO	
WHI1-3S	ARSENIC	88	88	50	45.1	AOC 7A	425	29	NO	
WHI1-3S	CHROMIUM	122	122	11	36.88	AOC 7A	425	1	YES	
WHI1-3S	COPPER	38	38	9	12.5	AOC 7A	425	360	NO	
WHI1-3S	SELENIUM	7	7	5	6.77	AOC 7A	425	5	YES	
WHI1-3S	VANADIUM	477	477	12	NA	AOC 7A	425	1000	NO	
WHI2-2S	CADMIUM	8	8	2.2	NA	AOC 7B	(1)	75	NA	
WHI2-2S	CHROMIUM	62	62	11	36.88	AOC 7B	(1)	1	NA	Surrogate for AOC 7B
WHI2-2S	COPPER	118	118	9	12.5	AOC 7B	(1)	360	NA	
WHI2-2S	LEAD	239	239	10	34.22	AOC 7B	(1)	11000	NA	
WHI2-2S	MERCURY	33.4	33.4	0.0013	0.0387	AOC 7B	(1)	52	NA	Surrogate for AOC 7B
WHI2-2S	VANADIUM	77	77	12	NA	AOC 7B	(1)	1000	NA	
WHI2-2S	ZINC	666	666	120	83.72	AOC 7B	(1)	62	NA	
WHI3-2S	MERCURY	0.0644	0.0644	0.0013	0.0387	NA	(1)	52	NA	
WHI4-1S	CHLORIDE	140000	140000	125000	NA	NA	(1)	1	NA	
WHI4-1S	COPPER	19	19	9	12.5	NA	(1)	360	NA	
WHI4-1S	MERCURY	0.0673	0.0673	0.0013	0.0387	NA	(1)	52	NA	
WHI6-1F	CHLORIDE	1080000	1080000	125000	NA	NA	25	1	YES	
WHI6-1F	CHLORIDE	9510000	9510000	125000	NA	NA	25	1	YES	
WHI6-1F	TOTAL CYANIDE	36	36	5.2	NA	NA	25	9.9	YES	
WHI6-1S	BARIUM	677	551.125	440	136.5	NA	25	41	YES	
WHI6-1S	BERYLLIUM	5	2.55	2.4	NA	NA	25	790	NO	
WHI6-1S	CHLORIDE	5211000	5211000	125000	NA	NA	25	1	YES	
WHI6-1S	CHLORIDE	14800000	14800000	125000	NA	NA	25	1	YES	
WHI6-1S	TOTAL CYANIDE	23.25	23.25	5.2	NA	NA	25	9.9	YES	
WHI6-2F	BERYLLIUM	5	2.5375	2.4	NA	AOC 2, AOC 4	20	790	NO	
WHI6-2F	CHLORIDE	598000	598000	125000	NA	AOC 2, AOC 4	20	1	YES	
WHI6-2F	CHLORIDE	504000	504000	125000	NA	AOC 2, AOC 4	20	1	YES	
WHI6-2F	TOTAL CYANIDE	34	34	5.2	NA	AOC 2, AOC 4	20	9.9	YES	
WHI6-2S	ANTIMONY	60	30.5125	2	NA	AOC 2, AOC 4	20	45	YES	
WHI6-2S	CHLORIDE	500000	484000	125000	NA	AOC 2, AOC 4	20	1	YES	
WHI6-2S	COPPER	75	29.725	9	12.5	AOC 2, AOC 4	20	360	NO	
WHI6-2S	MERCURY	0.151	0.0553	0.0013	0.0387	AOC 2, AOC 4	20	52	YES	Surrogate for AOC 4
WHI6-2S	VANADIUM	106	45.675	12	NA	AOC 2, AOC 4	20	1000	NO	
WHI6-2S	ZINC	552	198.475	120	83.72	AOC 2, AOC 4	20	62	YES	
WHI6-3F	CHLORIDE	1975000	1562500	125000	NA	AOC 2, AOC 4	365	1	YES	
WHI6-3F	TOTAL CYANIDE	100	85	5.2	NA	AOC 2, AOC 4	365	9.9	YES	
WHI6-3S	CHLORIDE	49900000	49900000	125000	NA	AOC 2, AOC 4	365	1	YES	
WHI6-3S	TOTAL CYANIDE	25	25	5.2	NA	AOC 2, AOC 4	365	9.9	YES	
WHI6-4F	BARIUM	2650	734.9	440	136.5	AOC 4	20	41	YES	
WHI6-4F	CHLORIDE	472000	472000	125000	NA	AOC 4	20	1	YES	
WHI6-4F	CHLORIDE	765000	765000	125000	NA	AOC 4	20	1	YES	
WHI6-4F	COPPER	25	15.625	9	12.5	AOC 4	20	360	NO	
WHI6-4F	TOTAL CYANIDE	20	20	5.2	NA	AOC 4	20	9.9	YES	
WHI6-4S	BARIUM	2670	1698.5	440	136.5	AOC 4	20	41	YES	
WHI6-4S	CHLORIDE	3570000	3570000	125000	NA	AOC 4	20	1	YES	
WHI6-4S	CHLORIDE	3780000	3780000	125000	NA	AOC 4	20	1	YES	
WHI9-2F	ANTIMONY	3.6	3.6	2	NA	SWMU G	440	45	NO	
WHI9-2F	CADMIUM	2.9	2.9	2.2	NA	SWMU G	440	75	NO	
WHI9-2F	CHLORIDE	200000	200000	125000	NA	SWMU G	440	1	YES	
WHI9-2F	COPPER	83	83	9	12.5	SWMU G	440	360	NO	
WHI9-2F	LEAD	140	140	10	34.22	SWMU G	440	11000	NO	
WHI9-2F	MERCURY	0.757	0.757	0.0013	0.0387	SWMU G	440	52	NO	
WHI9-2F	VANADIUM	52	52	12	NA	SWMU G	440	1000	NO	
WHI9-2S	MERCURY	0.0411	0.0411	0.0013	0.0387	SWMU G	440	52	NO	
(1) Groundwater flow map indicates that groundwater at this location is likely captured by a downgradient remedy; therefore, no evaluation completed.										
(2) Kd values from Table 4. No value reported for Chromium. Conservatively assumed to be 1.										

Table 5-6
Tier 2 Evaluation of Groundwater Surface Water Interface (GSI) Pathway
Groundwater: Fate and Transport Results for Organics
BASF North Works Facility
Wyandotte, MI

Location	Chemical (a)	Maximum Concentration (ug/L)	Mean Concentration (ug/L)	GSI (ug/L)	Downgradient of	Approximate Distance to River or Property Line (feet)	Kd (2)	Will COI reach river above GSI, ever?	Comments
CMS-MW-13F	NAPHTHALENE	19	19	13	NA	(1)	4.02	NA	
CMS-MW-13S	BENZENE	66	66	12	NA	(1)	0.1164	NA	
CMS-MW-16	BENZENE	21	21	12	AOC 2	220	0.1164	YES	
CMS-MW-2	PHENANTHRENE	3.7	2.5929	2.4	NA	35	66.6	YES	
CMS-MW-4	BIS(2-CHLOROETHYL) ETHER	730	730	15	AOC 4	260	0.0218	YES	
GTI SB-16	BENZENE	68	68	12	AOC 7B	940	0.1164	YES	
P15N	1,2-DICHLOROPROPANE	66.3	66.3	9.1	NA	(1)	0.087	NA	
P26N	BENZENE	150	50.35	12	AOC 4	530	0.1164	YES	
P26N	BIS(2-CHLOROETHYL) ETHER	310	170.3333	15	AOC 4	530	0.0218	YES	
P36N	BIS(2-ETHYLHEXYL) PHTHALATE	102	102	32	NA	(1)	30000	NA	
PM3NB	BIS(2-CHLOROISOPROPYL) ETHER	39	39	15	NA	1250	1	YES	
RFI-MW10F	BENZENE	23	15.225	12	NA	64	0.1164	YES	
RFI-MW10F	NAPHTHALENE	1600	1060	13	NA	55	4.02	YES	
RFI-MW10F	PHENANTHRENE	12	6.425	2.4	NA	55	66.6	YES	
RFI-MW10I	3-METHYLPHENOL	810	810	71	NA	55	0.0902	YES	
RFI-MW10I	3-METHYLPHENOL & 4-METHYLPHENOL	250	223.3333	71	NA	55	0.0902	YES	
RFI-MW10I	4-METHYLPHENOL	810	810	71	NA	55	0.0902	YES	
RFI-MW10I	NAPHTHALENE	36	21.175	13	NA	55	4.02	YES	
RFI-MW10I	PHENANTHRENE	15	8.05	2.4	NA	55	66.6	YES	
RFI-MW10I	PHENOL	870	512.5	210	NA	55	0.0356	YES	
RFI-MW12	1,4-DIOXANE	180	118.3333	34	NA	50	0.001176	YES	
RFI-MW12	3-METHYLPHENOL	100	100	71	NA	50	0.0902	YES	
RFI-MW12	3-METHYLPHENOL & 4-METHYLPHENOL	130	113.3333	71	NA	50	0.0902	YES	
RFI-MW12	4-METHYLPHENOL	100	100	71	NA	50	0.0902	YES	
RFI-MW12	PHENOL	880	645	210	NA	50	0.0356	YES	
RFI-MW12F	PHENOL	410	277.5	210	NA	50	0.0356	YES	
RFI-MW13	1,2-DICHLOROETHANE	22	22	6	NA	210	0.035	YES	
RFI-MW16	1,4-DIOXANE	39	39	34	AOC 2	580	0.001176	YES	
RFI-MW16	PHENOL	350	350	210	AOC 2	580	0.0356	YES	
RFI-MW21	ACETONE	2100	2100	1700	AOC-7A	825	0.001162	NO	
RFI-MW22	BENZENE	2000	1875	12	AOC 7A	35	0.1164	YES	
RFI-MW22	BIS(2-CHLOROETHYL) ETHER	92	86	15	AOC 7A	35	0.0218	YES	
RFI-MW22	CHLOROBENZENE	930	877.5	47	AOC 7A	35	0.44	YES	
RFI-MW22	ETHYLBENZENE	120	108.5	18	AOC 7A	35	0.734	YES	
RFI-MW22	TOTAL XYLENES	53	44.75	35	AOC 7A	35	0.696	YES	
RFI-MW22	VINYL CHLORIDE	140	122.5	15	AOC 7A	35	0.037	YES	
RFI-MW23	FLUORANTHENE	4.5	4.5	1.6	AOC 7A	40	216	NO	
RFI-MW6	1,2-DICHLOROPROPANE	9.95	9.4625	9.1	AOC 2	50	0.087	YES	Surrogate for SWMU F
RFI-MW8F	NAPHTHALENE	97	22.458	13	RFIMW09	55	4.02	YES	
RFI-MW8F	PENTACHLOROPHENOL	3	2.3667	1.8	RFIMW09	55	1.184	YES	
RFI-MW8F	PHENANTHRENE	7.8	4.602	2.4	RFIMW09	55	66.6	YES	
RFI-MW8I	3-METHYLPHENOL	120	120	71	RFIMW09	55	0.0902	YES	
RFI-MW8I	4-METHYLPHENOL	120	120	71	RFIMW09	55	0.0902	YES	
RFI-MW8I	DIBENZOFURAN	5.3	4.7	4	RFIMW09	55	27	YES	
RFI-MW8I	FLUORANTHENE	2.6	2	1.6	RFIMW09	55	216	NO	
RFI-MW8I	NAPHTHALENE	100	88.6667	13	RFIMW09	55	4.02	YES	Surrogate for SWMU H
RFI-MW8I	PHENANTHRENE	9.1	6.6667	2.4	RFIMW09	55	66.6	YES	
RFI-MW8I	TOTAL XYLENES	84	56.6667	35	RFIMW09	55	0.696	YES	
RFI-MW9I	FLUORANTHENE	4.6	2.1067	1.6	NA	72	216	NO	
RFI-MW9I	NAPHTHALENE	99	31.6	13	NA	72	4.02	YES	
RFI-MW9I	PHENANTHRENE	8.6	7.875	2.4	NA	72	66.6	YES	
WHI1-3S	BENZENE	681	681	12	AOC 7A	425	0.1164	YES	
WHI6-1F	BIS(2-CHLOROETHYL) ETHER	30	16.75	15	NA	25	0.0218	YES	
WHI6-2S	DIBENZOFURAN	5.8	5.2	4	AOC 2, AOC 4	20	27	YES	Surrogate for AOC 4
WHI6-2S	FLUORANTHENE	27	8.295	1.6	AOC 2, AOC 4	20	216	YES	Surrogate for AOC 4
WHI6-2S	PHENANTHRENE	22	8.0725	2.4	AOC 2, AOC 4	20	66.6	YES	Surrogate for AOC 4
WHI6-3F	1,4-DIOXANE	160	74.8333	34	AOC 2, AOC 4	365	0.001176	YES	
WHI6-3F	BENZENE	18	17	12	AOC 2, AOC 4	365	0.1164	YES	Surrogate for AOC 4
WHI6-3F	BIS(2-CHLOROETHYL) ETHER	730	600	15	AOC 2, AOC 4	365	0.0218	YES	

(1) Groundwater flow map indicates that groundwater at this location is likely captured by a downgradient remedy; therefore, no evaluation completed.
(2) For organics Koc from Table 4 was multiplied by an default foc of 0.002 to calculate a Kd.

Table 5-7
Tier 2 Evaluation of Groundwater Surface Water Interface (GSI) Pathway
Summary of Soil COIs
BASF North Works Facility
Wyandotte, MI

Area	Chemical	Units	FOD	Part 201 Risk Criteria Exceeded = GSI Protection	Maximum Detected Concentration (ug/kg)	Mean Calculated Concentration (ug/kg)	Comments
AOC 2	MERCURY	ug/kg	5 : 8 : 8	1.00E+02	1.71E+04	2.40E+03	
AOC 4	DIBENZOFURAN	ug/kg	2 : 2 : 2	1.70E+03	5.90E+06	3.32E+06	Degradation not simulated in model
AOC 4	FLUORANTHENE	ug/kg	2 : 2 : 2	5.50E+03	1.40E+07	7.80E+06	Degradation not simulated in model
AOC 4	MERCURY	ug/kg	5 : 8 : 8	1.00E+02	1.71E+04	2.40E+03	
AOC 4	TOTAL CYANIDE	ug/kg	2 : 2 : 2	2.00E+02	1.90E+04	1.50E+04	
SWMU F	1,2-DICHLOROPROPANE	ug/kg	9 : 10 : 10	1.80E+02	7.00E+04	4.84E+03	Degradation not simulated in model
SWMU F	COPPER	ug/kg	21 : 21 : 21	5.20E+04	2.21E+05	3.41E+04	
SWMU F	MERCURY	ug/kg	6 : 10 : 10	1.00E+02	2.11E+04	2.90E+03	
SWMU F	TOTAL CYANIDE	ug/kg	8 : 10 : 10	2.00E+02	5.10E+03	2.20E+03	
SWMU G	ARSENIC	ug/kg	10 : 10 : 10	2.30E+04	1.01E+05	2.67E+04	
SWMU G	MERCURY	ug/kg	8 : 10 : 10	1.00E+02	5.40E+03	7.69E+02	
SWMU H	MERCURY	ug/kg	15 : 21 : 21	1.00E+02	5.29E+04	2.90E+03	
SWMU H	NAPHTHALENE	ug/kg	12 : 20 : 31	8.70E+02	1.60E+04	1.10E+03	Degradation not simulated in model

Table 5-8
Tier 2 Evaluation of Groundwater Surface Water Interface (GSI) Pathway
Summary of Groundwater COIs
BASF North Works Facility
Wyandotte, MI

Chemical	AREA	Maximum Concentration (ug/L)[1]	Mean Concentration (ug/L)	GSI (ug/L)	90th Percentile Background Concentration (ug/L)	Comments
Inorganics						
ANTIMONY	RFI-MW10F	6.6	4.9167	2	NA	Detect in background well of 7.8 ug/L
ANTIMONY	RFI-MW10I	7.4	6.05	2	NA	Detect in background well of 7.8 ug/L
ANTIMONY	RFI-MW11	3.125	3.125	2	NA	Detect in background well of 7.8 ug/L
ANTIMONY	RFI-MW12	6.9	5.9	2	NA	Detect in background well of 7.8 ug/L
ANTIMONY	RFI-MW8	60	37.5	2	NA	
ANTIMONY	**RFI-MW9F**	**31.025**	**30.2563**	**2**	**NA**	
ANTIMONY	WHI6-2S	60	30.5125	2	NA	
ARSENIC	CMS-MW-16	273	273	50	45.1	
ARSENIC	RFI-MW10F	82.2	57.375	50	45.1	
ARSENIC	RFI-MW10I	314	203	50	45.1	
ARSENIC	RFI-MW22	110	105	50	45.1	
ARSENIC	RFI-MW12	397	348.75	50	45.1	
ARSENIC	**RFI-MW4**	**106**	**72.8625**	50	45.1	
BARIUM	RFI-MW10	1055	982.75	440	136.5	
BARIUM	RFI-MW3	1450	1450	440	136.5	
BARIUM	RFI-MW5	1080	991.625	440	136.5	
BARIUM	**RFI-MW7I**	**3700**	**2605**	**440**	**136.5**	
BARIUM	RFI-MW8	1090	1065	440	136.5	
BARIUM	RFI-MW8I	742	616	440	136.5	
BARIUM	WHI6-1S	677	551.125	440	136.5	
BARIUM	WHI6-4F	2650	734.9	440	136.5	
BARIUM	WHI6-4S	2670	1698.5	440	136.5	
CHLORIDE	CMS-MW-2	538000	424500	125000	NA	
CHLORIDE	CMS-MW-4	1950000	1950000	125000	NA	
CHLORIDE	P26N	26800000	26800000	125000	NA	
CHLORIDE	PM4NA	22000000	22000000	125000	NA	
CHLORIDE	RFI-MW1	18500000	18500000	125000	NA	
CHLORIDE	RFI-MW10	927000	896000	125000	NA	
CHLORIDE	RFI-MW10F	592000	534500	125000	NA	
CHLORIDE	RFI-MW10I	2510000	2250000	125000	NA	
CHLORIDE	RFI-MW11	168000	157000	125000	NA	
CHLORIDE	RFI-MW11F	558000	524500	125000	NA	
CHLORIDE	RFI-MW12	11600000	10420000	125000	NA	
CHLORIDE	RFI-MW12F	941000	844000	125000	NA	
CHLORIDE	RFI-MW13	19000000	19000000	125000	NA	
CHLORIDE	**RFI-MW14**	**50300000**	**50300000**	**125000**	**NA**	
CHLORIDE	RFI-MW15	11000000	11000000	125000	NA	
CHLORIDE	RFI-MW22	3720000	3605000	125000	NA	
CHLORIDE	RFI-MW4	2400000	2400000	125000	NA	
CHLORIDE	RFI-MW4	2390000	2390000	125000	NA	
CHLORIDE	RFI-MW5	8050000	6355000	125000	NA	
CHLORIDE	RFI-MW6	3110000	3087500	125000	NA	
CHLORIDE	RFI-MW7	5200000	5200000	125000	NA	
CHLORIDE	RFI-MW7F	993000	847500	125000	NA	
CHLORIDE	RFI-MW7I	28200000	28200000	125000	NA	
CHLORIDE	RFI-MW7I	24900000	24900000	125000	NA	
CHLORIDE	RFI-MW8	3045000	3045000	125000	NA	
CHLORIDE	RFI-MW8	2900000	2900000	125000	NA	
CHLORIDE	RFI-MW8F	455000	194066.6667	125000	NA	
CHLORIDE	RFI-MW8I	415000	415000	125000	NA	
CHLORIDE	RFI-MW9	6590000	6220000	125000	NA	
CHLORIDE	RFI-MW9F	140000	140000	125000	NA	
CHLORIDE	RFI-MW9I	3360000	3265000	125000	NA	
CHLORIDE	WHI6-1F	1080000	1080000	125000	NA	
CHLORIDE	WHI6-1F	9510000	9510000	125000	NA	
CHLORIDE	WHI6-1S	5211000	5211000	125000	NA	
CHLORIDE	WHI6-1S	14800000	14800000	125000	NA	
CHLORIDE	WHI6-2F	598000	598000	125000	NA	
CHLORIDE	WHI6-2F	504000	504000	125000	NA	
CHLORIDE	WHI6-2S	500000	484000	125000	NA	
CHLORIDE	WHI6-3F	1975000	1562500	125000	NA	
CHLORIDE	WHI6-3S	49900000	49900000	125000	NA	
CHLORIDE	WHI6-4F	472000	472000	125000	NA	
CHLORIDE	WHI6-4F	765000	765000	125000	NA	
CHLORIDE	WHI6-4S	3570000	3570000	125000	NA	
CHLORIDE	WHI6-4S	3780000	3780000	125000	NA	
CHLORIDE	WHI9-2F	200000	200000	125000	NA	
CHROMIUM	CMS-MW-16	63.8	63.8	11	36.88	
CHROMIUM	PM1NA	70	70	11	36.88	
CHROMIUM	PM4NA	41	41	11	36.88	Mean/max only slightly above background.
CHROMIUM	RFI-MW12	90.4	77.725	11	36.88	
CHROMIUM	RFI-MW13	54	54	11	36.88	
CHROMIUM	**RFI-MW15**	**250**	**250**	**11**	**36.88**	

Table 5-8
Tier 2 Evaluation of Groundwater Surface Water Interface (GSI) Pathway
Summary of Groundwater COIs
BASF North Works Facility
Wyandotte, MI

Chemical	AREA	Maximum Concentration (ug/L)[1]	Mean Concentration (ug/L)	GSI (ug/L)	90th Percentile Background Concentration (ug/L)	Comments
CHROMIUM	RFI-MW22	70.9	67.625	11	36.88	
CHROMIUM	RFI-MW3	76.25	76.25	11	36.88	
CHROMIUM	WHI1-3S	122	122	11	36.88	
MERCURY	CMS-MW-2	0.964	0.6578	0.0013	0.0387	
MERCURY	CMS-MW-8	3.9	3.9	0.0013	0.0387	
MERCURY	**RFI-MW10F**	**10.7**	**7.041**	**0.0013**	**0.0387**	
MERCURY	RFI-MW10I	2.79	2.2791	0.0013	0.0387	
MERCURY	RFI-MW12	3.14	1.2735	0.0013	0.0387	
MERCURY	RFI-MW12F	2.45	1.4352	0.0013	0.0387	
MERCURY	RFI-MW22	0.0685	0.0505	0.0013	0.0387	
MERCURY	RFI-MW5	0.181	0.1175	0.0013	0.0387	
MERCURY	RFI-MW6	0.373	0.3413	0.0013	0.0387	
MERCURY	RFI-MW7	0.121	0.121	0.0013	0.0387	
MERCURY	RFI-MW8F	1.6	0.3687	0.0013	0.0387	
MERCURY	RFI-MW8I	1.69	1.3883	0.0013	0.0387	
MERCURY	RFI-MW9F	0.422	0.2852	0.0013	0.0387	
MERCURY	RFI-MW9I	0.922	0.7707	0.0013	0.0387	
MERCURY	WHI6-2S	0.151	0.0553	0.0013	0.0387	
NICKEL	RFI-MW10I	197	102.35	52	43.63	
NICKEL	**RFI-MW12**	**307**	**260**	**52**	**43.63**	
NICKEL	RFI-MW12F	167	111.525	52	43.63	
NICKEL	RFI-MW3	100	100	52	43.63	
SELENIUM	**RFI-MW6**	**8.5**	**6.8**	**5**	**6.77**	Concentrations only slightly above background.
SELENIUM	WHI1-3S	7	7	5	6.77	Concentrations only slightly above background.
THALLIUM	**RFI-MW7I**	**46.1**	**24.325**	**1.2**	**8.29**	
THALLIUM	RFI-MW15	9.6	9.6	1.2	8.29	
TOTAL CYANIDE	CMS-MW-16	980	980	5.2	NA	
TOTAL CYANIDE	CMS-MW-2	15	15	5.2	NA	
TOTAL CYANIDE	CMS-MW-4	39	39	5.2	NA	
TOTAL CYANIDE	P26N	120	109	5.2	NA	
TOTAL CYANIDE	PM1NA	68	68	5.2	NA	
TOTAL CYANIDE	RFI-MW10	13.55	13.55	5.2	NA	
TOTAL CYANIDE	RFI-MW10F	480	480	5.2	NA	
TOTAL CYANIDE	**RFI-MW10I**	**2000**	**2000**	**5.2**	**NA**	
TOTAL CYANIDE	RFI-MW11F	200	200	5.2	NA	
TOTAL CYANIDE	RFI-MW12	1000	1000	5.2	NA	
TOTAL CYANIDE	RFI-MW16	390	390	5.2	NA	
TOTAL CYANIDE	RFI-MW22	1500	1500	5.2	NA	
TOTAL CYANIDE	RFI-MW4	69	69	5.2	NA	
TOTAL CYANIDE	RFI-MW6	18	18	5.2	NA	
TOTAL CYANIDE	RFI-MW7I	210	210	5.2	NA	
TOTAL CYANIDE	RFI-MW9	6.3	6.3	5.2	NA	
TOTAL CYANIDE	RFI-MW9F	6.9	6.9	5.2	NA	
TOTAL CYANIDE	RFI-MW9I	34	34	5.2	NA	
TOTAL CYANIDE	WHI6-1F	36	36	5.2	NA	
TOTAL CYANIDE	WHI6-1S	23.25	23.25	5.2	NA	
TOTAL CYANIDE	WHI6-2F	34	34	5.2	NA	
TOTAL CYANIDE	WHI6-3F	100	85	5.2	NA	
TOTAL CYANIDE	WHI6-3S	25	25	5.2	NA	
TOTAL CYANIDE	WHI6-4F	20	20	5.2	NA	
ZINC	**WHI6-2S**	**552**	**198.475**	**120**	**83.72**	
ZINC	RFI-MW3	182.75	182.75	120	83.72	
Organics						
1,2-DICHLOROETHANE	RFI-MW13	22	22	6	--	Degradation not simulated in model
1,2-DICHLOROPROPANE	RFI-MW6	9.95	9.4625	9.1	--	Degradation not simulated in model
1,4-DIOXANE	**RFI-MW12**	**180**	**118.3333**	**34**	**--**	Degradation not simulated in model
1,4-DIOXANE	RFI-MW16	39	39	34		
1,4-DIOXANE	WHI6-3F	160	74.8333	34	--	Degradation not simulated in model
3-METHYLPHENOL	**RFI-MW10I**	**810**	**810**	**71**	**--**	Degradation not simulated in model
3-METHYLPHENOL & 4-METHYLPHENOL	RFI-MW10I	250	223.3333	71	--	Degradation not simulated in model
4-METHYLPHENOL	RFI-MW10I	810	810	71	--	Degradation not simulated in model
3-METHYLPHENOL	RFI-MW12	100	100	71	--	Degradation not simulated in model
3-METHYLPHENOL & 4-METHYLPHENOL	RFI-MW12	130	113.3333	71	--	Degradation not simulated in model
4-METHYLPHENOL	RFI-MW12	100	100	71	--	Degradation not simulated in model
3-METHYLPHENOL	RFI-MW8I	120	120	71	--	Degradation not simulated in model
4-METHYLPHENOL	RFI-MW8I	120	120	71	--	Degradation not simulated in model

Table 5-8
Tier 2 Evaluation of Groundwater Surface Water Interface (GSI) Pathway
Summary of Groundwater COIs
BASF North Works Facility
Wyandotte, MI

Chemical	AREA	Maximum Concentration (ug/L)[1]	Mean Concentration (ug/L)	GSI (ug/L)	90th Percentile Background Concentration (ug/L)	Comments
BENZENE	CMS-MW-16	21	21	12	--	Degradation not simulated in model
BENZENE	GTI SB-16	68	68	12	--	Degradation not simulated in model
BENZENE	P26N	150	50.35	12	--	Degradation not simulated in model
BENZENE	RFI-MW10F	23	15.225	12	--	Degradation not simulated in model
BENZENE	**RFI-MW22**	**2000**	**1875**	**12**	**--**	Degradation not simulated in model
BENZENE	WHI1-3S	681	681	12	--	Degradation not simulated in model
BENZENE	WHI6-3F	18	17	12	--	Degradation not simulated in model
BIS(2-CHLOROETHYL) ETHER	**CMS-MW-4**	**730**	**730**	**15**	**--**	Degradation not simulated in model
BIS(2-CHLOROETHYL) ETHER	P26N	310	170.3333	15	--	Degradation not simulated in model
BIS(2-CHLOROETHYL) ETHER	RFI-MW22	92	86	15	--	Degradation not simulated in model
BIS(2-CHLOROETHYL) ETHER	WHI6-1F	30	16.75	15	--	Degradation not simulated in model
BIS(2-CHLOROETHYL) ETHER	WHI6-3F	730	600	15	--	Degradation not simulated in model
BIS(2-CHLOROISOPROPYL) ETHER	PM3NB	39	39	15	--	Degradation not simulated in model
CHLOROBENZENE	RFI-MW22	930	877.5	47	--	Degradation not simulated in model
DIBENZOFURAN	RFI-MW8I	5.3	4.7	4	--	Degradation not simulated in model
DIBENZOFURAN	**WHI6-2S**	**5.8**	**5.2**	**4**	**--**	Degradation not simulated in model
ETHYLBENZENE	RFI-MW22	120	108.5	18	--	Degradation not simulated in model
FLUORANTHENE	WHI6-2S	27	16	1.6	--	Degradation not simulated in model
NAPHTHALENE	**RFI-MW10F**	**1600**	**1060**	**13**	**--**	Degradation not simulated in model
NAPHTHALENE	RFI-MW10I	36	21.175	13	--	Degradation not simulated in model
NAPHTHALENE	RFI-MW8F	97	22.458	13	--	Degradation not simulated in model
NAPHTHALENE	RFI-MW8I	100	88.6667	13	--	Degradation not simulated in model
NAPHTHALENE	RFI-MW9I	99	31.6	13	--	Degradation not simulated in model
PENTACHLOROPHENOL	RFI-MW8F	3	2.3667	1.8	--	Degradation not simulated in model
PHENANTHRENE	CMS-MW-2	3.7	2.5929	2.4	--	Degradation not simulated in model
PHENANTHRENE	RFI-MW10F	12	6.425	2.4	--	Degradation not simulated in model
PHENANTHRENE	RFI-MW10I	15	8.05	2.4	--	Degradation not simulated in model
PHENANTHRENE	RFI-MW8F	7.8	4.602	2.4	--	Degradation not simulated in model
PHENANTHRENE	RFI-MW8I	9.1	6.6667	2.4	--	Degradation not simulated in model
PHENANTHRENE	RFI-MW9I	8.6	7.875	2.4	--	Degradation not simulated in model
PHENANTHRENE	**WHI6-2S**	**22**	**8.0725**	**2.4**	--	Degradation not simulated in model
PHENOL	RFI-MW10I	870	512.5	210	--	Degradation not simulated in model
PHENOL	**RFI-MW12**	**880**	**645**	**210**	**--**	Degradation not simulated in model
PHENOL	RFI-MW12F	410	277.5	210	--	Degradation not simulated in model
PHENOL	RFI-MW16	350	350	210	**--**	Degradation not simulated in model
VINYL CHLORIDE	RFI-MW22	140	122.5	15	--	Degradation not simulated in model
TOTAL XYLENES	RFI-MW22	53	44.75	35	--	Degradation not simulated in model
TOTAL XYLENES	RFI-MW8I	84	56.6667	35	--	Degradation not simulated in model

Notes:
There are no background data for organic compounds
1 - Where there is greater than one instance of a COI, maximum concentration is shown in **bold** text.

Table 5-9
Tier 2 Evaluation of Groundwater Surface Water Interface (GSI) Pathway
Groundwater Contact Protection Evaluation
BASF North Works Facility
Wyandotte, MI

Area	CAS No.	Chemical	units	FOD	Min	Max	Mean	GCPC	Detects in Downgradient Wells?	GCC (ug/L)	Does Detected Concentration exceed GCC?	Further Evaluation ?
AOC 4	91-57-6	2-Methylnaphthalene	ug/kg	2:2:2	9.40E+05	9.00E+06	4.97E+06	5.50E+06	6.1 J (WHI6-2S)	25000	NO	NO
AOC 4	208-96-8	Acenaphthylene	ug/kg	2:2:2	1.00E+06	9.30E+06	5.15E+06	4.40E+05	1.5 J (WHI6-2S)	3900	NO	NO
AOC 4	120-12-7	Anthracene	ug/kg	2:2:2	8.70E+05	7.10E+06	3.99E+06	4.10E+04	6.3 J (WHI6-2S)	43	NO	NO
AOC 4	71-43-2	Benzene	ug/kg	2:2:2	2.50E+05	6.80E+05	4.65E+05	2.20E+05	No	11000	NA	NO
AOC 4	206-44-0	Fluoranthene	ug/kg	2:2:2	1.60E+06	1.40E+07	7.80E+06	7.30E+05	27; 0.73 J; 0.45 J (WHI6-2S)	210	NO	NO
AOC 4	86-73-7	Fluorene	ug/kg	2:2:2	1.20E+06	9.50E+06	5.35E+06	8.90E+05	0.14 J (RFI-MW4), 3.7 J (WHI6-2S)	2000	NO	NO
AOC 4	91-20-3	Naphthalene	ug/kg	2:2:2	6.00E+06	4.80E+07	2.70E+07	2.10E+06	6.9 J (WHI6-2S)	31000	NO	NO
AOC 4	85-01-8	Phenanthrene	ug/kg	2:2:2	2.70E+06	2.30E+07	1.29E+07	1.10E+06	22; 0.29 J (WHI6-2S)	1000	NO	NO
AOC 4	129-00-0	Pyrene	ug/kg	2:2:2	1.10E+06	9.90E+06	5.50E+06	4.80E+05	23; 0.60 J; 0.37 J (WHI6-2S)	140	NO	NO
AOC 4	108-88-3	Toluene	ug/kg	2:2:2	1.90E+05	5.90E+05	3.90E+05	2.50E+05	0.31 J; 0.16 J (RFI-MW-3) 0.44 J (WHI6-2S)	530000	NO	NO
AOC 4	NA	Xylenes	ug/kg	2:2:2	2.55E+05	9.80E+05	6.18E+05	1.50E+05	No	190000	NA	NO

Notes:

GCC - Groundwater Contact Criteria.

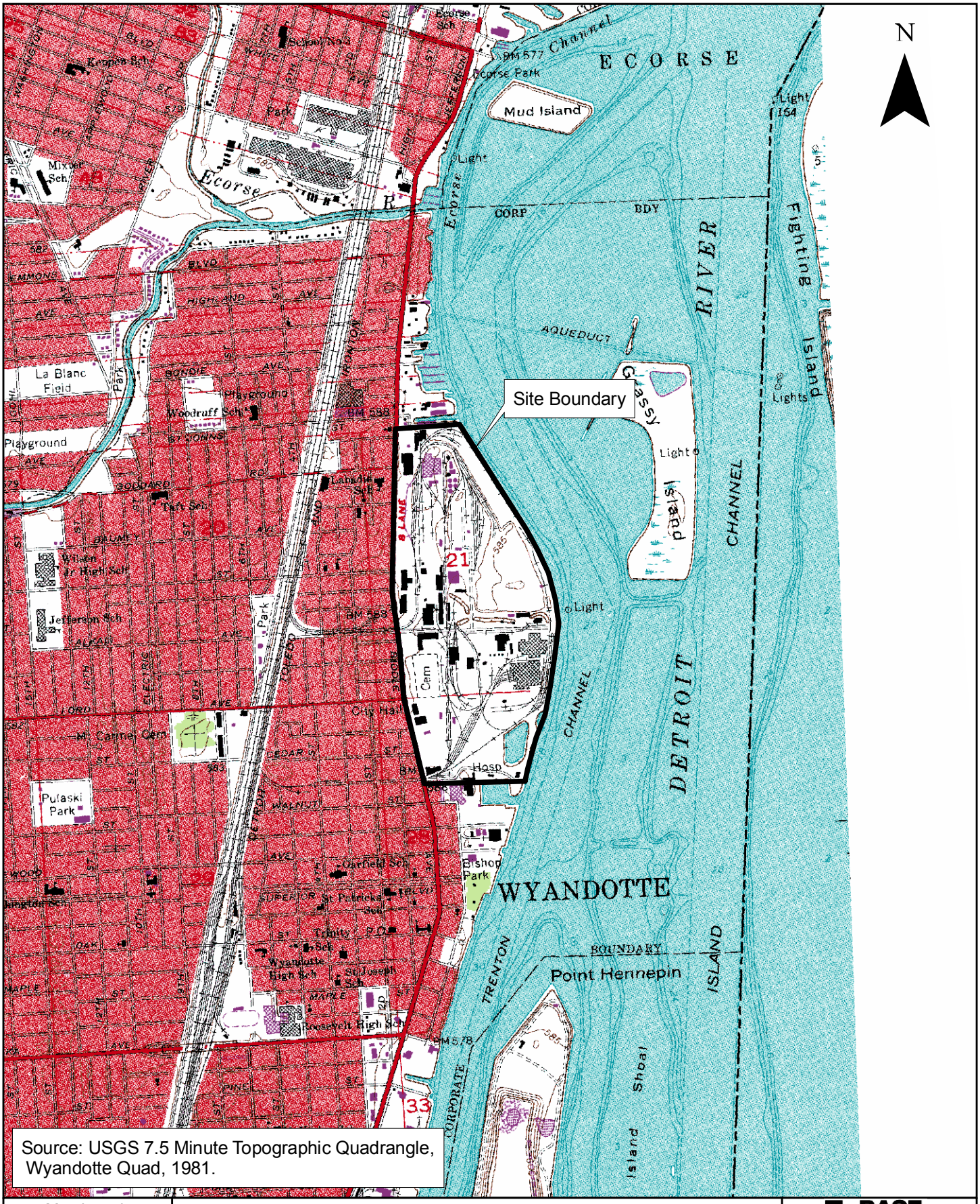
GCPC - Groundwater Contact Protection Criteria. Part 201 Generic Cleanup Criteria.

Table 6-1
Summary of Constituents of Concern (COC) for Soil and Groundwater at SWMU/AOCs
BASF North Works Facility
Wyandotte, Michigan
Tier 2 Risk Evaluation

Parameter	CAS No.	Soil																												Groundwater (g)
		AOC 2			AOC 4			AOC 5			AOC 6			AOC 7A			AOC 7B			AOC 7C (c)			SWMU F			SWMU G			SWMU H (c)			
Inorganics		HH	Eco (e)	GSI	HH (a)	Eco (e)	GSI	HH	Eco (e)	GSI (b)	HH	Eco	GSI (d)	HH	Eco	GSI	HH	Eco (e)	GSI (f)	HH	Eco (e)	GSI	HH	Eco (e)	GSI	HH	Eco	GSI	HH	Eco	GSI	GSI
Antimony	7440-36-0																												X		X
Arsenic	7440-38-2										X																	X			X
Barium	7440-39-3																														X
Cadmium	7440-43-9																														X
Chromium	7440-47-3																														X
Lead	7439-92-1																									X					
Mercury	7439-97-6			X			X							X										X		X	X	X		X	X
Nickel	7440-02-0																												X		X
Selenium	7782-49-2																						X								X
Thallium	7440-28-0																														X
Cyanide	57-12-5						X																X								X
Zinc	7440-66-6																														X
Chloride																															X
Organics																															
Semivolatile Organic Compounds																															
2-Methylnaphthalene	91-57-6				X																										
Acenaphthylene	208-96-8				X																										
Benzo(a)anthracene	56-55-3				X																										
Benzo(a)pyrene	50-32-8				X						X																				
Benzo(b)fluoranthene	205-99-2				X																										
Benzo(k)fluoranthene	207-08-9				X																										
Chrysene	218-01-9				X																										
Fluoranthene	206-44-0						X																								X
Indeno(1,2,3-cd)pyrene	193-39-5				X																										
Naphthalene	91-20-3				X						X																			X	X
Phenanthrene	85-01-8				X																										X
Bis(2-Chloroisopropyl) ether	108-60-1							X (h)												X (h)								X (h)			X
Bis(2-Chloroethyl) ether	111-44-4							X (h)												X (h)								X (h)			X
Bis(2-Ethylhexyl) phthalate	117-81-7							X (h)												X (h)								X (h)			
Dibenzofuran	132-64-9						X																								X
Methylphenols	108-39-4				X																										X
Pentachlorophenol	87-86-5																									X					X
Phenol	108-95-2																														X
Volatile Organic Compounds																															
1,2-Dichloroethane	107-06-2							X (h)												X (h)								X (h)			X
1,2-Dichloropropane	78-87-5							X (i)												X (h)				X				X (i)			X
1,4-Dioxane	123-91-1																														X
Benzene	71-43-2				X						X																				X
Chlorobenzene	108-90-7																														X
Ethylbenzene	100-41-4																														X
Toluene	108-88-3				X																										
Vinyl chloride	75-01-4																														X
Xylenes	1330-20-7				X						X																				X
Pesticides																															
4,4-DDT	50-29-3																									X			X		

Notes:
HH - COC based on the results of the Tier 2 Human Health Risk Evaluation.
Eco - COC based on the results of the limited Preliminary Ecological Risk Assessment (PERA) food web modeling.
GSI - COC based on the results of the Tier 2 Evaluation of the Groundwater Surface Water Interface (GSI) Pathway.
(a) - AOC 4 was not evaluated in the Tier 2 human health risk evaluation, as it is assumed to require corrective action and will be addressed in the CMS. Human health COC based on results of Tier 1 risk screening
(b) - AOC 5 was not evaluated in the Tier 2 evaluation of the GSI pathway, as it is assumed to require corrective action and will be addressed in the CMS
(c) - AOC 7C, the west segment of SWMU H, and most of the central segment of SWMU H lie entirely within the AOC 5 footprint; these areas share the same AOC 5 groundwater COI which will be addressed with AOC 5 in the CMS
(d) - The existing remedy at AOC 6 (i.e., groundwater extraction) mitigates migration of groundwater from the AOC to the river. Therefore, the GSI pathway from AOC 6 to the river is incomplete
(e) - The SERA identified no complete ecological exposure pathways at this SWMU/AOC.
(f) - AOC 7B is upgradient of a groundwater extraction remedy (TMW-4), which captures groundwater originating from AOC 7B. Therefore, the GSI pathway from AOC 7B to the river is incomplete
(g) - Site-wide groundwater; includes refinement of chemicals retained from SERA.
(h) - Chemical is a COC for groundwater only in this SWMU/AOC, based on results of the Tier 2 redevelopment scenario.
(i) - Chemical is a COC for both soil and groundwater in this SWMU/AOC, based on results of the Tier 2 redevelopment scenario.

Figures



Map Location

Site Location Map
BASF - Northworks Facility
1609 Biddle Avenue
Wyandotte, MI 48192

Scale: 1:24,000

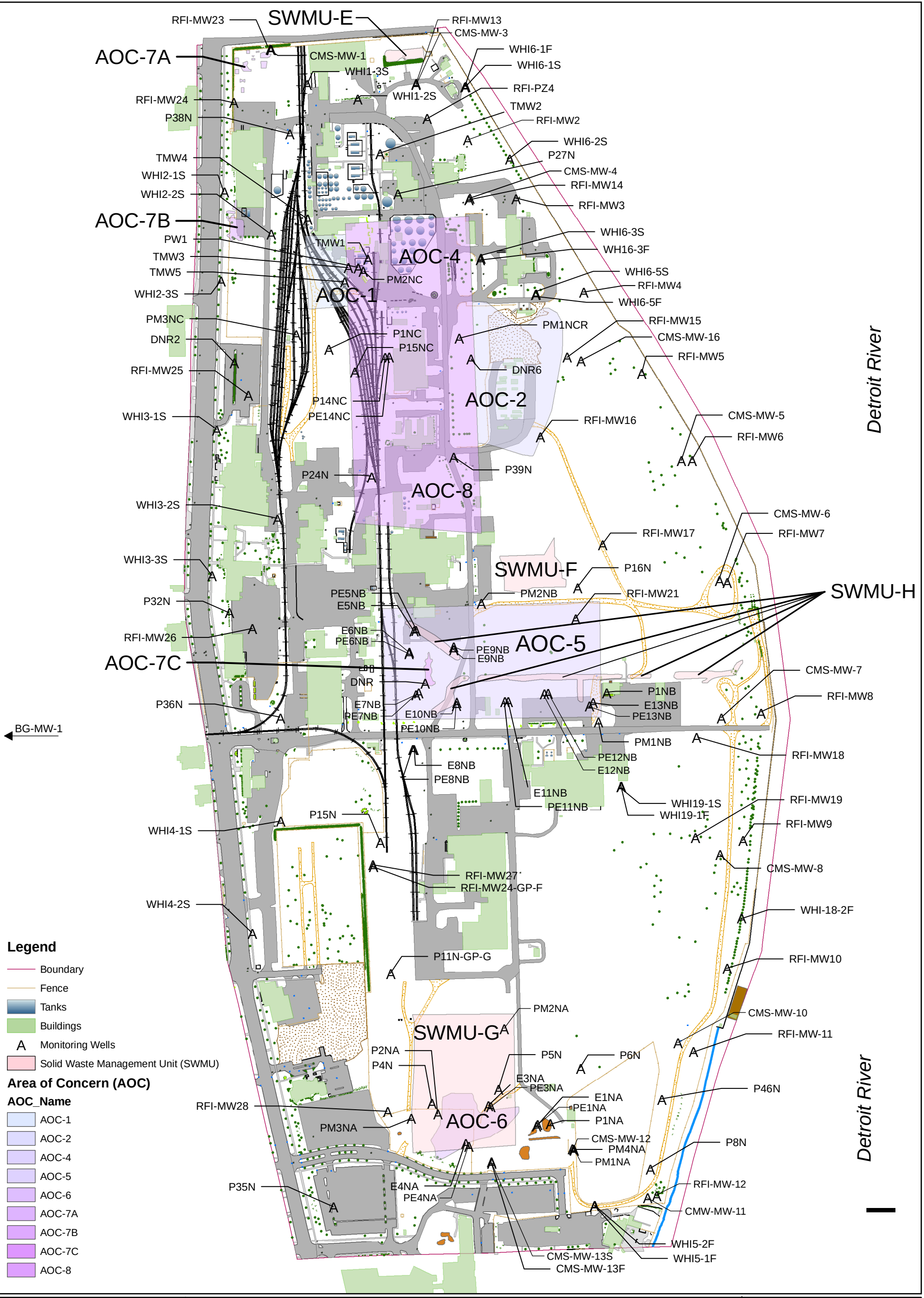
0 0.25 0.5 1 Miles

BASF
The Chemical Company

ENSR | AECOM

Project # 00760-180
January 2008

Figure 1



Map Location

BASF - North Works Facility
Wyandotte, Michigan
Locations of SWMU/AOC and Monitoring Wells

BASF The Chemical Company

ENSR | AECOM

Project # 00760-180
January 2007

Scale: 1:5,000

0 250 500 1,000 Feet

Figure 2

Surface Soil Samples

Historic RFI Soil Sample

Well

Monument

SWMU

AOC

Wyandotte Background

SURVEY MONUMENT #1

AOC-7A

AOC-7B

AOC-1

AOC-2

AOC-3

AOC-4

AOC-5

AOC-6

AOC-7C

SWMU-E

SWMU-F

SWMU-H

SWMU-G

SURVEY MONUMENT #4

SURVEY MONUMENT #5

RG-LOC-1

RG-LOC-2

RG-LOC-3

ACOE_BM_"STACKS"

BG-MW-1

RP2NB

Scale 1:500

0 25 50 100 Feet

N

ENSR | AECOM

Figure 3
BASF - Wyandotte, MI
Data Points

Scale 1:1,600	January 2008	Project Number 00760-180

0 125 250 500 Feet

N

SWMUF-SS-3
SWMUF-SS-10
SWMUF-SS-4
SP04-SWMU-F
SP18-SWMU-F
SP03-SWMU-F
SP02-SWMU-F
SWMUF-SS-5
SP01-SWMU-F
SP06-SWMU-F
SWMUF-SS-9
SWMUF-SS-2
SWMU-F
SP11-SWMU-F
SP07-SWMU-F
SWMUF-SS-6
SWMUF-SS-1
SP08-SWMU-F
SWMUF-SS-8
SP09-SWMU-F
SWMUF-SS-7
CSN-GP-3
P21N
P16N

Map Location

- Surface Soil Samples
- Historic RFI Soil Sample
- Well
- Monument
- SWMU
- AOCs
- Wyandotte Background

BASF Wyandotte, MI
SWMU F
Data Points

Scale: 1:400

0 15 30 60 Feet

BASF The Chemical Company

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Project # 00760-180
January 2008

Figure 3a

N

SWMUG-10
PM2NA
PE2NA
E2NA
SWMUG-2
SWMUG-6
SWMUG-9
SWMUG-1
SWMU-G
P5N
SP62A-AOC-6
SP63-AOC-6
SP62-AOC-6
MH-NORTH
SWMUG-4
P4N
AOC6-SS-9
AOC6-SS-10
E3NA
PE3NA
SP58-AOC-6
GP-S(2')
P2NA
SP61A-AOC-6
AOC6-SS-4
AOC6-SS-5
PM3NA
SP61-AOC-6
AOC6-SS-2
AOC6-SS-3
SP64-AOC-6
AOC-6
SWMUG-7
AOC6-SS-6
SWMUG-8
SWMUG-5
AOC6-SS-8
MH-SOUTH
SP65-AOC-6
AOC6-SS-7
SP55-AOC-6
E4NA
SP55-A-AOC-6
PE4NA
SP54-AOC-6
AOC6-SS-1
SWMUG-3
P1N
FIELD SUMP
CMS-MW-13F
SP54B-AOC-6
CMS-MW-13S
CMS-MW-14S

Map Location

BASF Wyandotte, MI
SWMU G and AOC 6
Data Points

- Surface Soil Samples
- Historic RFI Soil Sample
- Well
- Monument
- SWMU
- AOCs
- Wyandotte Background

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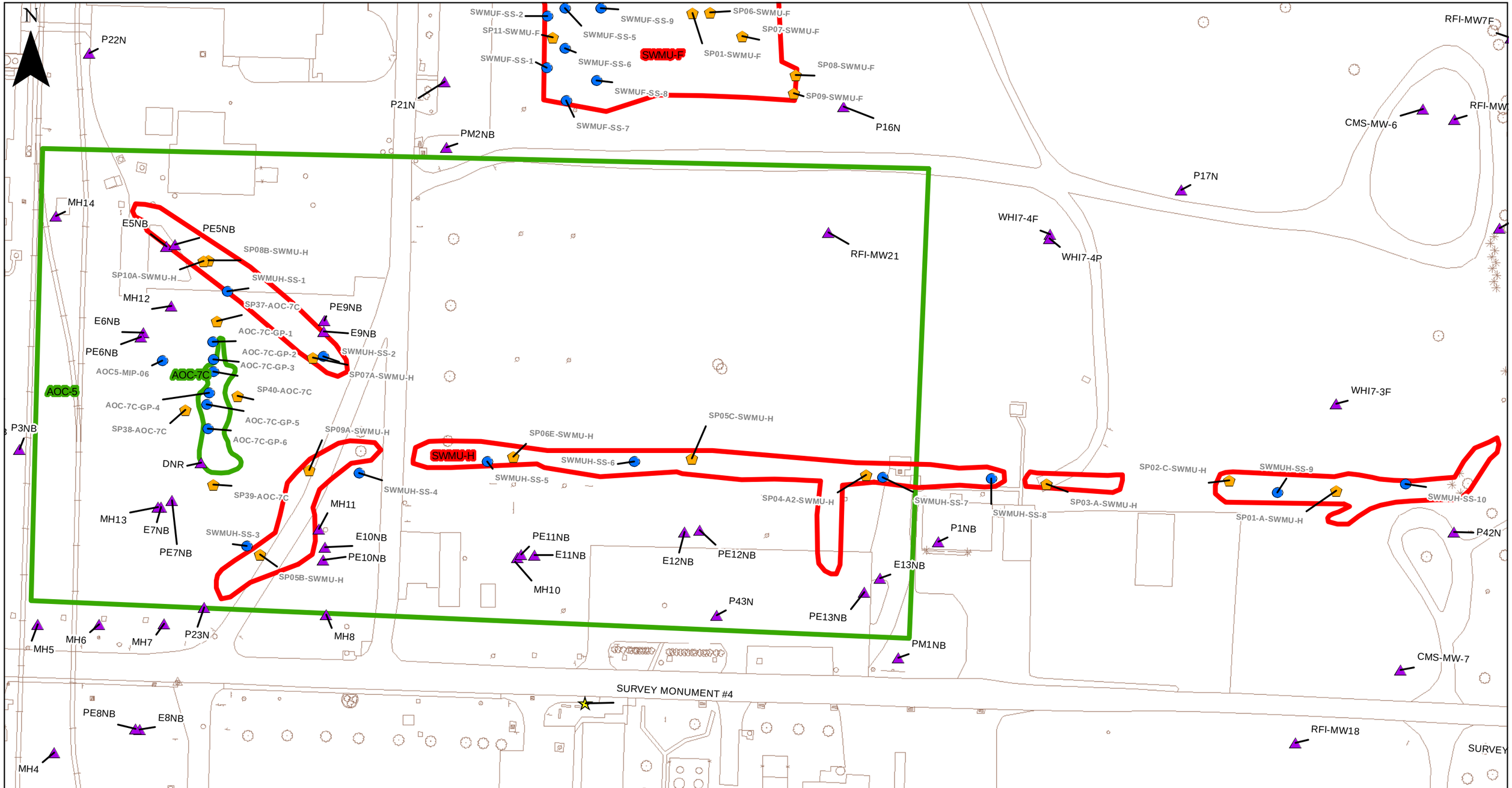
January 2008

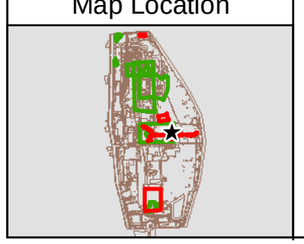
Scale: 1:700

0 25 50 100 Feet

Figure 3b



Map Location



- Surface Soil Samples
- Historic RFI Soil Sample
- Well
- Monument
- SWMU
- AOC
- Wyandotte Background

BASF Wyandotte, MI
SWMU H, AOC 5 and AOC 7C
Data Points

Scale: 1:1,200

0 50 100 200 Feet

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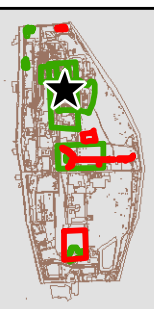
Project # 00760-180
January 2008

Figure 3c

N

GTI-SB-18
GTI-SB-7
P27N
CMS-MW-4
RFI-MW14
RFI-MW3
TMW4
GTI-SB-16
GTI-SB-17
WHI6-4S
WHI6-4
AOC-1
TMW1
GTI-SB-10
TMW3
PW1
PM2NC
GTI-SB-11
TMW5
GTI-SB-12
GTI-SB-2
GTI-SB-8
DNR3
GTI-SB-14
SG001AOC2-2
SG003AOC4-1
AOC-4
GTI-SB-13
P26N
WHI6-3S
WHI6-3F
SG003AOC2-1
WHI6-5S
WHI6-5F
SG001AOC2-8
GTI-SB-9
P2NC
PM3NC
PM1NCR
P1NC
GTI-SB-1
DNR4
PE14NC
P25N
P14NC
DNR6
RFI-MW15
AOC-2
DNR7
P15NC
GTI-SB-6
AOC-2-GP-2
SG008AOC2-3
SG005AOC2-7
RFI-MW16
AOC-2-GP-1
CSN-GP-1
SG001AOC2-6
SG002AOC2-5
SG002AOC2-4
P20N
P39N
P24N
AOC-8
CSN-GP-2
SWMU-F
SWMUF-SS-3
SWMUF-SS-10

Map Location



BASF Wyandotte, MI
AOC 1, AOC 2, AOC 4 and AOC 8 Data Points

Surface Soil Samples
Historic RFI Soil Sample
Well
Monument

SWMU
AOC-1
AOC-2
AOC-4
AOC-8
Wyandotte Background

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Project # 00760-180
January 2008

Scale: 1:1,500

0 55 110 220 Feet

Figure 3d

SP10A-AOC-7A
RFI-MW23
CMS-MW-1
SP03-AOC-7A
AOC-7A
SP04-AOC-7A
SP09A-AOC-7A
SP01-AOC-7A
SURVEY MONUMENT #1
SP02-AOC-7A
SP05-AOC-7A
SP08B-AOC-7A
WHI1-3S
SP06-AOC-7A
SP07-AOC-7A
P31N
RFI-MW24
RFIMW24-GP-S(2')
GTI-SB-15
P38N
WHI2-1S
SP34-AOC-7B
GTI-SB-7
SP35-AOC-7B
TMW4
GTI-SB-16
AOC-7B
N
WHI2-2S
GTI-SB-3
AOC-1
SP36-AOC-7B

Map Location

BASF Wyandotte, MI
AOC 7A and AOC 7B
Data Points

Surface Soil Samples
Historic RFI Soil Sample
Well
Monument
SWMU
AOC
Wyandotte Background

Scale: 1:800

0 25 50 100 Feet

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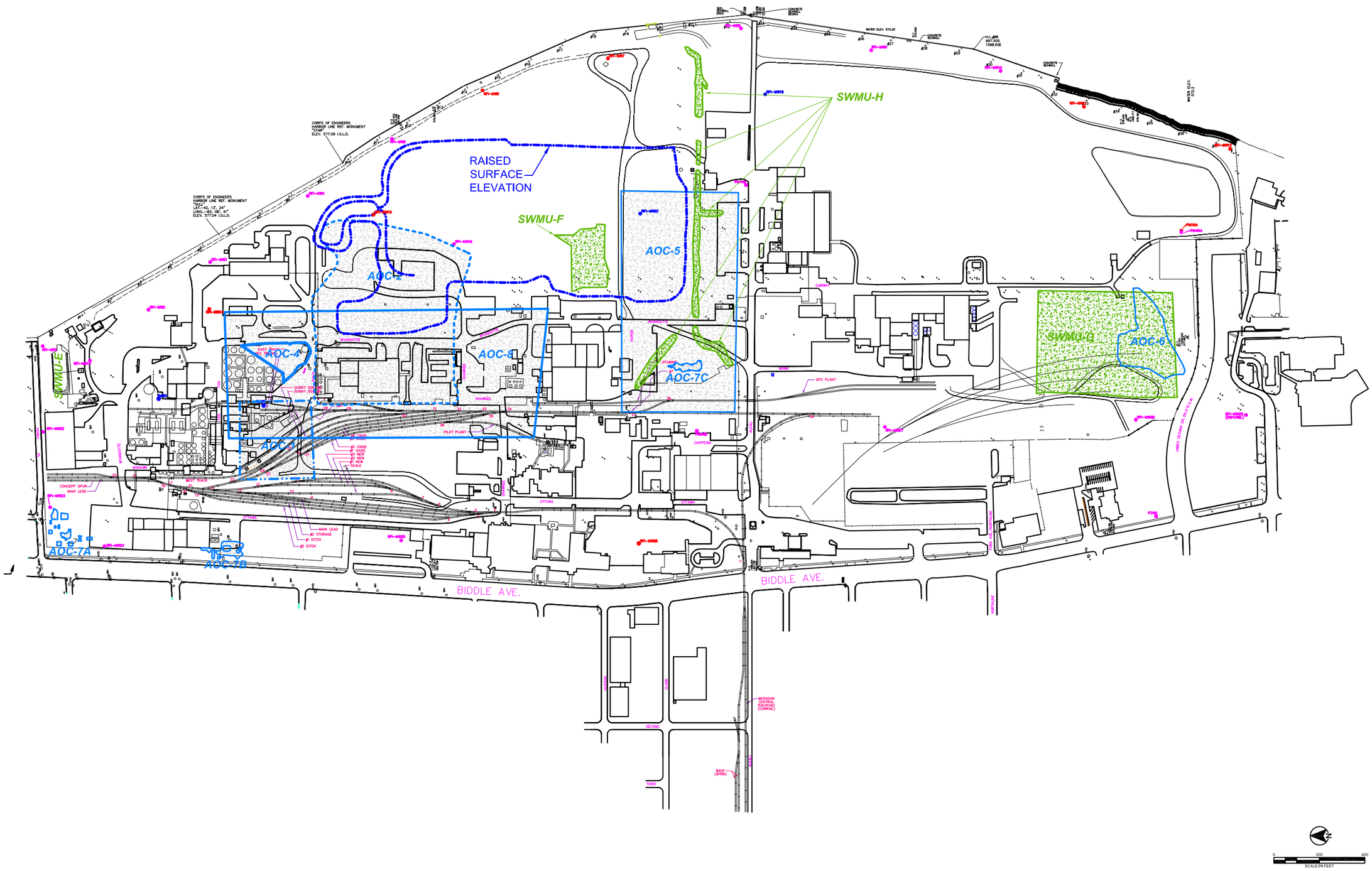
Project # 00760-180
January 2008

Figure 3e



REVISIONS

NO.:	DESCRIPTION:	DATE:	BY:

DESIGNED BY: X
DRAWN BY: JG
CHECKED BY: RG
APPROVED BY: RE

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BASF CORPORATION
WYANDOTTE, MICHIGAN
Location of Proposed Expansion

SCALE: AS SHOWN
DATE: 6/13/07
PROJECT NUMBER: 00760-180

DRAWING NUMBER: 4

SHEET NUMBER: X

Appendix A
Soil Background Evaluation

Soil Background Evaluation

As part of the uncertainty evaluations for the HHRA and SERA for the BASF North Works site, a statistical analysis of soil data was conducted to determine if concentrations of specific inorganic COIs in soil at the exposure areas identified in the Tier I risk screening are similar to or greater than concentrations of chemicals in background samples. As part of the RCRA Corrective Action program, 20 background soil samples were collected from off-site and unimpacted on-site locations and analyzed for TAL metals. Of these, fourteen samples were collected from known surface soil and used in the SERA background evaluation. The six deeper soil samples (collected from 3-10 feet and one sample at 15 feet) were included only in the human health background evaluation. [Note: The pooling of shallow and deeper background samples into one data set for human health is consistent with the approach used in the Tier 2 which involved comparing all soil samples throughout the soil interval with the Part 201 criteria, whereas inclusion of the shallow background soil samples only is consistent with the ecological risk assessment approach.] The background soil sampling locations are similar in basic characteristics to soil at the site.

Chemical concentrations from background soil stations were statistically compared to concentrations in soil at the SWMU/AOCs to evaluate whether or not the exposure area-specific concentrations are consistent with the background data set. If the concentrations are consistent with background, no further evaluation is necessary. If the HHRA or SERA indicates there is a need for further evaluation, additional data may be collected to further assess the risks. For a limited set of data inadequate for statistical comparison using USEPA guidance (2002), qualitative evaluations that involved plotting the distributions of site and background data for visual comparison.

Data Sets Used in the Statistical Evaluation

As described in the USEPA's (2002) *Guidance for Comparing Background and Chemical Concentrations in Soil for CERCLA Sites*, sampling station locations were selected following a "Targeted Sampling Design" where prior knowledge of site-related factors were incorporated into the process of station location. The targeted sampling design was developed to meet the following criteria:

- Sampling stations were selected that were representative of the defined area of interest; and
- Stations with similar physical characteristics were selected to minimize the sampling error.

As recommended by the guidance (USEPA, 2002), inorganics with at least 50% frequency of detection in both the site and background data sets were considered appropriate for statistical evaluation. In addition, a minimum of five samples is also recommended for meaningful statistical evaluation (USEPA, 2002). Based on these criteria, the data sets for

inclusion in the statistical background evaluations for human health and ecological risk are discussed below.

Human Health Data Set

The background soil evaluation was performed for each of the seven SWMU/AOCs identified below:

- AOC 2
- AOC 6
- AOC 7A
- AOC 7C
- SWMU F
- SWMU G
- SWMU H

AOC 4 and AOC 7B were not included in the statistical evaluation due to insufficient sample size (i.e., n < 5). Less than five samples were collected from each of these areas, preventing any meaningful statistical analysis.

The following inorganics were included in the human health background evaluation: antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, nickel, selenium, silver, thallium, tin, vanadium and zinc. Antimony, beryllium, cobalt, mercury, selenium, thallium and tin have percent frequency of detection values less than 50% in the human health background data set and were therefore not included in the human health statistical evaluation. Silver was not detected in the background samples and is therefore not included in the statistical evaluation.

Because of the importance of mercury at the North Works site, a qualitative evaluation of mercury soil concentrations detected in each SWMU/AOC relative to the background soil data set was performed. The qualitative evaluation involved plotting the background mercury data set with the mercury data set from each SWMU/AOC (both detected and undetected values) and visually evaluating the overall distribution. Figures presenting the mercury distributions for each SWMU/AOC are provided at the end of this Appendix.

Ecological Data Set

Adequate data (n > 5) were not available for all SWMU/AOCs evaluated in the SERA. The background soil evaluation was performed for only AOC 7A. The following AOCs were not included in the background evaluation:

- AOC 6: Frequency of detect was <50% for all inorganic constituents.
- SWMU G: Frequency of detect was <50% for all inorganic constituents.
- SWMU H: Frequency of detect was <50% for all inorganic constituents.

The details of the statistical methods are discussed in the following section, followed by the results of the analyses.

The following inorganics were included in the ecological background evaluation for AOC 7A: arsenic, barium, cadmium, chromium, copper, cyanide, lead, mercury, nickel, vanadium and zinc. Silver was not detected in the background samples and is therefore not included in the statistical evaluation. Beryllium, cobalt and selenium have percent frequency of detection values less than 50% in AOC 7A and/or the background set and were therefore not included in the ecological statistical evaluation.

Qualitative evaluations were performed for the three SWMU/AOCs and inorganics with insufficient detects in the data sets. Figures presenting the distributions for these COI and SWMU/AOCs are provided at the end of this Appendix.

Statistical Methods

Treatment of Non-Detects

Because the data sets that included a large percentage of non-detects were excluded, the non-detect values in the remaining data sets were assumed not to introduce significant statistical bias. Therefore, all non-detect values were replaced with ½ the value of the sample quantitation limit (SQL) for the purposes of calculating the statistics. Where ½ the SQL was greater than the highest detected concentrations, the sample results for the non-detect were eliminated from the analysis.

Tests for Normality

Each constituent in each data set was tested to determine whether the data were normally or lognormally distributed. The Shapiro-Wilk's test was used for this determination (α=0.05). To evaluate a lognormal distribution, the data were transformed by calculating the natural logarithm of each concentration. If both untransformed and log-transformed data were normally distributed, untransformed data were selected for the analysis. Generalized statistical references describing the various methods are listed in the references at the end of this appendix.

Parametric Comparison of Means

For any individual chemical, where both the exposure area and background data set distributions were normal or lognormal, and the frequency of detection in both site and

background data sets was greater than or equal to 80%, the Student's t-test (α= 0.10) was used to compare the exposure area mean to the background mean. The variances of each paired data set were calculated, and compared using an F-test (α=0.10). The t-test for either equal or unequal variance was used, as appropriate. For the lognormally distributed data sets, all calculations were performed on the log-transformed data.

Non-Parametric Comparison of Populations

For any individual chemical, if the distribution of either the exposure area or background data sets was not normal or lognormal, if the distributions were mixed, or if the frequency of detection in the site and/or background data set was greater than 50% but less than 80%, then a non-parametric comparison was necessary. The Wilcoxon Rank-Sum Test (also known as the Mann-Whitney U Test) was used for the non-parametric comparison (α=0.10).

In the human health background data set, the frequency of detection for cadmium was less than 80% (53%) in the background data set; therefore, cadmium was tested using the non-parametric test rather than the parametric test in all exposure areas.

In the ecological background data set, the frequency of detection values for cadmium and mercury (71% and and 50%, respectively) were less than 80%, so these constituents were tested using non-parametric techniques in all areas. In addition, total cyanide (79%) and mercury (79%) had frequency of detection values less than 80% in the AOC 7A data set, and were tested using non-parametric techniques.

Hypothesis Testing

The soil data from each exposure area were evaluated against background data using statistical Background Test Form 2 from the U.S. EPA *Guidance for Comparing Background and Chemical Concentrations in Soil for CERCLA Sites* (U.S. EPA, 2002). Background Test Form 2 requires a strict burden of proof by selecting the null hypothesis that the chemical concentration in potentially contaminated areas exceeds background by more than a substantial difference S ($\Delta > S$). This approach favors the protection of the environment (U.S. EPA, 2002). A significant difference (S) of one standard deviation (1sd) of the background data set was selected to provide a reasonable ability to distinguish differences between data sets. If background data were normally or lognormally distributed, S was calculated as 1sd, with sd calculated in log-space for lognormally distributed data. If the background data were neither normally nor lognormally distributed, a percentile value was calculated equivalent to the mean plus one standard deviation in a normally distributed data set (84.13^{th} percentile). The S for nonparametric tests was determined as the difference between the 84.13^{th} percentile and the median (50th percentile).

Figure A-1 provides a graphical depiction of the test selection criteria. The specific statistical tests performed, and the S selected, are specified in Tables A-I through A-8. The specific

hypotheses to be used in the statistical evaluation are as stated in Test Form 2 (USEPA, 2002):

H_o: The mean of the contaminant concentration in the exposure area data set is greater than the mean of the background data set by S ($\Delta > S$) where, S = 1sd of the upstream data set ($u_{site} > u_{back}+S$).

H_A: The mean of the contaminant concentration in the exposure area data set does not exceed the mean of the background data set by S ($\Delta \leq S$)($u_{site} \leq u_{back}+S$).

If the null hypothesis H_0 is rejected, it can be concluded with statistical significance that the mean of the exposure area data set is not significantly greater than the mean of the background data set, or that, in general, the exposure area is consistent with background. If the null hypothesis is not rejected, it was assumed that the mean from the exposure area data set may be greater than the mean of the background data set, although this is not a statistically significant conclusion. This hypothesis was tested at the 0.10 level of significance ($\alpha = 0.10$).

Evaluation of Power

The power represents the ability of the test to reject the null hypothesis; specifically, are there enough samples to make it theoretically possible to reject the null hypothesis? Because of the structure of the null hypothesis (U.S. EPA Test Form 2), insufficient power may result in a Type II error, the incorrect acceptance of the null hypothesis, that the exposure area data are greater than the background data. A power of greater than 80% is the intended target for the statistical comparisons.

For the parametric t-tests, the power of each comparison was calculated. These results can be used to aid the interpretation of statistical results, and may be useful to identify data gaps. Power was not calculated for non-parametric Wilcoxon Rank Sum tests. Although power has not been calculated for the non-parametric Wilcoxon Rank Sum tests, the rejection of the null hypothesis indicates that power was sufficient.

Results of Statistical Analyses

Human Health Background Evaluation

The statistical software package Stata 8.2 was used to perform the statistical calculations. The distributions of the constituents from the site and background data sets are presented in Tables A-1 through A-7. The results indicate a mixture of normally, lognormally, and not normally distributed data.

AOC 2 vs. Background

In the AOC 2 vs. background evaluation, parametric tests were run using untransformed data for barium. Parametric tests were run using log-transformed data for arsenic, lead and nickel. Non-parametric tests were run for the remaining 5 constituents, including cadmium, chromium, copper, vanadium and zinc. The step-by-step summary of the statistical results is presented in Table A-1.

The null hypothesis was rejected for all of the parametric tests (barium [untransformed data], arsenic, lead and nickel [log-transformed data]) and non-parametric Wilcoxon Rank Sum tests for cadmium, copper and vanadium, indicating concentrations for these constituents are consistent with the background data set. The null hypothesis was not rejected for the non-parametric tests for chromium and zinc, indicating either the concentrations of chromium and zinc in AOC 2 are greater than the concentrations found in the background data set, or that the test did not have sufficient power to recognize a difference. Power was not calculated for the Wilcoxon Rank Sum results.

AOC 6 vs. Background

In the AOC 6 vs. background evaluation, parametric tests were run using untransformed data for barium. Parametric tests were run using log-transformed data for arsenic, lead and nickel. Non-parametric tests were run for the remaining five constituents, including cadmium, chromium, copper, vanadium and zinc. The step-by-step summary of the statistical results is presented in Table A-2.

The null hypothesis was rejected for the parametric tests for barium, lead and nickel. The null hypothesis was also rejected for all of the non-parametric Wilcoxon Rank Sum tests except for copper, indicating concentrations at AOC 6 for cadmium, chromium, vanadium and zinc are consistent with background. The null hypothesis was not rejected in the parametric evaluation of arsenic and the non-parametric evaluation of copper, indicating either the concentrations of these constituents at AOC 6 are greater than the concentrations found in the background data set, or that the tests did not have sufficient power to recognize a difference. Examination of power calculations, where available (t-tests), indicates power was 36% for arsenic, so power is likely to be insufficient to detect a difference in arsenic concentrations between AOC 6 and Background.

AOC 7A vs. Background

In the AOC 7A vs. background evaluation, parametric tests were run using untransformed data for barium and log-transformed data for arsenic and lead. Non-parametric tests were run for the remaining six constituents, including cadmium, chromium, copper, nickel, vanadium and zinc. The step-by-step summary of the statistical results is presented in Table A-3.

The null hypothesis was rejected for the parametric evaluation of arsenic and barium, indicating concentrations for these constituents in AOC 7A are consistent with background. The null hypothesis was also rejected for the non-parametric Wilcoxon Rank Sum tests for cadmium, vanadium and zinc, indicating concentrations for these constituents in AOC 7A are also consistent with background. The null hypothesis was not rejected for the parametric evaluation of lead and for the non-parametric evaluation of chromium, copper and nickel, indicating either the concentrations of these constituents in the AOC 7A data set are greater than the background data set, or that the test did not have sufficient power to recognize a difference. Examination of power calculations, where available (t-tests), indicates power for the lead parametric test was 43%, so power is likely to be insufficient to detect a difference in lead concentrations between AOC 7A and Background.

AOC 7C vs. Background

In the AOC 7C vs. background evaluation, parametric tests were run using untransformed data for barium. Parametric tests were run using log-transformed data for arsenic, copper, lead and nickel. Non-parametric tests were run for the remaining three constituents, including chromium, vanadium and zinc. The step-by-step summary of the statistical results is presented in Table A-4.

The null hypothesis was rejected for barium and copper in the parametric evaluation and for chromium and vanadium in the non-parametric Wilcoxon Rank Sum tests, indicating concentrations for these constituents in AOC 7C are consistent with background. The null hypothesis was not rejected in the parametric evaluation of arsenic, lead and nickel, and in the non-parametric Wilcoxon Rank Sum evaluation of zinc, indicating either the constituent concentrations in the AOC 7C data set are greater than the background data set, or that the test did not have sufficient power to recognize a difference. Examination of power calculations, where available (t-tests), indicates power ranged from 43% (lead) to 66% (arsenic), with power likely insufficient to evaluate arsenic, lead and nickel.

SWMU F vs. Background

In the SWMU F vs. background evaluation, parametric tests were run using log-transformed data for arsenic and lead. Non-parametric Wilcoxon Rank Sum tests were run for the remaining seven constituents, including barium, cadmium, chromium, copper, nickel, vanadium and zinc. The step-by-step summary of the statistical results is presented in Table A-5.

The null hypothesis was rejected for the parametric evaluation of lead and for the non-parametric evaluation of chromium, vanadium and zinc, indicating concentrations for these constituents in SWMU F are consistent with background. For the remaining constituents (arsenic, barium, cadmium, copper and nickel), the null hypothesis was not rejected, indicating either the constituent concentrations in the SWMU F data set are greater than the background data set, or that the test did not have sufficient power to recognize a difference.

Examination of power calculations, where available (t-tests), indicates power for the parametric test was 32%. The calculated power was likely insufficient to detect a difference in arsenic concentrations between SWMU F and Background.

SWMU G vs. Background

In the SWMU G vs. background evaluation, parametric tests were run using log-transformed data for arsenic, lead and nickel. Non-parametric tests were run for the remaining six constituents, including barium, cadmium, chromium, copper, vanadium and zinc. The step-by-step summary of the statistical results is presented in Table A-6.

The null hypothesis was rejected for the parametric test for nickel and for the non-parametric Wilcoxon Rank Sum tests for chromium and vanadium, indicating concentrations for these constituents in SWMU G are consistent with background. For the remaining six constituents (arsenic, barium, cadmium, copper, lead and zinc), the null hypothesis was not rejected, indicating either the constituent concentrations in the SWMU G data set are greater than the background data set, or that the test did not have sufficient power to recognize a difference. Examination of power calculations, where available (t-tests), indicates power ranged from 13% (lead) to 28% (arsenic). The calculated power was likely insufficient to detect a difference in arsenic and lead concentrations between SWMU G and Background.

SWMU H vs. Background

In the SWMU H vs. background evaluation, parametric tests were run using log-transformed data for arsenic, lead and nickel. Non-parametric tests were run for the remaining six constituents (barium, cadmium, chromium, copper, vanadium and zinc). The step-by-step summary of the statistical results is presented in Table A-7.

The null hypothesis was rejected for parametric tests for arsenic and lead, and for three of the six non-parametric Wilcoxon Rank Sum tests (barium, cadmium and zinc), indicating concentrations for these constituents in SWMU H are consistent with background. For the remaining constituents (chromium, copper,, nickel and vanadium) the null hypothesis was not rejected, indicating either the constituent concentrations in the SWMU H data set are greater than the background data set, or that the test did not have sufficient power to recognize a difference. Examination of power calculations, where available (t-tests), indicates power was 26% (nickel). The calculated power was likely insufficient to evaluate nickel.

Based on the human health evaluation of the seven exposure areas compared to background, it could not be ruled out (i.e., the null hypothesis could not be rejected) that the concentrations of arsenic and nickel in four of the seven exposure areas may exceed the background concentrations by more than S. The concentrations of barium, chromium, lead and zinc at three of the seven exposure areas, the concentrations of copper at six of the

seven exposure areas and the concentrations of vanadium at one of the seven exposure areas may also exceed the background concentrations by more than S.

Ecological Background Evaluation

The statistical software package Stata 8.2 was used to perform the statistical calculations. The distributions of the constituents from AOC 7A and background data sets are presented in Table A-8. The results indicate a mixture of normally, lognormally, and not normally distributed data.

AOC 7A vs. Background

In the AOC 7A vs. background evaluation, parametric tests were run using untransformed data for barium and nickel and log-transformed data for arsenic and lead. Non-parametric tests were run for the remaining nine constituents, including the two constituents testing using t-tests on log-transformed data. The step-by-step summary of the statistical results is presented in Table A-8.

The null hypothesis was rejected for the parametric evaluation of arsenic, barium, lead and nickel, indicating concentrations for these constituents in AOC 7A are consistent with background. The null hypothesis was also rejected for five of the non-parametric Wilcoxon Rank Sum tests (arsenic and lead (tested concurrent with log-transformed t-test), cadmium, vanadium and zinc), indicating concentrations for these constituents in AOC 7A are also consistent with background. The null hypothesis was not rejected for the non-parametric evaluation of chromium, copper, cyanide and mercury, indicating either the concentrations of these constituents in the AOC 7A data set are greater than the background data set, or that the test did not have sufficient power to recognize a difference. Power was not calculated for the Wilcoxon Rank Sum results.

Based on the evaluation of AOC 7A compared to background, it could not be ruled out (i.e., the null hypothesis could not be rejected) that the concentrations of beryllium, chromium, cobalt, copper, cyanide, mercury, selenium and silver may exceed the background concentrations by more than S.

Uncertainties

In general, the statistical analysis was conducted in order to reduce uncertainties in the risk evaluation of soil at the BASF North Works Facility site. However, there are specific uncertainties associated with the statistical analysis. None of the data sets assessed in the statistical evaluation were quantitatively examined for outliers. In general, the presence of outliers would tend to make two different groups of data look different, when they in fact might be more similar if the outlier(s) were to be omitted. While outliers are possible, it should be noted that every attempt was made to collect background samples in locations that are representative of local conditions but not impacted by the facility.

Where the background data were normally distributed, S was defined as one standard deviation, regardless of the test used to compare to other data sets. For all tests where the background data were not normally distributed, a non-parametric S was calculated. The value selected for S (the difference between the median and the 84.13th percentile of the data) is equivalent to one standard deviation above the mean in a normally distributed data set. One standard deviation was selected for ease of statistical implementation and may or may not have significance from a human health and/or ecological risk perspective in the risk assessments.

Conclusions

Human Health Background Evaluation

This statistical evaluation compared the concentrations of specific inorganic constituents in soil in seven SWMU/AOCs to site-specific background soil concentrations. The results of this statistical evaluation indicate that the following constituents in the following SWMU/AOCs were not consistent with background:

- AOC 2: chromium and zinc;
- AOC 6: arsenic and copper;
- AOC 7A: chromium, copper, lead and nickel;
- AOC 7C: arsenic, lead, nickel, and zinc;
- SWMU F: arsenic, barium, cadmium, copper and nickel;
- SWMU G: arsenic, barium, cadmium, copper, lead and zinc;
- SWMU H: chromium, copper, nickel and vanadium.

The following is a summary of inorganics in soil found to be consistent with site-specific background.

AOC 2	Arsenic
	Barium
	Cadmium
	Copper
	Lead
	Nickel
	Vanadium
AOC 6	Barium
	Cadmium
	Chromium
	Lead
	Nickel
	Vanadium
	Zinc

AOC 7A	Arsenic
	Barium
	Cadmium
	Vanadium
	Zinc
AOC 7C	Barium
	Chromium
	Copper
	Vanadium
SWMU F	Chromium
	Lead
	Vanadium
	Zinc
SWMU G	Chromium
	Nickel
	Vanadium
SWMU H	Arsenic
	Barium
	Cadmium
	Lead
	Zinc

Qualitative Evaluation of Background for Mercury (Human Health Data Sets)

The results of the qualitative evaluation of background for the human health data set for mercury are discussed below. Figures presenting the data distributions are provided at the end of this appendix.

The qualitative evaluation indicates that in the small mercury data sets of AOC 4 (2 samples) and AOC 7B (4 samples), all mercury concentrations are fully within the range of the background mercury concentrations (i.e., mercury concentrations within these AOCs are below the background maximum detect of 3 mg/kg).

Within AOC 6, AOC 7A, AOC 7C, and SWMU G, the majority of the mercury concentrations are within the background range, but one or two samples are slightly in excess of the maximum background mercury concentration (SWMU G has the highest mercury concentration among these SWMU/AOCs at 5.4 mg/kg). As shown in the plots for AOC 6 and AOC 7A, the data distribution indicates that many of the mercury concentrations are in the vicinity of the upper range of the background data set (i.e., although most samples are below the maximum background concentration, the majority of the data for these two AOCs are skewed toward the upper end of that range). The smaller data sets of AOC 7C (5 samples) and SWMU G (10 samples) are more evenly distributed throughout the range of background mercury soil concentrations.

Each of the remaining SWMU/AOCs (AOC 2, SWMU F, SWMU H) contain an individual sample with mercury concentrations at least six times higher than the maximum background mercury concentration. Within AOC 2, the majority of the 8 mercury concentrations are within the range of the background mercury concentrations. However, one sample has a detected mercury concentration of 17.1 mg/kg. A similar trend is observed within the mercury concentrations at SWMU F (with two elevated concentrations; 3.5 mg/kg and 21.1 mg/kg) and SWMU H which had the highest detected mercury concentration (52.9 mg/kg).

Based on this qualitative evaluation of mercury in soil, for the majority of SWMU/AOCs, detected mercury concentrations generally fall within the range of background mercury concentrations, with one or two samples slightly above the upper end of the range of background mercury. For a limited number of SWMU/AOCs, specifically AOC 2, SWMU F, and SWMU H, the majority of soil mercury concentrations are consistent with background, but mercury in one sample in each SWMU/AOC is well above the maximum concentration in the site-specific background data set.

Ecological Background Evaluation

This statistical evaluation compared the concentrations of specific inorganic constituents in AOC 7A surface soil to site-specific background surface soil concentrations. The following is a summary of inorganics in AOC 7A surface soil found to be consistent with site-specific background:

- Arsenic
- Barium
- Cadmium
- Lead
- Nickel
- Vanadium
- Zinc

Qualitative Evaluation of Background (Ecological Data Sets)

The results of the qualitative evaluation of background for the ecological data sets are discussed below. Figures presenting the data distributions are provided at the end of this appendix.

AOC 6 - Within AOC 6, concentrations of seven COI (arsenic, copper, mercury, lead, antimony, selenium, and vanadium) are distributed fully within the range of the background concentrations for those COI (i.e., the maximum background concentration is higher than the concentrations within this AOC). For cadmium, the maximum background concentration and the maximum AOC 6 concentration are the same (1.4 mg/kg) and the data are similarly distributed with slightly more elevated concentrations found within the AOC 6 data set. The maximum AOC 6 concentrations of nickel and zinc are elevated above the maximum

background concentrations for these COI. The nickel data are distributed with slightly more elevated concentrations found within AOC 6 and the highest AOC 6 concentration is twice the maximum background concentration. The majority of the AOC 6 zinc concentrations are distributed evenly throughout the background concentrations with only one AOC 6 concentration higher than the maximum background concentration. Based on this evaluation, all inorganic constituents in AOC 6 in this qualitative evaluation except nickel can be considered generally consistent with background.

AOC 7A - The qualitative evaluation of silver and selenium in AOC 7A indicates that the AOC 7A data are distributed evenly throughout the background data set. For silver the highest concentration is found in the AOC 7A data set, but the concentrations of site and background data are generally consistent. For selenium, the maximum background concentration is more than twice the highest AOC 7A concentration, and the concentrations from site and background are generally consistent.

SWMU G - With the exception of selenium, the concentrations of COI within SWMU G are distributed fairly evenly with the background concentrations. In the case of selenium, the background concentrations are all above the SWMU G concentrations. Concentrations of seven COI in SWMU G (chromium, copper, nickel, lead, antimony, selenium, and vanadium) are distributed fully within the range of background concentrations for those COI (i.e., the maximum background concentration is higher than the concentrations within this SWMU). For arsenic, the maximum background concentration and the maximum SWMU G concentration are the same (101 mg/kg) and the data are similarly distributed with slightly more elevated concentrations found within the SWMU G data set. Although higher concentrations of cadmium, mercury, and zinc are found within the SWMU G data set, the majority of the SWMU G concentrations for these COI are distributed evenly throughout the background concentrations and only one SWMU G sample is higher than the background concentration. All inorganic constituents detected in SWMU G and evaluated in this qualitative evaluation can be considered generally consistent with background.

SWMU H - Within SWMU H, concentrations of nine COI (arsenic, chromium, copper, mercury, lead, tin, thallium, vanadium, and zinc) are distributed fully within the range of the background concentrations for those COI (i.e., the maximum background concentration is higher than the concentrations within this SWMU). The maximum concentrations of cadmium, nickel, and antimony within this SWMU are above the maximum background concentrations for these COI. However, for these three COI, the majority of the SWMU H concentrations are distributed evenly throughout the background concentrations and only one SWMU H sample is higher than the background concentration. All inorganic constituents detected in SWMU H and evaluated in this qualitative evaluation can be considered generally consistent with background.

References

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Table A-1
Results of Statistical Analysis
AOC 2
S = One standard deviation
S = 84.13% non-parametric not normal tests

Chemical	Distributions[a]			Tests to Run			Parametric Tests Normal Distribution				Parametric Tests Log-normal Distribution				Non-parametric Tests		Results	Is AOC2 consistent with Background?
				Parametric t-test		Non-parametric Wilcoxon rank sum test	Test for homogeneity of variance		t-test p-value [p_l]	power	Test for homogeneity of variance		t-test p-value [p_l]	power				
	AOC2	Background	S	Raw data	Log-trans. data		F-test p-value	t-test used			F-test p value	t-test used			p-value	z-score		
Arsenic	N + LN	LN	sigma		Yes						0.7300	equal	**0.0786**	0.5504			Reject Ho	**Yes**
Barium	N	N	sigma	Yes			**0.0234**	unequal	**0.0000**	0.9996							Reject Ho	**Yes**
Cadmium	--	LN	84.13%			Yes									**0.0220**	**-2.290**	Reject Ho	**Yes**
Chromium	--	--	84.13%			Yes									0.2421	**-1.170**	Do not reject Ho	No
Copper	N	LN	84.13%			Yes									**0.0168**	**-2.390**	Reject Ho	**Yes**
Lead	LN	LN	sigma		Yes						0.2714	equal	**0.0141**	0.9214			Reject Ho	**Yes**
Nickel	N + LN	LN	sigma		Yes						**0.0046**	unequal	**0.0046**	0.9389			Reject Ho	**Yes**
Vanadium	LN	--	84.13%			Yes									**0.0044**	**-2.848**	Reject Ho	**Yes**
Zinc	LN	--	84.13%			Yes									0.1149	**-1.577**	Do not reject Ho	No

[a] N indicates normal distribution, LN indicates log-normal distribution, -- indicates distribution not normal
Null hypotheses rejected if p-value < 0.10 for f-tests and t-tests
Null hypotheses rejected if p-value < 0.10 and z-score < 0 for WRS tests
p-values that are signficant (i.e., <0.10) are bolded.
z-scores that are significant (i.e., <0) are bolded.

Table A-2
Results of Statistical Analysis
AOC 6
S = One standard deviation
S = 84.13% non-parametric not normal tests

Chemical	Distributions[a]			Tests to Run			Parametric Tests Normal Distribution				Parametric Tests Log-normal Distribution				Non-parametric Tests		Results	Is AOC 6 consistent with Background?
				Parametric t-test		Non-parametric Wilcoxon rank sum test	Test for homogeneity of variance		t-test p-value [p_l]	power	Test for homogeneity of variance		t-test p-value [p_l]	power				
	AOC 6	Background	S	Raw data	Log-trans. data		F-test p-value	t-test used			F-test p-value	t-test used			p-value	z-score		
Arsenic	LN	LN	sigma		Yes						0.6621	equal	0.1807	0.3567			Do not reject Ho	No
Barium	N	N	sigma	Yes			0.9974	equal	**0.0335**	0.7268							Reject Ho	**Yes**
Cadmium	LN	LN	84.13%			Yes									**0.0316**	**-2.149**	Reject Ho	**Yes**
Chromium	LN	--	84.13%			Yes									**0.0194**	**-2.338**	Reject Ho	**Yes**
Copper	N	LN	84.13%			Yes									0.9783	**-0.027**	Do not reject Ho	No
Lead	LN	LN	sigma		Yes						0.1664	equal	**0.0561**	0.6150			Reject Ho	**Yes**
Nickel	LN	LN	sigma		Yes						0.7935	equal	**0.0312**	0.7342			Reject Ho	**Yes**
Vanadium	N + LN	--	84.13%			Yes									**0.0000**	**-5.112**	Reject Ho	**Yes**
Zinc	LN	--	84.13%			Yes									**0.0180**	**-2.365**	Reject Ho	**Yes**

[a] N indicates normal distribution, LN indicates log-normal distribution, -- indicates distribution not normal
Null hypotheses rejected if p-value < 0.10 for f-tests and t-tests
Null hypotheses rejected if p-value < 0.10 and z-score < 0 for WRS tests
p-values that are signficant (i.e., <0.10) are bolded.
z-scores that are significant (i.e., <0) are bolded.

Table A-3
Results of Statistical Analysis
AOC 7A
S = One standard deviation
S = 84.13% non-parametric not normal tests

Chemical	Distributions[a]			Tests to Run			Parametric Tests Normal Distribution				Parametric Tests Log-normal Distribution				Non-parametric Tests		Results	Is AOC7A consistent with Background?
				Parametric t-test		Non-parametric Wilcoxon rank sum test	Test for homogeneity of variance		t-test p-value [p_l]	power	Test for homogeneity of variance		t-test p-value [p_l]	power				
	AOC7A	Background	S	Raw data	Log-trans. data		F-test p-value	t-test used			F-test p-value	t-test used			p-value	z-score		
Arsenic	LN	LN	sigma		Yes						0.5168	equal	**0.0532**	0.6649			Reject Ho	**Yes**
Barium	N + LN	N	sigma	Yes			0.4323	equal	**0.0075**	0.9170							Reject Ho	**Yes**
Cadmium	N + LN	LN	84.13%			Yes									**0.0001**	**-3.886**	Reject Ho	**Yes**
Chromium	N + LN	--	84.13%			Yes									0.1416	**-1.470**	Do not reject Ho	No
Copper	N	LN	84.13%			Yes									0.3448	**-0.945**	Do not reject Ho	No
Lead	LN	LN	sigma		Yes						0.4813	equal	0.1481	0.4253			Do not reject Ho	No
Nickel	N	LN	84.13%			Yes									0.4010	**-0.840**	Do not reject Ho	No
Vanadium	N + LN	--	84.13%			Yes									**0.0543**	**-1.925**	Reject Ho	**Yes**
Zinc	N + LN	--	84.13%			Yes									**0.0010**	**-3.290**	Reject Ho	**Yes**

[a] N indicates normal distribution, LN indicates log-normal distribution, -- indicates distribution not normal
Null hypotheses rejected if p-value < 0.10 for f-tests and t-tests
Null hypotheses rejected if p-value < 0.10 and z-score < 0 for WRS tests
p-values that are signficant (i.e., <0.10) are bolded.
z-scores that are significant (i.e., <0) are bolded.

Table A-4
Results of Statistical Analysis
AOC 7C
S = One standard deviation
S = 84.13% non-parametric not normal tests

Chemical	Distributions[a]			Tests to Run			Parametric Tests Normal Distribution				Parametric Tests Log-normal Distribution				Non-parametric Tests		Results	Is AOC7C consistent with Background?
				Parametric t-test		Non-parametric Wilcoxon rank sum test	Test for homogeneity of variance		t-test p-value [p_l]	power	Test for homogeneity of variance		t-test p-value [p_l]	power				
	AOC7C	Background	S	Raw data	Log-trans. data		F-test p-value	t-test used			F-test p-value	t-test used			p-value	z-score		
Arsenic	N + LN	LN	sigma		Yes						**0.0035**	unequal	0.2360	0.6649			Do not reject Ho	No
Barium	N + LN	N	sigma	Yes			0.9965	equal	**0.0645**	0.9170							Reject Ho	**Yes**
Chromium	N + LN	--	84.13%			Yes									**0.0066**	**-2.718**	Reject Ho	**Yes**
Copper	N + LN	LN	sigma		Yes						**0.0006**	unequal	**0.0443**	0.8485			Reject Ho	**Yes**
Lead	N + LN	LN	sigma		Yes						0.4224	equal	0.2172	0.4253			Do not reject Ho	No
Nickel	LN	LN	sigma		Yes						0.7964	equal	0.6556	0.5768			Do not reject Ho	No
Vanadium	N + LN	--	84.13%			Yes									**0.0022**	**-3.057**	Reject Ho	**Yes**
Zinc	LN	--	84.13%			Yes									0.2213	**-1.223**	Do not reject Ho	No

[a] N indicates normal distribution, LN indicates log-normal distribution, -- indicates distribution not normal
Null hypotheses rejected if p-value < 0.10 for f-tests and t-tests
Null hypotheses rejected if p-value < 0.10 and z-score < 0 for WRS tests
p-values that are signficant (i.e., <0.10) are bolded.
z-scores that are significant (i.e., <0) are bolded.

Table A-5
Results of Statistical Analysis
SWMU F
S = One standard deviation
S = 84.13% non-parametric not normal tests

Chemical	Distributions[a]			Tests to Run			Parametric Tests Normal Distribution				Parametric Tests Log-normal Distribution				Non-parametric Tests		Results	Is SWMU F consistent with Background?
				Parametric t-test		Non-parametric Wilcoxon rank sum test	Test for homogeneity of variance		t-test p-value [p_l]	power	Test for homogeneity of variance		t-test p-value [p_l]	power				
	SWMU F	Background	S	Raw data	Log-trans. data		F-test p-value	t-test used			F-test p-value	t-test used			p-value	z-score		
Arsenic	LN	LN	sigma		Yes						0.5871	equal	0.2196	0.3245			Do not reject Ho	No
Barium	LN	N	sigma			Yes									0.1236	**-1.540**	Do not reject Ho	No
Cadmium	--	LN	84.13%			Yes									0.2017	**-1.277**	Do not reject Ho	No
Chromium	--	--	84.13%			Yes									**0.0430**	**-2.024**	Reject Ho	**Yes**
Copper	--	LN	84.13%			Yes									0.6284	**-0.484**	Do not reject Ho	No
Lead	LN	LN	sigma		Yes						0.8856	equal	**0.0861**	0.5406			Reject Ho	**Yes**
Nickel	--	LN	84.13%			Yes									0.2910	**-1.056**	Do not reject Ho	No
Vanadium	N + LN	--	84.13%			Yes									**0.0003**	**-3.608**	Reject Ho	**Yes**
Zinc	LN	--	84.13%			Yes									**0.0529**	**-1.936**	Reject Ho	**Yes**

[a] N indicates normal distribution, LN indicates log-normal distribution, -- indicates distribution not normal
Null hypotheses rejected if p-value < 0.10 for f-tests and t-tests
Null hypotheses rejected if p-value < 0.10 and z-score < 0 for WRS tests
p-values that are signficant (i.e., <0.10) are bolded.
z-scores that are significant (i.e., <0) are bolded.

Table A-6
Results of Statistical Analysis
SWMU G
S = One standard deviation
S = 84.13% non-parametric not normal tests

Chemical	Distributions[a]			Tests to Run			Parametric Tests Normal Distribution				Parametric Tests Log-normal Distribution				Non-parametric Tests		Results	Is SWMU G consistent with Background?
				Parametric t-test		Non-parametric Wilcoxon rank sum test	Test for homogeneity of variance		t-test p-value [p_l]	power	Test for homogeneity of variance		t-test p-value [p_l]	power				
	SWMU G	Background	S	Raw data	Log-trans. data		F-test p-value	t-test used			F-test p-value	t-test used			p-value	z-score		
Arsenic	LN	LN	sigma		Yes						0.7091	equal	0.2494	0.2839			Do not reject Ho	No
Barium	LN	N	sigma			Yes									0.5975	**-0.528**	Do not reject Ho	No
Cadmium	LN	LN	84.13%			Yes									0.3786	**-0.880**	Do not reject Ho	No
Chromium	N + LN	--	84.13%			Yes									**0.0529**	**-1.936**	Reject Ho	**Yes**
Copper	--	LN	84.13%			Yes									0.6284	0.484	Do not reject Ho	No
Lead	LN	LN	sigma		Yes						**0.0445**	unequal	0.4479	0.1252			Do not reject Ho	No
Nickel	LN	LN	sigma		Yes						**0.0078**	unequal	**0.0540**	0.6489			Reject Ho	**Yes**
Vanadium	LN	--	84.13%			Yes									**0.0001**	**-3.827**	Reject Ho	**Yes**
Zinc	LN	--	84.13%			Yes									0.1465	**-1.452**	Do not reject Ho	No

[a] N indicates normal distribution, LN indicates log-normal distribution, -- indicates distribution not normal
Null hypotheses rejected if p-value < 0.10 for f-tests and t-tests
Null hypotheses rejected if p-value < 0.10 and z-score < 0 for WRS tests
p-values that are signficant (i.e., <0.10) are bolded.
z-scores that are significant (i.e., <0) are bolded.

Table A-7
Results of Statistical Analysis
SWMU H
S = One standard deviation
S = 84.13% non-parametric not normal tests

Chemical	Distributions[a]			Tests to Run			Parametric Tests Normal Distribution				Parametric Tests Log-normal Distribution				Non-parametric Tests		Results	Is SWMU H consistent with Background?
				Parametric t-test		Non-parametric Wilcoxon rank sum test	Test for homogeneity of variance		t-test p-value [p_l]	power	Test for homogeneity of variance		t-test p-value [p_l]	power				
	SWMU H	Background	S	Raw data	Log-trans. data		F-test p-value	t-test used			F-test p-value	t-test used			p-value	z-score		
Arsenic	LN	LN	sigma		Yes						0.6774	equal	**0.0152**	0.8295			Reject Ho	**Yes**
Barium	--	N	84.13%			Yes									0.0857	**-1.718**	Reject Ho	**Yes**
Cadmium	--	LN	84.13%			Yes									0.0044	**-2.847**	Reject Ho	**Yes**
Chromium	LN	--	84.13%			Yes									**0.0425**	2.028	Do not reject Ho	No
Copper	--	LN	84.13%			Yes									**0.7566**	**-0.310**	Do not reject Ho	No
Lead	LN	LN	sigma		Yes						**0.0930**	unequal	**0.0569**	0.6365			Reject Ho	**Yes**
Nickel	LN	LN	sigma		Yes						**0.0502**	unequal	0.7357	0.2600			Do not reject Ho	No
Vanadium	N + LN	--	84.13%			Yes									0.2972	**-1.042**	Do not reject Ho	No
Zinc	LN	--	84.13%			Yes									**0.0209**	**-2.310**	Reject Ho	**Yes**

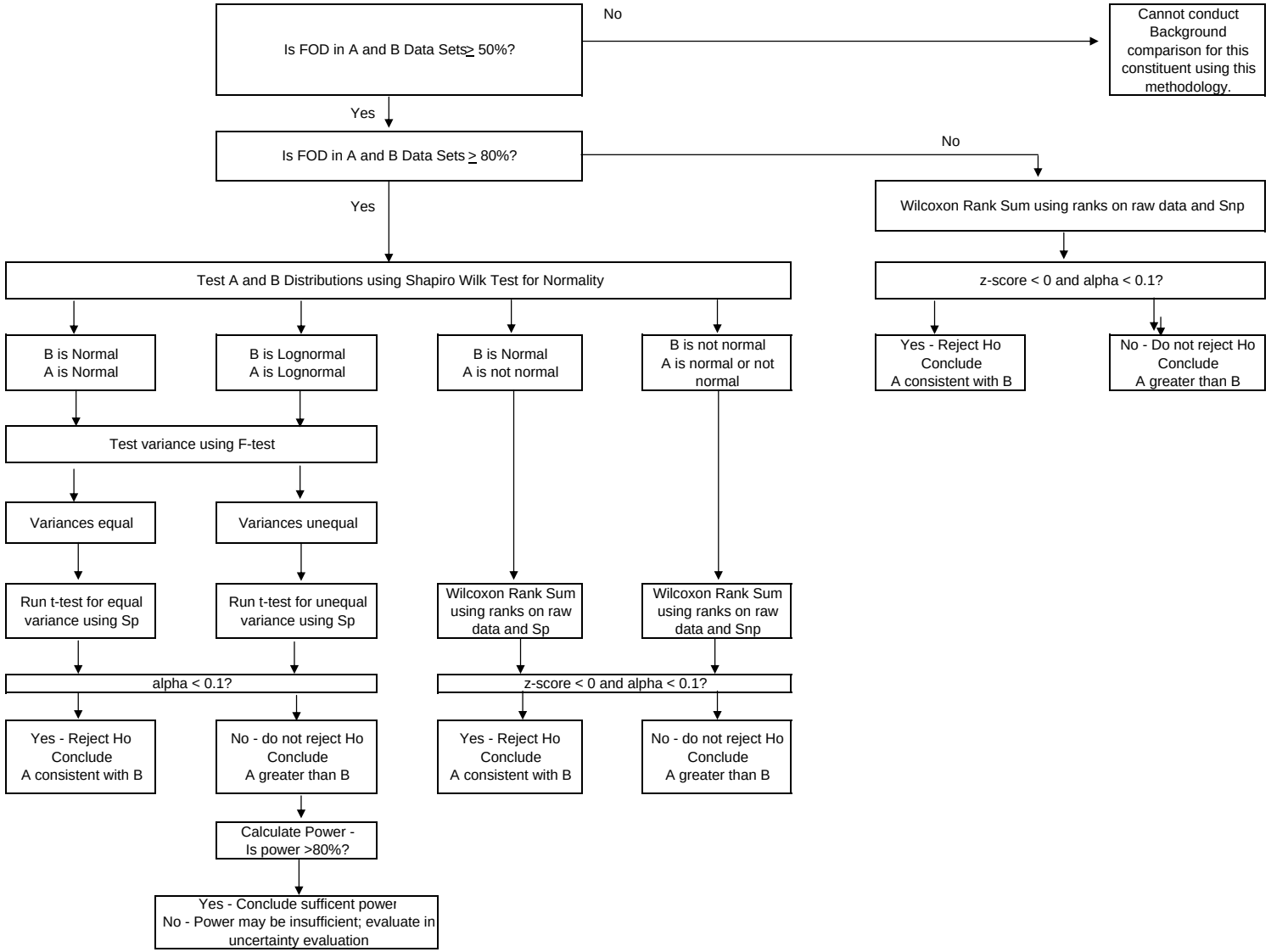
[a] N indicates normal distribution, LN indicates log-normal distribution, -- indicates distribution not normal
Null hypotheses rejected if p-value < 0.10 for f-tests and t-tests
Null hypotheses rejected if p-value < 0.10 and z-score < 0 for WRS tests
p-values that are signficant (i.e., <0.10) are bolded.
z-scores that are significant (i.e., <0) are bolded.

Table A-8
Results of Statistical Analysis
Ecological Evalaution: AOC7A
S = One standard deviation
S = 84.13% non-parametric not normal tests

Chemical	Frequency of Detection		Distributions[a]			Tests to Run			Parametric Tests Normal Distribution				Parametric Tests Log-normal distribution				Non-parametric Tests		Results	Are Site Data consistent with Background Data?
						Parametric t-test		Non-parametric Wilcoxon rank sum test	Test for homogeneity of variance		t-test p-value [p_l]	power	Test for homogeneity of variance		t-test p-value [p_l]	power				
	Ecological Evalaution: AOC7A	Background	Ecological Evalaution: AOC7A	Background		Raw data	Log-trans. data		F-test p-value	t-test used			F-test p-value	t-test used			p-value	z-score		
Arsenic	100%	100%	LN	LN	sigma		Yes	Yes					0.7812	equal	**0.0266**	0.7661	**0.0118**	2.519	Reject Ho	**Yes**
Barium	100%	86%	N + LN	N + LN	sigma	Yes			0.5911	equal	**0.0003**	0.9955							Reject Ho	**Yes**
Beryllium	14%	21%	--	--	NA														NA	NA
Cadmium	86%	71%	LN	N + LN	sigma			Yes									**0.0790**	1.757	Reject Ho	**Yes**
Chromium	100%	100%	N + LN	--	84.13%			Yes									0.1011	1.640	Do not reject Ho	No
Cobalt	14%	57%	--	N + LN	NA														NA	NA
Copper	100%	100%	N	LN	sigma			Yes									0.3195	0.995	Do not reject Ho	No
Total Cyanide	79%	83%	--	N + LN	sigma			Yes									0.1924	1.304	Do not reject Ho	No
Lead	100%	100%	LN	LN	sigma		Yes	Yes					0.3688	equal	**0.0616**	0.6109	**0.0010**	3.279	Reject Ho	**Yes**
Mercury	79%	50%	--	--	84.13%			Yes									0.3482	0.938	Do not reject Ho	No
Nickel	93%	93%	N + LN	N	sigma	Yes			0.5114	equal	**0.0261**	0.7646							Reject Ho	**Yes**
Selenium	29%	15%	--	--	NA														NA	NA
Silver	7%	0%	--	--	NA														NA	NA
Vanadium	100%	100%	N + LN	--	84.13%			Yes									**0.0006**	3.455	Reject Ho	**Yes**
Zinc	100%	100%	LN	N	sigma			Yes									**0.0609**	1.874	Reject Ho	**Yes**

[a] N indicates normal distribution, LN indicates log-normal distribution, -- indicates distribution not normal
Null hypotheses rejected if p-value < 0.10 for f-tests and t-tests
Null hypotheses rejected if p-value < 0.10 and z-score > 0 for WRS tests
p-values that are signficant (i.e., <0.10) are bolded.
z-scores that are significant (i.e., >0) are bolded.

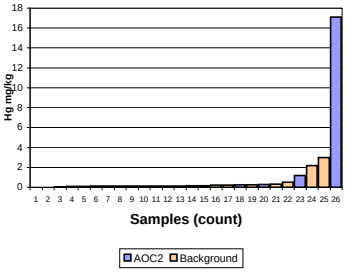
Figure A-1
Background Comparison Approach
BASF North Works Facility Site



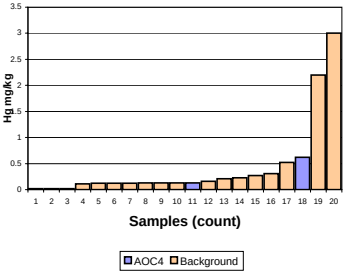
Notes:
FOD = Frequency of Detection = Number of Detects/Total number of Samples * 100%.
A = Area of Investigation
B = Background
Sp = Substantial Difference where Background data are at least 80% detected and normally distributed. Equal to the standard deviation of the background data set.
Snp = Substantial Difference where Background data are greater than 50% detected but less than 80% detected, and/or not normally distributed.
Equal to the difference between the 84.13th and 50th percentiles of the background data (equivalent to one standard deviation for a normal distribution).

Qualitative Background Evaluation for Mercury in Soils (all Depths)

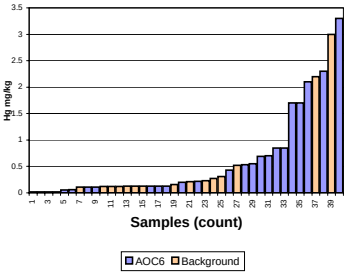
AOC 2



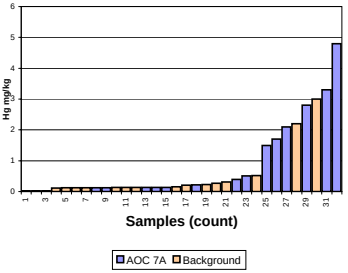
AOC 4



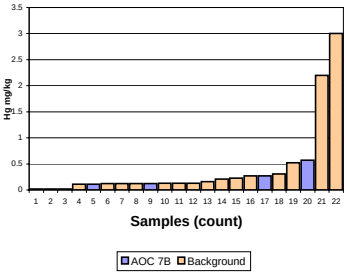
AOC 6



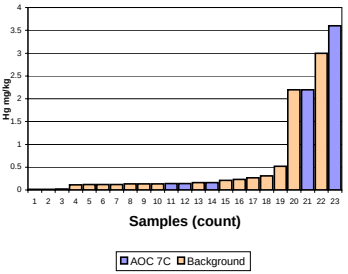
AOC 7A



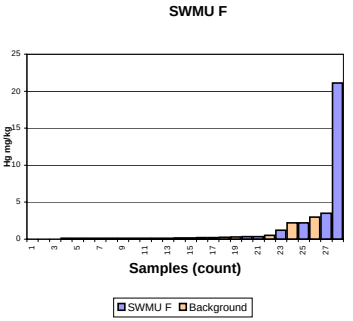
AOC 7B

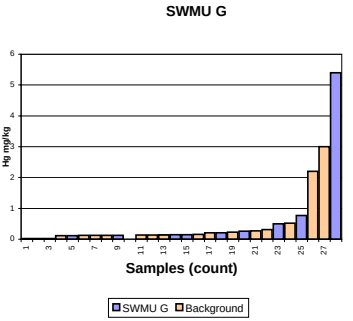


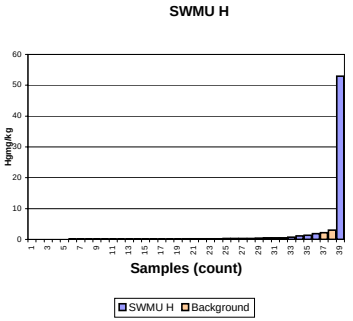
AOC 7C



Qualitative Background Evaluation for Mercury in Soils (all Depths)

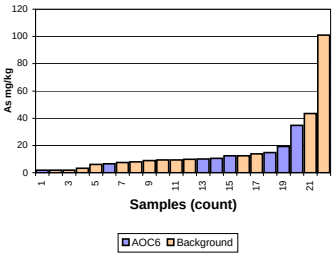




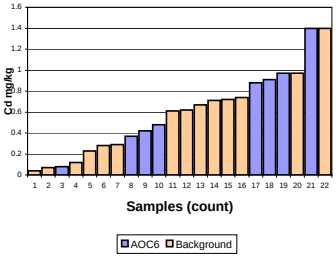


Qualitative Background Evaluation for Metals in Surface Soil at AOC 6

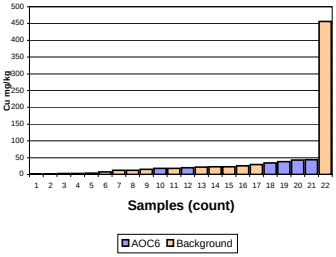
Arsenic



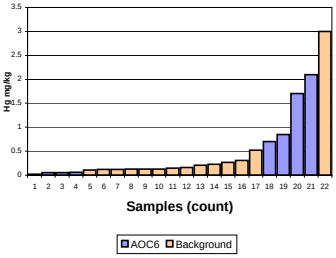
Cadmium



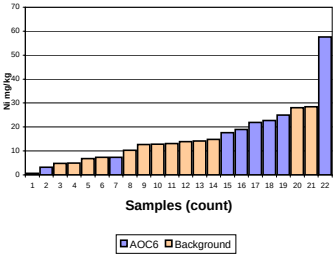
Copper



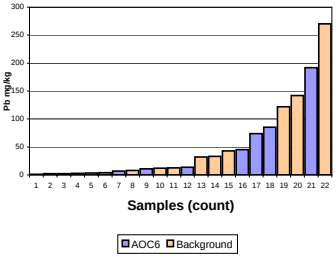
Mercury



Nickel

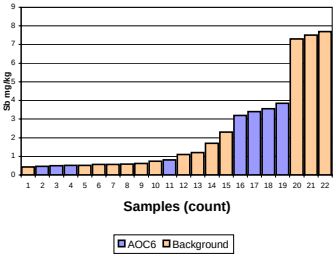


Lead

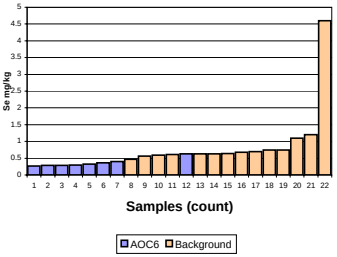


Qualitative Background Evaluation for Metals in Surface Soil at AOC 6

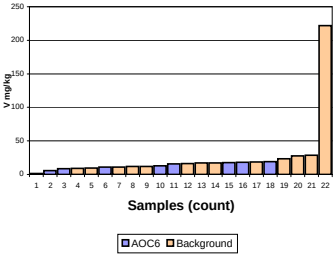
Antimony



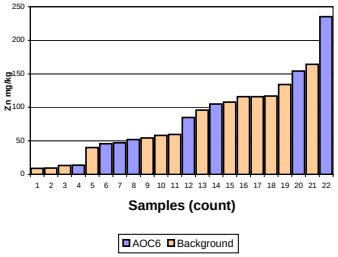
Selenium



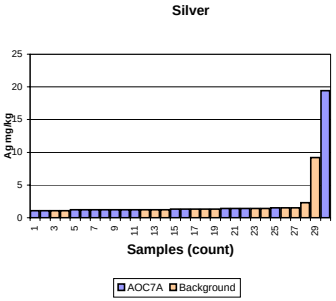
Vanadium

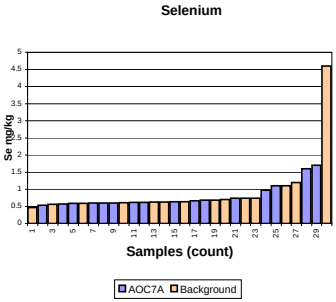


Zinc



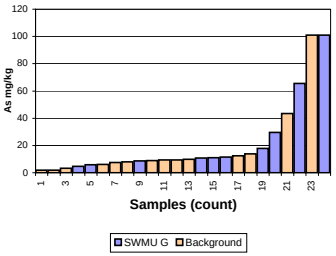
Qualitative Background Evaluation for Metals in Surface Soil at AOC 7A



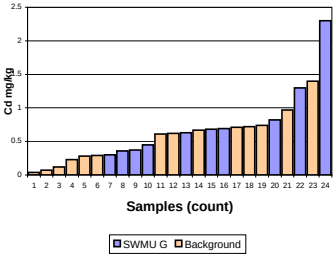


Qualitative Background Evaluation for Metals in Surface Soil at SWMU G

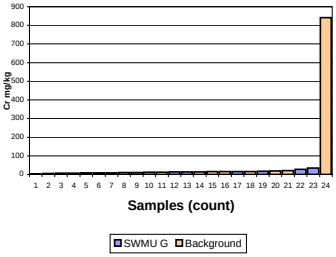
Arsenic



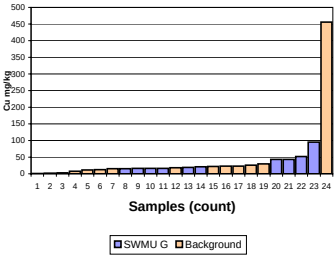
Cadmium



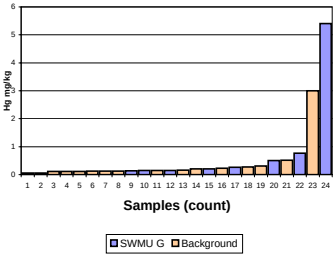
Chromium



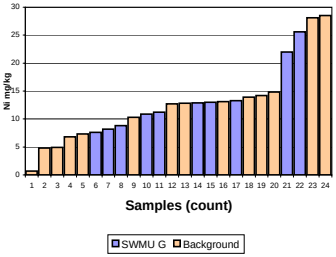
Copper



Mercury

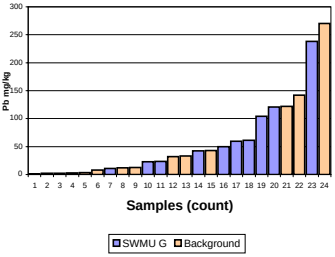


Nickel

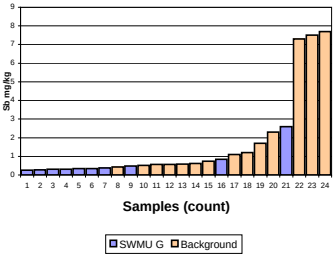


Qualitative Background Evaluation for Metals in Surface Soil at SWMU G

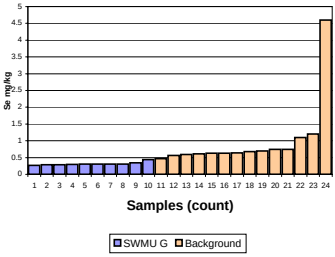
Lead



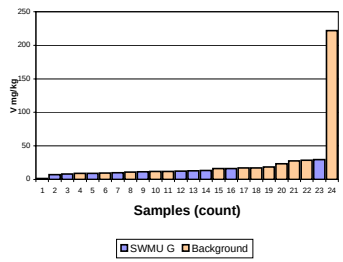
Antimony



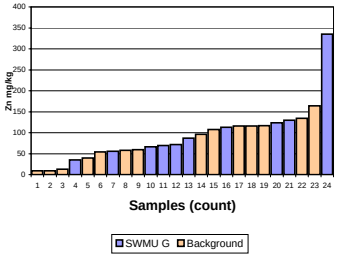
Selenium



Vanadium

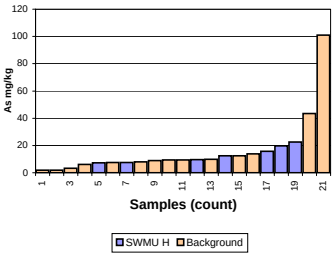


Zinc

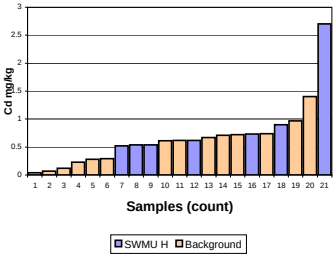


Qualitative Background Evaluation for Metals in Surface Soil at SWMU H

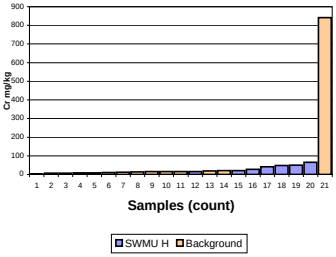
Arsenic



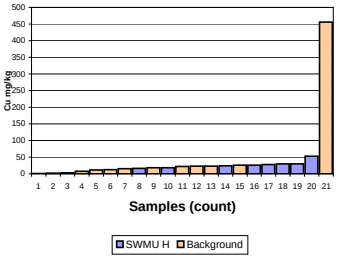
Cadmium



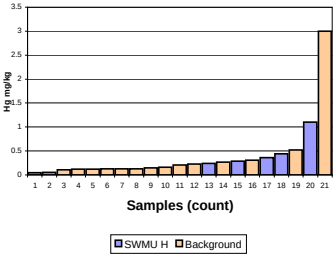
Chromium



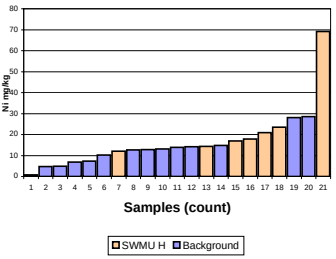
Copper



Mercury

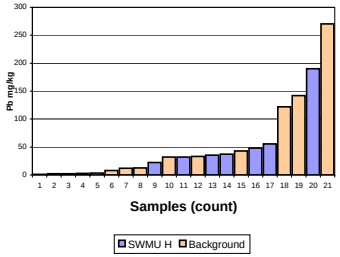


Nickel

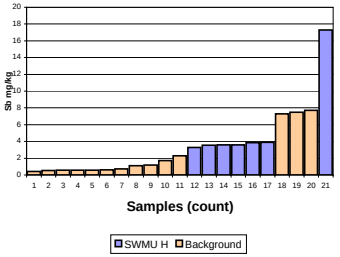


Qualitative Background Evaluation for Metals in Surface Soil at SWMU H

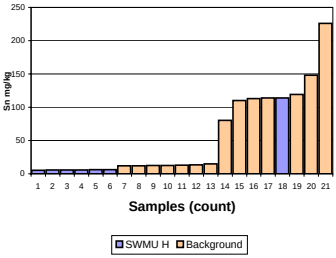
Lead



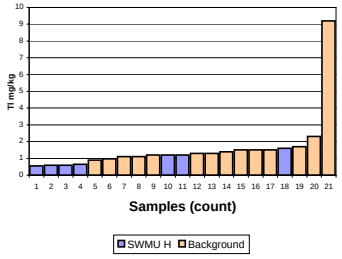
Antimony



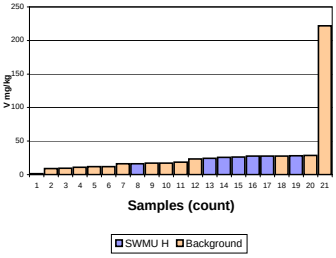
Tin



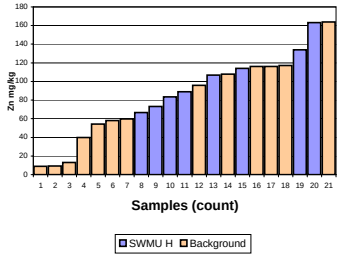
Thallium



Vanadium



Zinc



Appendix B

ProUCL UCL Calculation Output Tables

ProUCL 4.0 OUTPUT - ALL SOIL
BASF NORTH WORKS FACILITY
WYANDOTTE, MICHIGAN
TIER 2 RISK ASSESSMENT

General UCL Statistics for Full Data Sets

User Selected Options	
From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operati	2000

ARSENIC (AOC 2)

General Statistics

Number of Valid Samples	10	Number of Unique Samples	9
Raw Statistics		Log-transformed Statistics	
Minimum	0.73	Minimum of Log Data	-0.315
Maximum	41.1	Maximum of Log Data	3.716
Mean	17.59	Mean of log Data	2.413
Median	16.1	SD of log Data	1.234
SD	13.43		
Coefficient of Variation	0.763		
Skewness	0.491		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.945	Shapiro Wilk Test Statistic	0.884
Shapiro Wilk Critical Value	0.842	Shapiro Wilk Critical Value	0.842
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	25.38	95% H-UCL	105.4
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	59.71
95% Adjusted-CLT UCL	25.28	97.5% Chebyshev (MVUE) UCL	76.32
95% Modified-t UCL	25.49	99% Chebyshev (MVUE) UCL	108.9
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	0.935	Data appear Normal at 5% Significance Level	
Theta Star	18.82		
nu star	18.69		
Approximate Chi Square Value (.05)	9.894	Nonparametric Statistics	
Adjusted Level of Significance	0.0267	95% CLT UCL	24.58
Adjusted Chi Square Value	8.802	95% Jackknife UCL	25.38
		95% Standard Bootstrap UCL	24.32
Anderson-Darling Test Statistic	0.279	95% Bootstrap-t UCL	26.52
Anderson-Darling 5% Critical Value	0.744	95% Hall's Bootstrap UCL	25.33
Kolmogorov-Smirnov Test Statistic	0.168	95% Percentile Bootstrap UCL	24.21
Kolmogorov-Smirnov 5% Critical Value	0.272	95% BCA Bootstrap UCL	24.82
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	36.1
		97.5% Chebyshev(Mean, Sd) UCL	44.11
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	59.84
95% Approximate Gamma UCL	33.24		
95% Adjusted Gamma UCL	37.36		

Potential UCL to Use		Use 95% Student's-t UCL	25.38

ProUCL 4.0 OUTPUT - ALL SOIL
BASF NORTH WORKS FACILITY
WYANDOTTE, MICHIGAN
TIER 2 RISK ASSESSMENT

General UCL Statistics for Data Sets with Non-Detects

User Selected Options
From File WorkSheet.wst
Full Precision OFF
Confidence Coefficient 95%
Number of Bootstrap Operations 2000

ANTHRACENE (AOC 6)

General Statistics
Number of Valid Samples 22
Number of Unique Samples 15
Number of Detected Data 15
Number of Non-Detect Data 7
Percent Non-Detects 31.82%

Raw Statistics
Minimum Detected 0.014
Maximum Detected 120
Mean of Detected 10.87
SD of Detected 30.44
Minimum Non-Detect 0.28
Maximum Non-Detect 380

Log-transformed Statistics
Minimum Detected -4.269
Maximum Detected 4.787
Mean of Detected -0.146
SD of Detected 2.654
Minimum Non-Detect -1.273
Maximum Non-Detect 5.94

Note: Data have multiple DLs - Use of KM Method is recommended
For all methods (except KM, DL/2, and ROS Methods),
Observations < Largest ND are treated as NDs

Number treated as Non-Detect 22
Number treated as Detected 0
Single DL Non-Detect Percentage 100.00%

UCL Statistics
Normal Distribution Test with Detected Values Only
Shapiro Wilk Test Statistic 0.384
5% Shapiro Wilk Critical Value 0.881
Data not Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only
Shapiro Wilk Test Statistic 0.958
5% Shapiro Wilk Critical Value 0.881
Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution
DL/2 Substitution Method
Mean 17.09
SD 46.14
95% DL/2 (t) UCL 34.02

Assuming Lognormal Distribution
DL/2 Substitution Method
Mean 0.146
SD 2.613
95% H-Stat (DL/2) UCL 474.2

Maximum Likelihood Estimate(MLE) Method N/A
MLE method failed to converge properly

Log ROS Method
Mean in Log Scale -0.653
SD in Log Scale 2.335
Mean in Original Scale 7.485
SD in Original Scale 25.37
95% Percentile Bootstrap UCL 18.02
95% BCA Bootstrap UCL 23.54

Gamma Distribution Test with Detected Values Only
k star (bias corrected) 0.265
Theta Star 40.98
nu star 7.959

Data Distribution Test with Detected Values Only
Data appear Gamma Distributed at 5% Significance Level

A-D Test Statistic 0.743
5% A-D Critical Value 0.845
K-S Test Statistic 0.845
5% K-S Critical Value 0.241
Data appear Gamma Distributed at 5% Significance Level

Nonparametric Statistics
Kaplan-Meier (KM) Method
Mean 7.993
SD 25.29
SE of Mean 5.718
95% KM (t) UCL 17.83
95% KM (z) UCL 17.4
95% KM (jackknife) UCL 17.74
95% KM (bootstrap t) UCL 65.56
95% KM (BCA) UCL 19.6
95% KM (Percentile Bootstrap) UCL 19.07
95% KM (Chebyshev) UCL 32.92
97.5% KM (Chebyshev) UCL 43.7
99% KM (Chebyshev) UCL 64.89

Assuming Gamma Distribution
Gamma ROS Statistics using Extrapolated Data
Minimum 0
Maximum 120
Mean 8.312
Median 0.675
SD 25.23
k star 0.148
Theta star 56.26
Nu star 6.5
AppChi2 1.901
95% Gamma Approximate UCL 28.43
95% Adjusted Gamma UCL 31.39

Potential UCLs to Use
95% KM (BCA) UCL 19.6

Note: DL/2 is not a recommended method.

ARSENIC (AOC6)

General Statistics

Number of Valid Samples	22	Number of Unique Samples	21

Raw Statistics		Log-transformed Statistics	
Minimum	1.8	Minimum of Log Data	0.588
Maximum	200	Maximum of Log Data	5.298
Mean	27.82	Mean of log Data	2.822
Median	17.1	SD of log Data	0.989
SD	40.58		
Coefficient of Variation	1.459		
Skewness	3.95		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.508	Shapiro Wilk Test Statistic	0.972
Shapiro Wilk Critical Value	0.911	Shapiro Wilk Critical Value	0.911
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	42.71	95% H-UCL	47.36
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	54.01
95% Adjusted-CLT UCL	49.83	97.5% Chebyshev (MVUE) UCL	65.89
95% Modified-t UCL	43.92	99% Chebyshev (MVUE) UCL	89.22

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	1.006	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	27.66		
nu star	44.26		
Approximate Chi Square Value (.05)	30	Nonparametric Statistics	
Adjusted Level of Significance	0.0386	95% CLT UCL	42.05
Adjusted Chi Square Value	29.13	95% Jackknife UCL	42.71
		95% Standard Bootstrap UCL	41.92
Anderson-Darling Test Statistic	0.712	95% Bootstrap-t UCL	68.42
Anderson-Darling 5% Critical Value	0.768	95% Hall's Bootstrap UCL	96.44
Kolmogorov-Smirnov Test Statistic	0.134	95% Percentile Bootstrap UCL	44.14
Kolmogorov-Smirnov 5% Critical Value	0.19	95% BCA Bootstrap UCL	54.93
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	65.53
		97.5% Chebyshev(Mean, Sd) UCL	81.85
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	113.9
95% Approximate Gamma UCL	41.04		
95% Adjusted Gamma UCL	42.28		

Potential UCL to Use	Use 95% Approximate Gamma UCL	41.04

BENZENE (AOC6)

General Statistics			
Number of Valid Samples	22	Number of Detected Data	12
Number of Unique Samples	12	Number of Non-Detect Data	10
		Percent Non-Detects	45.45%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.0039	Minimum Detected	-5.547
Maximum Detected	1400	Maximum Detected	7.244
Mean of Detected	192.6	Mean of Detected	-0.453
SD of Detected	451.3	SD of Detected	4.221
Minimum Non-Detect	0.0054	Minimum Non-Detect	-5.221
Maximum Non-Detect	0.047	Maximum Non-Detect	-3.058
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	14
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	8
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	63.64%
UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.505	Shapiro Wilk Test Statistic	0.858
5% Shapiro Wilk Critical Value	0.859	5% Shapiro Wilk Critical Value	0.859
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	105.1	Mean	-2.591
SD	341.1	SD	3.931
95% DL/2 (t) UCL	230.2	95% H-Stat (DL/2) UCL	30680
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-3.819
		SD in Log Scale	4.874
		Mean in Original Scale	105.1
		SD in Original Scale	341.1
		95% Percentile Bootstrap UCL	232.3
		95% BCA Bootstrap UCL	301.4
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.158	Data do not follow a Discernable Distribution (0.05)	
Theta Star	1220		
nu star	3.788		
A-D Test Statistic	1.583	Nonparametric Statistics	
5% A-D Critical Value	0.887	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.887	Mean	105.1
5% K-S Critical Value	0.274	SD	333.3
Data not Gamma Distributed at 5% Significance Level		SE of Mean	74.21
		95% KM (t) UCL	232.8
Assuming Gamma Distribution		95% KM (z) UCL	227.1
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	230.2
Minimum	0.0039	95% KM (bootstrap t) UCL	2854
Maximum	1400	95% KM (BCA) UCL	248.7
Mean	124.3	95% KM (Percentile Bootstrap) UCL	232.3
Median	38.69	95% KM (Chebyshev) UCL	428.5
SD	335.5	97.5% KM (Chebyshev) UCL	568.5
k star	0.217	99% KM (Chebyshev) UCL	843.4
Theta star	573.8		
Nu star	9.53	Potential UCLs to Use	
AppChi2	3.65	99% KM (Chebyshev) UCL	843.4
95% Gamma Approximate UCL	324.5		
95% Adjusted Gamma UCL	350.2		

Note: DL/2 is not a recommended method.

BENZO(A)ANTHRACENE (AOC6)

General Statistics			
Number of Valid Samples	22	Number of Detected Data	19
Number of Unique Samples	19	Number of Non-Detect Data	3
		Percent Non-Detects	13.64%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.048	Minimum Detected	-3.037
Maximum Detected	130	Maximum Detected	4.868
Mean of Detected	12.99	Mean of Detected	0.486
SD of Detected	29.75	SD of Detected	2.433
Minimum Non-Detect	10	Minimum Non-Detect	2.303
Maximum Non-Detect	380	Maximum Non-Detect	5.94
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	22
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	0
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	100.00%
UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.468	Shapiro Wilk Test Statistic	0.939
5% Shapiro Wilk Critical Value	0.901	5% Shapiro Wilk Critical Value	0.901
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	20.81	Mean	0.857
SD	46.8	SD	2.514
95% DL/2 (t) UCL	37.98	95% H-Stat (DL/2) UCL	1040
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	0.428
		SD in Log Scale	2.261
		Mean in Original Scale	11.38
		SD in Original Scale	27.86
		95% Percentile Bootstrap UCL	22.51
		95% BCA Bootstrap UCL	28.99
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.311	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	41.85		
nu star	11.8		
A-D Test Statistic	0.643	Nonparametric Statistics	
5% A-D Critical Value	0.837	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.837	Mean	12.15
5% K-S Critical Value	0.214	SD	27.75
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	6.239
		95% KM (t) UCL	22.88
Assuming Gamma Distribution		95% KM (z) UCL	22.41
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	22.87
Minimum	0	95% KM (bootstrap t) UCL	43.33
Maximum	130	95% KM (BCA) UCL	23.58
Mean	11.6	95% KM (Percentile Bootstrap) UCL	23.01
Median	2.391	95% KM (Chebyshev) UCL	39.34
SD	27.79	97.5% KM (Chebyshev) UCL	51.11
k star	0.246	99% KM (Chebyshev) UCL	74.22
Theta star	47.16		
Nu star	10.82	Potential UCLs to Use	
AppChi2	4.46	95% KM (Chebyshev) UCL	39.34
95% Gamma Approximate UCL	28.13		
95% Adjusted Gamma UCL	30.17		

Note: DL/2 is not a recommended method.

BENZO(A)PYRENE (AOC6)

General Statistics			
Number of Valid Samples	22	Number of Detected Data	19
Number of Unique Samples	16	Number of Non-Detect Data	3
		Percent Non-Detects	13.64%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.045	Minimum Detected	-3.101
Maximum Detected	94	Maximum Detected	4.543
Mean of Detected	10.43	Mean of Detected	0.4
SD of Detected	21.67	SD of Detected	2.403
Minimum Non-Detect	10	Minimum Non-Detect	2.303
Maximum Non-Detect	380	Maximum Non-Detect	5.94
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	22
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	0
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	100.00%
UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.514	Shapiro Wilk Test Statistic	0.935
5% Shapiro Wilk Critical Value	0.901	5% Shapiro Wilk Critical Value	0.901
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	18.6	Mean	0.783
SD	43.25	SD	2.5
95% DL/2 (t) UCL	34.47	95% H-Stat (DL/2) UCL	913.6
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	0.335
		SD in Log Scale	2.237
		Mean in Original Scale	9.144
		SD in Original Scale	20.33
		95% Percentile Bootstrap UCL	16.84
		95% BCA Bootstrap UCL	21.32
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.327	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	31.92		
nu star	12.42		
A-D Test Statistic	0.552	Nonparametric Statistics	
5% A-D Critical Value	0.834	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.834	Mean	9.768
5% K-S Critical Value	0.214	SD	20.25
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	4.557
		95% KM (t) UCL	17.61
Assuming Gamma Distribution		95% KM (z) UCL	17.26
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	17.6
Minimum	0	95% KM (bootstrap t) UCL	30.32
Maximum	94	95% KM (BCA) UCL	18.65
Mean	9.368	95% KM (Percentile Bootstrap) UCL	17.82
Median	2.34	95% KM (Chebyshev) UCL	29.63
SD	20.26	97.5% KM (Chebyshev) UCL	38.22
k star	0.255	99% KM (Chebyshev) UCL	55.1
Theta star	36.71		
Nu star	11.23	Potential UCLs to Use	
AppChi2	4.724	95% KM (Chebyshev) UCL	29.63
95% Gamma Approximate UCL	22.27		
95% Adjusted Gamma UCL	23.84		

Note: DL/2 is not a recommended method.

BENZO(B)FLUORANTHENE (AOC6)

General Statistics			
Number of Valid Samples	22	Number of Detected Data	19
Number of Unique Samples	18	Number of Non-Detect Data	3
		Percent Non-Detects	13.64%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.061	Minimum Detected	-2.797
Maximum Detected	100	Maximum Detected	4.605
Mean of Detected	12.68	Mean of Detected	0.711
SD of Detected	23.58	SD of Detected	2.388
Minimum Non-Detect	10	Minimum Non-Detect	2.303
Maximum Non-Detect	380	Maximum Non-Detect	5.94
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	22
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	0
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	100.00%
UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.578	Shapiro Wilk Test Statistic	0.929
5% Shapiro Wilk Critical Value	0.901	5% Shapiro Wilk Critical Value	0.901
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	20.54	Mean	1.051
SD	43.73	SD	2.447
95% DL/2 (t) UCL	36.58	95% H-Stat (DL/2) UCL	907.1
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	0.646
		SD in Log Scale	2.222
		Mean in Original Scale	11.13
		SD in Original Scale	22.19
		95% Percentile Bootstrap UCL	19.68
		95% BCA Bootstrap UCL	24.08
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.343	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	37		
nu star	13.02		
A-D Test Statistic	0.452	Nonparametric Statistics	
5% A-D Critical Value	0.83	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.83	Mean	11.92
5% K-S Critical Value	0.213	SD	22.09
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	4.982
		95% KM (t) UCL	20.49
Assuming Gamma Distribution		95% KM (z) UCL	20.11
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	20.48
Minimum	0	95% KM (bootstrap t) UCL	28.98
Maximum	100	95% KM (BCA) UCL	21.48
Mean	11.45	95% KM (Percentile Bootstrap) UCL	20.72
Median	3.35	95% KM (Chebyshev) UCL	33.63
SD	22.08	97.5% KM (Chebyshev) UCL	43.03
k star	0.262	99% KM (Chebyshev) UCL	61.49
Theta star	43.62		
Nu star	11.55	Potential UCLs to Use	
AppChi2	4.93	95% KM (Chebyshev) UCL	33.63
95% Gamma Approximate UCL	26.81		
95% Adjusted Gamma UCL	28.67		

Note: DL/2 is not a recommended method.

DIBENZ(A,H)ANTHRACENE (AOC6)

General Statistics			
Number of Valid Samples	22	Number of Detected Data	12
Number of Unique Samples	12	Number of Non-Detect Data	10
		Percent Non-Detects	45.45%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.11	Minimum Detected	-2.207
Maximum Detected	12	Maximum Detected	2.485
Mean of Detected	2.562	Mean of Detected	0.0129
SD of Detected	3.407	SD of Detected	1.566
Minimum Non-Detect	0.28	Minimum Non-Detect	-1.273
Maximum Non-Detect	380	Maximum Non-Detect	5.94

Note: Data have multiple DLs - Use of KM Method is recommended	Number treated as Non-Detect	22
For all methods (except KM, DL/2, and ROS Methods),	Number treated as Detected	0
Observations < Largest ND are treated as NDs	Single DL Non-Detect Percentage	100.00%

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.73	Shapiro Wilk Test Statistic	0.929
5% Shapiro Wilk Critical Value	0.859	5% Shapiro Wilk Critical Value	0.859
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	11.18	Mean	0.0379
SD	40.15	SD	1.997
95% DL/2 (t) UCL	25.91	95% H-Stat (DL/2) UCL	50.38
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-0.619
		SD in Log Scale	1.395
		Mean in Original Scale	1.531
		SD in Original Scale	2.725
		95% Percentile Bootstrap UCL	2.591
		95% BCA Bootstrap UCL	2.929
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.548	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	4.671		
nu star	13.16		
A-D Test Statistic	0.433	Nonparametric Statistics	
5% A-D Critical Value	0.773	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.773	Mean	1.703
5% K-S Critical Value	0.256	SD	2.793
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.663
		95% KM (t) UCL	2.844
Assuming Gamma Distribution		95% KM (z) UCL	2.794
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	2.829
Minimum	0.11	95% KM (bootstrap t) UCL	3.817
Maximum	12	95% KM (BCA) UCL	2.993
Mean	2.576	95% KM (Percentile Bootstrap) UCL	2.836
Median	2.138	95% KM (Chebyshev) UCL	4.593
SD	2.528	97.5% KM (Chebyshev) UCL	5.844
k star	0.964	99% KM (Chebyshev) UCL	8.301
Theta star	2.671		
Nu star	42.44	Potential UCLs to Use	
AppChi2	28.5	95% KM (BCA) UCL	2.993
95% Gamma Approximate UCL	3.836		
95% Adjusted Gamma UCL	3.954		

Note: DL/2 is not a recommended method.

NAPHTHALENE (AOC6)

General Statistics			
Number of Valid Samples	22	Number of Detected Data	18
Number of Unique Samples	17	Number of Non-Detect Data	4
		Percent Non-Detects	18.18%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.024	Minimum Detected	-3.73
Maximum Detected	2700	Maximum Detected	7.901
Mean of Detected	168.9	Mean of Detected	0.13
SD of Detected	636.1	SD of Detected	2.927
Minimum Non-Detect	0.2	Minimum Non-Detect	-1.609
Maximum Non-Detect	2.4	Maximum Non-Detect	0.875
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	18
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	4
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	81.82%
UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.296	Shapiro Wilk Test Statistic	0.876
5% Shapiro Wilk Critical Value	0.897	5% Shapiro Wilk Critical Value	0.897
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	138.3	Mean	-0.0907
SD	576.2	SD	2.724
95% DL/2 (t) UCL	349.7	95% H-Stat (DL/2) UCL	1029
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-0.276
		SD in Log Scale	2.806
		Mean in Original Scale	138.2
		SD in Original Scale	576.2
		95% Percentile Bootstrap UCL	383.5
		95% BCA Bootstrap UCL	520.5
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.165	Data do not follow a Discernable Distribution (0.05)	
Theta Star	1025		
nu star	5.931		
A-D Test Statistic	3.251	Nonparametric Statistics	
5% A-D Critical Value	0.902	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.902	Mean	138.2
5% K-S Critical Value	0.227	SD	563
Data not Gamma Distributed at 5% Significance Level		SE of Mean	123.5
		95% KM (t) UCL	350.7
Assuming Gamma Distribution		95% KM (z) UCL	341.4
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	349.6
Minimum	0.024	95% KM (bootstrap t) UCL	63084
Maximum	2700	95% KM (BCA) UCL	383.1
Mean	170.9	95% KM (Percentile Bootstrap) UCL	369.4
Median	1.575	95% KM (Chebyshev) UCL	676.6
SD	572.4	97.5% KM (Chebyshev) UCL	909.5
k star	0.188	99% KM (Chebyshev) UCL	1367
Theta star	909.8		
Nu star	8.267	Potential UCLs to Use	
AppChi2	2.891	99% KM (Chebyshev) UCL	1367
95% Gamma Approximate UCL	488.9		
95% Adjusted Gamma UCL	531.7		

Note: DL/2 is not a recommended method.

PHENANTHRENE (AOC6)

General Statistics			
Number of Valid Samples	22	Number of Detected Data	19
Number of Unique Samples	19	Number of Non-Detect Data	3
		Percent Non-Detects	13.64%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.041	Minimum Detected	-3.194
Maximum Detected	490	Maximum Detected	6.194
Mean of Detected	31.67	Mean of Detected	0.5
SD of Detected	111.5	SD of Detected	2.498
Minimum Non-Detect	10	Minimum Non-Detect	2.303
Maximum Non-Detect	380	Maximum Non-Detect	5.94

Note: Data have multiple DLs - Use of KM Method is recommended	Number treated as Non-Detect	21
For all methods (except KM, DL/2, and ROS Methods),	Number treated as Detected	1
Observations < Largest ND are treated as NDs	Single DL Non-Detect Percentage	95.45%

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.304	Shapiro Wilk Test Statistic	0.952
5% Shapiro Wilk Critical Value	0.901	5% Shapiro Wilk Critical Value	0.901
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	36.94	Mean	0.87
SD	108.9	SD	2.565
95% DL/2 (t) UCL	76.91	95% H-Stat (DL/2) UCL	1351
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	0.434
		SD in Log Scale	2.32
		Mean in Original Scale	27.49
		SD in Original Scale	103.8
		95% Percentile Bootstrap UCL	70.89
		95% BCA Bootstrap UCL	94.95
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.239	Data appear Lognormal at 5% Significance Level	
Theta Star	132.7		
nu star	9.066		
A-D Test Statistic	1.736	Nonparametric Statistics	
5% A-D Critical Value	0.869	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.869	Mean	27.9
5% K-S Critical Value	0.218	SD	101.4
Data not Gamma Distributed at 5% Significance Level		SE of Mean	22.21
		95% KM (t) UCL	66.11
Assuming Gamma Distribution		95% KM (z) UCL	64.43
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	65.97
Minimum	0.041	95% KM (bootstrap t) UCL	487.4
Maximum	490	95% KM (BCA) UCL	71.82
Mean	31.87	95% KM (Percentile Bootstrap) UCL	70.92
Median	1.83	95% KM (Chebyshev) UCL	124.7
SD	103.2	97.5% KM (Chebyshev) UCL	166.6
k star	0.267	99% KM (Chebyshev) UCL	248.9
Theta star	119.3		
Nu star	11.75	Potential UCLs to Use	
AppChi2	5.063	99% KM (Chebyshev) UCL	248.9
95% Gamma Approximate UCL	73.97		
95% Adjusted Gamma UCL	79.04		

Note: DL/2 is not a recommended method.

TOTAL XYLENES (AOC6)

General Statistics			
Number of Valid Samples	19	Number of Detected Data	9
Number of Unique Samples	9	Number of Non-Detect Data	10
		Percent Non-Detects	52.63%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.033	Minimum Detected	-3.411
Maximum Detected	176	Maximum Detected	5.17
Mean of Detected	19.67	Mean of Detected	-1.42
SD of Detected	58.62	SD of Detected	2.566
Minimum Non-Detect	0.0108	Minimum Non-Detect	-4.528
Maximum Non-Detect	122	Maximum Non-Detect	4.804
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	18
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	1
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	94.74%
UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.391	Shapiro Wilk Test Statistic	0.648
5% Shapiro Wilk Critical Value	0.829	5% Shapiro Wilk Critical Value	0.829
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	12.66	Mean	-2.29
SD	41.94	SD	2.947
95% DL/2 (t) UCL	29.35	95% H-Stat (DL/2) UCL	205.9
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-3.774
		SD in Log Scale	2.964
		Mean in Original Scale	9.321
		SD in Original Scale	40.36
		95% Percentile Bootstrap UCL	27.84
		95% BCA Bootstrap UCL	37.12
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.188	Data do not follow a Discernable Distribution (0.05)	
Theta Star	104.5		
nu star	3.389		
A-D Test Statistic	2.307	Nonparametric Statistics	
5% A-D Critical Value	0.855	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.855	Mean	9.342
5% K-S Critical Value	0.309	SD	39.28
Data not Gamma Distributed at 5% Significance Level		SE of Mean	9.559
		95% KM (t) UCL	25.92
Assuming Gamma Distribution		95% KM (z) UCL	25.06
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	25.39
Minimum	0	95% KM (bootstrap t) UCL	6695
Maximum	176	95% KM (BCA) UCL	27.88
Mean	12.98	95% KM (Percentile Bootstrap) UCL	27.86
Median	0.075	95% KM (Chebyshev) UCL	51.01
SD	40.76	97.5% KM (Chebyshev) UCL	69.03
k star	0.102	99% KM (Chebyshev) UCL	104.4
Theta star	126.7		
Nu star	3.894	Potential UCLs to Use	
AppChi2	0.68	99% KM (Chebyshev) UCL	104.4
95% Gamma Approximate UCL	74.32		
95% Adjusted Gamma UCL	87.73		

Note: DL/2 is not a recommended method.

ProUCL 4.0 OUTPUT - ALL SOIL
BASF NORTH WORKS FACILITY
WYANDOTTE, MICHIGAN
TIER 2 RISK ASSESSMENT

General UCL Statistics for Full Data Sets

User Selected Options	
From File	WorkSheet_a.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

ARSENIC (AOC 7A)

General Statistics			
Number of Valid Samples	14	Number of Unique Samples	13
Raw Statistics		Log-transformed Statistics	
Minimum	2.5	Minimum of Log Data	0.916
Maximum	62.4	Maximum of Log Data	4.134
Mean	17.67	Mean of log Data	2.458
Median	9.55	SD of log Data	0.94
SD	17.63		
Coefficient of Variation	0.998		
Skewness	1.63		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.793	Shapiro Wilk Test Statistic	0.971
Shapiro Wilk Critical Value	0.874	Shapiro Wilk Critical Value	0.874
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	26.01	95% H-UCL	36.78
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	38.02
95% Adjusted-CLT UCL	27.61	97.5% Chebyshev (MVUE) UCL	46.93
95% Modified-t UCL	26.35	99% Chebyshev (MVUE) UCL	64.44
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	1.108	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	15.94		
nu star	31.04		
Approximate Chi Square Value (.05)	19.31	Nonparametric Statistics	
Adjusted Level of Significance	0.0312	95% CLT UCL	25.42
Adjusted Chi Square Value	18.09	95% Jackknife UCL	26.01
		95% Standard Bootstrap UCL	25.15
Anderson-Darling Test Statistic	0.428	95% Bootstrap-t UCL	31.17
Anderson-Darling 5% Critical Value	0.753	95% Hall's Bootstrap UCL	29.94
Kolmogorov-Smirnov Test Statistic	0.173	95% Percentile Bootstrap UCL	25.21
Kolmogorov-Smirnov 5% Critical Value	0.233	95% BCA Bootstrap UCL	27.8
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	38.2
		97.5% Chebyshev(Mean, Sd) UCL	47.09
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	64.54
95% Approximate Gamma UCL	28.4		
95% Adjusted Gamma UCL	30.31		
Potential UCL to Use		Use 95% Approximate Gamma UCL	28.4

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General UCL Statistics for Full Data Sets

User Selected Options	
From File	WorkSheet_b.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

ARSENIC (AOC 7C)

General Statistics			
Number of Valid Samples	11	Number of Unique Samples	11
Raw Statistics		**Log-transformed Statistics**	
Minimum	9.2	Minimum of Log Data	2.219
Maximum	34.5	Maximum of Log Data	3.541
Mean	19.09	Mean of log Data	2.858
Median	19.2	SD of log Data	0.453
SD	8.352		
Coefficient of Variation	0.438		
Skewness	0.468		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.929	Shapiro Wilk Test Statistic	0.934
Shapiro Wilk Critical Value	0.85	Shapiro Wilk Critical Value	0.85
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	23.66	95% H-UCL	26.17
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	30.71
95% Adjusted-CLT UCL	23.61	97.5% Chebyshev (MVUE) UCL	35.73
95% Modified-t UCL	23.71	99% Chebyshev (MVUE) UCL	45.57
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	4.184	Data appear Normal at 5% Significance Level	
Theta Star	4.563		
nu star	92.04		
Approximate Chi Square Value (.05)	70.92	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0278	95% CLT UCL	23.23
Adjusted Chi Square Value	67.9	95% Jackknife UCL	23.66
		95% Standard Bootstrap UCL	23.04
Anderson-Darling Test Statistic	0.343	95% Bootstrap-t UCL	24.14
Anderson-Darling 5% Critical Value	0.731	95% Hall's Bootstrap UCL	23.62
Kolmogorov-Smirnov Test Statistic	0.17	95% Percentile Bootstrap UCL	23.16
Kolmogorov-Smirnov 5% Critical Value	0.256	95% BCA Bootstrap UCL	23.25
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	30.07
		97.5% Chebyshev(Mean, Sd) UCL	34.82
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	44.15
95% Approximate Gamma UCL	24.78		
95% Adjusted Gamma UCL	25.88		

Potential UCL to Use	Use 95% Student's-t UCL	23.66

ProUCL 4.0 OUTPUT - ALL SOIL
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TIER 2 RISK ASSESSMENT

General UCL Statistics for Data Sets with Non-Detects

User Selected Options	
From File	WorkSheet_c.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

1,2-DICHLOROPROPANE (SWMU F)

General Statistics			
Number of Valid Samples	20	Number of Detected Data	9
Number of Unique Samples	9	Number of Non-Detect Data	11
		Percent Non-Detects	55.00%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.0042	Minimum Detected	-5.473
Maximum Detected	70	Maximum Detected	4.248
Mean of Detected	10.11	Mean of Detected	-0.862
SD of Detected	22.85	SD of Detected	3.347
Minimum Non-Detect	0.011	Minimum Non-Detect	-4.51
Maximum Non-Detect	6.7	Maximum Non-Detect	1.902

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	17
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	3
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	85.00%

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.518	Shapiro Wilk Test Statistic	0.951
5% Shapiro Wilk Critical Value	0.829	5% Shapiro Wilk Critical Value	0.829
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	4.839	Mean	-1.766
SD	15.63	SD	2.792
95% DL/2 (t) UCL	10.88	95% H-Stat (DL/2) UCL	203.2
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-2.967
		SD in Log Scale	2.989
		Mean in Original Scale	4.557
		SD in Original Scale	15.7
		95% Percentile Bootstrap UCL	11.09
		95% BCA Bootstrap UCL	15.15
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.225	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	44.85		
nu star	4.059		
A-D Test Statistic	0.463	Nonparametric Statistics	
5% A-D Critical Value	0.835	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.835	Mean	4.577
5% K-S Critical Value	0.306	SD	15.29
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	3.627
		95% KM (t) UCL	10.85
Assuming Gamma Distribution		95% KM (z) UCL	10.54
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	10.64
Minimum	0.0042	95% KM (bootstrap t) UCL	37.82
Maximum	70	95% KM (BCA) UCL	11.61
Mean	10.34	95% KM (Percentile Bootstrap) UCL	11.17
Median	8.642	95% KM (Chebyshev) UCL	20.39
SD	14.87	97.5% KM (Chebyshev) UCL	27.23
k star	0.416	99% KM (Chebyshev) UCL	40.66
Theta star	24.85		
Nu star	16.63	Potential UCLs to Use	
AppChi2	8.412	95% KM (t) UCL	10.85
95% Gamma Approximate UCL	20.44		
95% Adjusted Gamma UCL	21.62		

Note: DL/2 is not a recommended method.

ARSENIC (SWMU F)

General Statistics			
Number of Valid Samples	10	Number of Unique Samples	10
Raw Statistics		Log-transformed Statistics	
Minimum	4.4	Minimum of Log Data	1.482
Maximum	63.9	Maximum of Log Data	4.157
Mean	23.23	Mean of log Data	2.744
Median	13.5	SD of log Data	0.949
SD	22.27		
Coefficient of Variation	0.959		
Skewness	1.321		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.778	Shapiro Wilk Test Statistic	0.929
Shapiro Wilk Critical Value	0.842	Shapiro Wilk Critical Value	0.842
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	36.14	95% H-UCL	63.08
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	54.51
95% Adjusted-CLT UCL	37.96	97.5% Chebyshev (MVUE) UCL	68.14
95% Modified-t UCL	36.63	99% Chebyshev (MVUE) UCL	94.92
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	1.039	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	22.36		
nu star	20.78		
Approximate Chi Square Value (.05)	11.43	Nonparametric Statistics	
Adjusted Level of Significance	0.0267	95% CLT UCL	34.81
Adjusted Chi Square Value	10.24	95% Jackknife UCL	36.14
		95% Standard Bootstrap UCL	34.08
Anderson-Darling Test Statistic	0.455	95% Bootstrap-t UCL	49.62
Anderson-Darling 5% Critical Value	0.741	95% Hall's Bootstrap UCL	88.77
Kolmogorov-Smirnov Test Statistic	0.182	95% Percentile Bootstrap UCL	34.72
Kolmogorov-Smirnov 5% Critical Value	0.272	95% BCA Bootstrap UCL	35.62
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	53.93
		97.5% Chebyshev(Mean, Sd) UCL	67.21
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	93.3
95% Approximate Gamma UCL	42.24		
95% Adjusted Gamma UCL	47.13		
Potential UCL to Use		Use 95% Approximate Gamma UCL	42.24

BIS(2-CHLOROISOPROPYL) ETHER (SWMU F)

General Statistics			
Number of Valid Samples	20	Number of Detected Data	11
Number of Unique Samples	11	Number of Non-Detect Data	9
		Percent Non-Detects	45.00%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.037	Minimum Detected	-3.297
Maximum Detected	28	Maximum Detected	3.332
Mean of Detected	5.024	Mean of Detected	-0.257
SD of Detected	8.927	SD of Detected	2.255
Minimum Non-Detect	0.37	Minimum Non-Detect	-0.994
Maximum Non-Detect	4	Maximum Non-Detect	1.386
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	17
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	3
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	85.00%
UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.645	Shapiro Wilk Test Statistic	0.943
5% Shapiro Wilk Critical Value	0.85	5% Shapiro Wilk Critical Value	0.85
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	2.991	Mean	-0.645
SD	6.887	SD	1.785
95% DL/2 (t) UCL	5.654	95% H-Stat (DL/2) UCL	13.82
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	18.63	Mean in Log Scale	-1.061
SD	8.432	SD in Log Scale	1.892
95% MLE (t) UCL	21.89	Mean in Original Scale	2.826
95% MLE (Tiku) UCL	26.89	SD in Original Scale	6.94
		95% Percentile Bootstrap UCL	5.554
		95% BCA Bootstrap UCL	6.81
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.321	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	15.65		
nu star	7.062		
A-D Test Statistic	0.595	Nonparametric Statistics	
5% A-D Critical Value	0.809	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.809	Mean	2.845
5% K-S Critical Value	0.274	SD	6.758
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	1.586
		95% KM (t) UCL	5.586
Assuming Gamma Distribution		95% KM (z) UCL	5.453
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	5.527
Minimum	0.037	95% KM (bootstrap t) UCL	12.3
Maximum	28	95% KM (BCA) UCL	5.907
Mean	5.081	95% KM (Percentile Bootstrap) UCL	5.568
Median	4.672	95% KM (Chebyshev) UCL	9.756
SD	6.487	97.5% KM (Chebyshev) UCL	12.75
k star	0.542	99% KM (Chebyshev) UCL	18.62
Theta star	9.367		
Nu star	21.7	Potential UCLs to Use	
AppChi2	12.11	95% KM (BCA) UCL	5.907
95% Gamma Approximate UCL	9.102		
95% Adjusted Gamma UCL	9.547		

Note: DL/2 is not a recommended method.

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General UCL Statistics for Full Data Sets

User Selected Options	
From File	WorkSheet_d.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

ARSENIC (SWMU G)

General Statistics			
Number of Valid Samples	10	Number of Unique Samples	10
Raw Statistics		**Log-transformed Statistics**	
Minimum	4.8	Minimum of Log Data	1.569
Maximum	101	Maximum of Log Data	4.615
Mean	26.69	Mean of log Data	2.781
Median	11.35	SD of log Data	0.999
SD	31.76		
Coefficient of Variation	1.19		
Skewness	1.873		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.708	Shapiro Wilk Test Statistic	0.915
Shapiro Wilk Critical Value	0.842	Shapiro Wilk Critical Value	0.842
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	45.1	95% H-UCL	74.57
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	60.74
95% Adjusted-CLT UCL	49.57	97.5% Chebyshev (MVUE) UCL	76.26
95% Modified-t UCL	46.09	99% Chebyshev (MVUE) UCL	106.8

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	0.859	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	31.07		
nu star	17.18		
Approximate Chi Square Value (.05)	8.801	Nonparametric Statistics	
Adjusted Level of Significance	0.0267	95% CLT UCL	43.21
Adjusted Chi Square Value	7.78	95% Jackknife UCL	45.1
		95% Standard Bootstrap UCL	42.58
Anderson-Darling Test Statistic	0.723	95% Bootstrap-t UCL	92.16
Anderson-Darling 5% Critical Value	0.746	95% Hall's Bootstrap UCL	121.6
Kolmogorov-Smirnov Test Statistic	0.272	95% Percentile Bootstrap UCL	42.81
Kolmogorov-Smirnov 5% Critical Value	0.273	95% BCA Bootstrap UCL	48.37
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	70.47
		97.5% Chebyshev(Mean, Sd) UCL	89.41
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	126.6
95% Approximate Gamma UCL	52.1		
95% Adjusted Gamma UCL	58.94		

Potential UCL to Use	Use 95% Approximate Gamma UCL	52.1

ProUCL 4.0 OUTPUT - ALL SOIL
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General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	WorkSheet_e.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

1,2-DICHLOROPROPANE (SWMU H)

General Statistics

Number of Valid Samples	21	Number of Detected Data	17
Number of Unique Samples	17	Number of Non-Detect Data	4
		Percent Non-Detects	19.05%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.004	Minimum Detected	-5.521
Maximum Detected	50000	Maximum Detected	10.82
Mean of Detected	2959	Mean of Detected	0.161
SD of Detected	12122	SD of Detected	4.182
Minimum Non-Detect	0.0063	Minimum Non-Detect	-5.067
Maximum Non-Detect	0.0465	Maximum Non-Detect	-3.068

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	9
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	12
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	42.86%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.264	Shapiro Wilk Test Statistic	0.922
5% Shapiro Wilk Critical Value	0.892	5% Shapiro Wilk Critical Value	0.892
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	2395	Mean	-0.769
SD	10908	SD	4.246
95% DL/2 (t) UCL	6500	95% H-Stat (DL/2) UCL	2957724

Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-1.098
		SD in Log Scale	4.629
		Mean in Original Scale	2395
		SD in Original Scale	10908
		95% Percentile Bootstrap UCL	7156
		95% BCA Bootstrap UCL	9550

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.124	Data appear Lognormal at 5% Significance Level	
Theta Star	23808		
nu star	4.225		

A-D Test Statistic	2.91	Nonparametric Statistics	
5% A-D Critical Value	0.919	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.919	Mean	2395
5% K-S Critical Value	0.235	SD	10645
Data not Gamma Distributed at 5% Significance Level		SE of Mean	2394
		95% KM (t) UCL	6525
Assuming Gamma Distribution		95% KM (z) UCL	6333
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	6500
Minimum	0	95% KM (bootstrap t) UCL	927869
Maximum	50000	95% KM (BCA) UCL	7156
Mean	2395	95% KM (Percentile Bootstrap) UCL	7151
Median	0.71	95% KM (Chebyshev) UCL	12832
SD	10908	97.5% KM (Chebyshev) UCL	17348
k star	0.0941	99% KM (Chebyshev) UCL	26219
Theta star	25464		
Nu star	3.95	Potential UCLs to Use	
AppChi2	0.702	99% KM (Chebyshev) UCL	26219
95% Gamma Approximate UCL	13474		
95% Adjusted Gamma UCL	15562		

Note: DL/2 is not a recommended method.

ARSENIC (SWMU H)

General Statistics			
Number of Valid Samples	21	Number of Unique Samples	21
Raw Statistics		Log-transformed Statistics	
Minimum	1.9	Minimum of Log Data	0.642
Maximum	116	Maximum of Log Data	4.754
Mean	18.15	Mean of log Data	2.374
Median	9.6	SD of log Data	0.993
SD	24.98		
Coefficient of Variation	1.377		
Skewness	3.316		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.591	Shapiro Wilk Test Statistic	0.982
Shapiro Wilk Critical Value	0.908	Shapiro Wilk Critical Value	0.908
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	27.55	95% H-UCL	30.98
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	35.01
95% Adjusted-CLT UCL	31.33	97.5% Chebyshev (MVUE) UCL	42.8
95% Modified-t UCL	28.2	99% Chebyshev (MVUE) UCL	58.11
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	0.966	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	18.79		
nu star	40.55		
Approximate Chi Square Value (.05)	26.96	Nonparametric Statistics	
Adjusted Level of Significance	0.0383	95% CLT UCL	27.11
Adjusted Chi Square Value	26.11	95% Jackknife UCL	27.55
		95% Standard Bootstrap UCL	26.92
Anderson-Darling Test Statistic	0.666	95% Bootstrap-t UCL	40.29
Anderson-Darling 5% Critical Value	0.768	95% Hall's Bootstrap UCL	61.84
Kolmogorov-Smirnov Test Statistic	0.14	95% Percentile Bootstrap UCL	27.87
Kolmogorov-Smirnov 5% Critical Value	0.195	95% BCA Bootstrap UCL	32.59
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	41.91
		97.5% Chebyshev(Mean, Sd) UCL	52.19
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	72.38
95% Approximate Gamma UCL	27.29		
95% Adjusted Gamma UCL	28.18		
Potential UCL to Use		Use 95% Approximate Gamma UCL	27.29

BIS(2-CHLOROISOPROPYL) ETHER (SWMU H)

General Statistics			
Number of Valid Samples	21	Number of Detected Data	9
Number of Unique Samples	9	Number of Non-Detect Data	12
		Percent Non-Detects	57.14%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.13	Minimum Detected	-2.04
Maximum Detected	1400	Maximum Detected	7.244
Mean of Detected	173.9	Mean of Detected	1.308
SD of Detected	461.8	SD of Detected	3.168
Minimum Non-Detect	0.29	Minimum Non-Detect	-1.238
Maximum Non-Detect	0.49	Maximum Non-Detect	-0.713

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	14
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	7
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	66.67%

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.446	Shapiro Wilk Test Statistic	0.89
5% Shapiro Wilk Critical Value	0.829	5% Shapiro Wilk Critical Value	0.829
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	74.61	Mean	-0.429
SD	305	SD	2.53
95% DL/2 (t) UCL	189.4	95% H-Stat (DL/2) UCL	67.79
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-1.061
		SD in Log Scale	2.957
		Mean in Original Scale	74.55
		SD in Original Scale	305
		95% Percentile Bootstrap UCL	203.3
		95% BCA Bootstrap UCL	276
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.202	Data appear Lognormal at 5% Significance Level	
Theta Star	859.5		
nu star	3.641		
A-D Test Statistic	1.027	Nonparametric Statistics	
5% A-D Critical Value	0.848	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.848	Mean	74.6
5% K-S Critical Value	0.308	SD	297.7
Data not Gamma Distributed at 5% Significance Level		SE of Mean	68.9
		95% KM (t) UCL	193.4
Assuming Gamma Distribution		95% KM (z) UCL	187.9
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	189.4
Minimum	0.13	95% KM (bootstrap t) UCL	3477
Maximum	1400	95% KM (BCA) UCL	206.5
Mean	179.6	95% KM (Percentile Bootstrap) UCL	206.5
Median	195.3	95% KM (Chebyshev) UCL	374.9
SD	294.2	97.5% KM (Chebyshev) UCL	504.9
k star	0.366	99% KM (Chebyshev) UCL	760.2
Theta star	490.4		
Nu star	15.38	Potential UCLs to Use	
AppChi2	7.529	99% KM (Chebyshev) UCL	760.2
95% Gamma Approximate UCL	367		
95% Adjusted Gamma UCL	388.7		

Note: DL/2 is not a recommended method.

CHROMIUM (SWMU H)

General Statistics			
Number of Valid Samples	21	Number of Unique Samples	21
Raw Statistics		Log-transformed Statistics	
Minimum	6.7	Minimum of Log Data	1.902
Maximum	195	Maximum of Log Data	5.273
Mean	38.99	Mean of log Data	3.376
Median	25	SD of log Data	0.708
SD	40.59		
Coefficient of Variation	1.041		
Skewness	3.182		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.605	Shapiro Wilk Test Statistic	0.928
Shapiro Wilk Critical Value	0.908	Shapiro Wilk Critical Value	0.908
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	54.27	95% H-UCL	53.29
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	63.8
95% Adjusted-CLT UCL	60.13	97.5% Chebyshev (MVUE) UCL	75.37
95% Modified-t UCL	55.29	99% Chebyshev (MVUE) UCL	98.09
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	1.653	Data appear Lognormal at 5% Significance Level	
Theta Star	23.59		
nu star	69.43		
Approximate Chi Square Value (.05)	51.24	Nonparametric Statistics	
Adjusted Level of Significance	0.0383	95% CLT UCL	53.56
Adjusted Chi Square Value	50.04	95% Jackknife UCL	54.27
		95% Standard Bootstrap UCL	53.29
Anderson-Darling Test Statistic	1.224	95% Bootstrap-t UCL	74.81
Anderson-Darling 5% Critical Value	0.755	95% Hall's Bootstrap UCL	114.7
Kolmogorov-Smirnov Test Statistic	0.245	95% Percentile Bootstrap UCL	54.6
Kolmogorov-Smirnov 5% Critical Value	0.192	95% BCA Bootstrap UCL	60.45
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	77.6
		97.5% Chebyshev(Mean, Sd) UCL	94.3
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	127.1
95% Approximate Gamma UCL	52.83		
95% Adjusted Gamma UCL	54.09		
Potential UCL to Use		Use 95% H-UCL	53.29

MERCURY (SWMU H)

General Statistics			
Number of Valid Samples	22	Number of Detected Data	15
Number of Unique Samples	15	Number of Non-Detect Data	6
		Percent Non-Detects	28.57%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.036	Minimum Detected	-3.324
Maximum Detected	52.9	Maximum Detected	3.968
Mean of Detected	4.036	Mean of Detected	-0.835
SD of Detected	13.53	SD of Detected	1.795
Minimum Non-Detect	0.12	Minimum Non-Detect	-2.12
Maximum Non-Detect	0.17	Maximum Non-Detect	-1.772
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	10
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	11
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	47.62%
UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.315	Shapiro Wilk Test Statistic	0.904
5% Shapiro Wilk Critical Value	0.881	5% Shapiro Wilk Critical Value	0.881
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	2.903	Mean	-1.355
SD	11.47	SD	1.722
95% DL/2 (t) UCL	7.219	95% H-Stat (DL/2) UCL	5.383
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-1.509
		SD in Log Scale	1.864
		Mean in Original Scale	2.895
		SD in Original Scale	11.47
		95% Percentile Bootstrap UCL	7.859
		95% BCA Bootstrap UCL	10.49
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.291	Data appear Lognormal at 5% Significance Level	
Theta Star	13.88		
nu star	8.722		
A-D Test Statistic	2.251	Nonparametric Statistics	
5% A-D Critical Value	0.834	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.834	Mean	2.897
5% K-S Critical Value	0.24	SD	11.19
Data not Gamma Distributed at 5% Significance Level		SE of Mean	2.528
		95% KM (t) UCL	7.257
Assuming Gamma Distribution		95% KM (z) UCL	7.055
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	7.213
Minimum	0	95% KM (bootstrap t) UCL	86.2
Maximum	52.9	95% KM (BCA) UCL	7.957
Mean	2.883	95% KM (Percentile Bootstrap) UCL	7.864
Median	0.24	95% KM (Chebyshev) UCL	13.92
SD	11.47	97.5% KM (Chebyshev) UCL	18.68
k star	0.123	99% KM (Chebyshev) UCL	28.05
Theta star	23.46		
Nu star	5.162	Potential UCLs to Use	
AppChi2	1.228	99% KM (Chebyshev) UCL	28.05
95% Gamma Approximate UCL	12.12		
95% Adjusted Gamma UCL	13.67		

Note: DL/2 is not a recommended method.

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General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

BENZENE (AOC 6)

General Statistics

Number of Valid Samples	10	Number of Detected Data	7
Number of Unique Samples	7	Number of Non-Detect Data	3
		Percent Non-Detects	30.00%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.01	Minimum Detected	-4.605
Maximum Detected	0.46	Maximum Detected	-0.777
Mean of Detected	0.204	Mean of Detected	-2.071
SD of Detected	0.15	SD of Detected	1.342
Minimum Non-Detect	0.04	Minimum Non-Detect	-3.219
Maximum Non-Detect	0.047	Maximum Non-Detect	-3.058

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	5
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	5
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	50.00%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.916	Shapiro Wilk Test Statistic	0.815
5% Shapiro Wilk Critical Value	0.803	5% Shapiro Wilk Critical Value	0.803
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.149	Mean	-2.593
SD	0.15	SD	1.381
95% DL/2 (t) UCL	0.236	95% H-Stat (DL/2) UCL	0.693

Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	0.0714	Mean in Log Scale	-2.624
SD	0.235	SD in Log Scale	1.417
95% MLE (t) UCL	0.208	Mean in Original Scale	0.149
95% MLE (Tiku) UCL	0.239	SD in Original Scale	0.151
		95% Percentile Bootstrap UCL	0.221
		95% BCA Bootstrap UCL	0.234

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.77	Data appear Normal at 5% Significance Level	
Theta Star	0.265		
nu star	10.77		

A-D Test Statistic	0.588	Nonparametric Statistics	
5% A-D Critical Value	0.725	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.725	Mean	0.148
5% K-S Critical Value	0.319	SD	0.144
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.0494
		95% KM (t) UCL	0.238
Assuming Gamma Distribution		95% KM (z) UCL	0.229
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.234
Minimum	0.01	95% KM (bootstrap t) UCL	0.249
Maximum	0.46	95% KM (BCA) UCL	0.266
Mean	0.179	95% KM (Percentile Bootstrap) UCL	0.258
Median	0.163	95% KM (Chebyshev) UCL	0.363
SD	0.129	97.5% KM (Chebyshev) UCL	0.456
k star	1.124	99% KM (Chebyshev) UCL	0.639
Theta star	0.159		
Nu star	22.48	Potential UCLs to Use	
AppChi2	12.7	95% KM (t) UCL	0.238
95% Gamma Approximate UCL	0.317	95% KM (Percentile Bootstrap) UCL	0.258
95% Adjusted Gamma UCL	0.352		

Note: DL/2 is not a recommended method.

NAPHTHALENE (AOC 6)

General Statistics			
Number of Valid Samples	10	Number of Detected Data	8
Number of Unique Samples	8	Number of Non-Detect Data	2
		Percent Non-Detects	20.00%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.024	Minimum Detected	-3.73
Maximum Detected	1.65	Maximum Detected	0.501
Mean of Detected	0.708	Mean of Detected	-1.162
SD of Detected	0.691	SD of Detected	1.685
Minimum Non-Detect	0.2	Minimum Non-Detect	-1.609
Maximum Non-Detect	0.23	Maximum Non-Detect	-1.47

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	5
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	5
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	50.00%

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.829	Shapiro Wilk Test Statistic	0.864
5% Shapiro Wilk Critical Value	0.818	5% Shapiro Wilk Critical Value	0.818
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.588	Mean	-1.376
SD	0.66	SD	1.554
95% DL/2 (t) UCL	0.97	95% H-Stat (DL/2) UCL	8.376
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	0.268	Mean in Log Scale	-1.49
SD	0.992	SD in Log Scale	1.639
95% MLE (t) UCL	0.843	Mean in Original Scale	0.579
95% MLE (Tiku) UCL	0.976	SD in Original Scale	0.668
		95% Percentile Bootstrap UCL	0.925
		95% BCA Bootstrap UCL	0.972
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.543	Data appear Normal at 5% Significance Level	
Theta Star	1.305		
nu star	8.685		
A-D Test Statistic	0.422	Nonparametric Statistics	
5% A-D Critical Value	0.746	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.746	Mean	0.583
5% K-S Critical Value	0.304	SD	0.631
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.214
		95% KM (t) UCL	0.975
Assuming Gamma Distribution		95% KM (z) UCL	0.934
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.97
Minimum	0.024	95% KM (bootstrap t) UCL	1.022
Maximum	1.65	95% KM (BCA) UCL	0.926
Mean	0.614	95% KM (Percentile Bootstrap) UCL	0.921
Median	0.32	95% KM (Chebyshev) UCL	1.515
SD	0.64	97.5% KM (Chebyshev) UCL	1.918
k star	0.636	99% KM (Chebyshev) UCL	2.71
Theta star	0.966		
Nu star	12.72	Potential UCLs to Use	
AppChi2	5.706	95% KM (t) UCL	0.975
95% Gamma Approximate UCL	1.37	95% KM (Percentile Bootstrap) UCL	0.921
95% Adjusted Gamma UCL	1.591		

Note: DL/2 is not a recommended method.

PHENANTHRENE (AOC 6)

General Statistics

Number of Valid Samples	10	Number of Unique Samples	10

Raw Statistics		Log-transformed Statistics	
Minimum	0.041	Minimum of Log Data	-3.194
Maximum	18	Maximum of Log Data	2.89
Mean	5.31	Mean of log Data	-0.0781
Median	1.78	SD of log Data	2.543
SD	6.738		
Coefficient of Variation	1.269		
Skewness	1.053		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.799	Shapiro Wilk Test Statistic	0.842
Shapiro Wilk Critical Value	0.842	Shapiro Wilk Critical Value	0.842
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	9.215	95% H-UCL	7048
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	45.1
95% Adjusted-CLT UCL	9.573	97.5% Chebyshev (MVUE) UCL	60.17
95% Modified-t UCL	9.334	99% Chebyshev (MVUE) UCL	89.76

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	0.332	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	15.97		
nu star	6.649		
Approximate Chi Square Value (.05)	1.98	Nonparametric Statistics	
Adjusted Level of Significance	0.0267	95% CLT UCL	8.814
Adjusted Chi Square Value	1.569	95% Jackknife UCL	9.215
		95% Standard Bootstrap UCL	8.627
Anderson-Darling Test Statistic	0.598	95% Bootstrap-t UCL	11.47
Anderson-Darling 5% Critical Value	0.799	95% Hall's Bootstrap UCL	9.894
Kolmogorov-Smirnov Test Statistic	0.247	95% Percentile Bootstrap UCL	8.739
Kolmogorov-Smirnov 5% Critical Value	0.285	95% BCA Bootstrap UCL	9.442
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	14.6
		97.5% Chebyshev(Mean, Sd) UCL	18.62
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	26.51
95% Approximate Gamma UCL	17.83		
95% Adjusted Gamma UCL	22.5		

Potential UCL to Use	Use 95% Adjusted Gamma UCL	22.5

Recommended UCL exceeds the maximum observation

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General UCL Statistics for Data Sets with Non-Detects

User Selected Options
From File WorkSheet_a.wst
Full Precision OFF
Confidence Coefficient 95%
Number of Bootstrap Operations 2000

1,2-DICHLOROPROPANE (SWMU F)

General Statistics

Number of Valid Samples	10	Number of Detected Data	4
Number of Unique Samples	4	Number of Non-Detect Data	6
		Percent Non-Detects	60.00%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.015	Minimum Detected	-4.2
Maximum Detected	0.44	Maximum Detected	-0.821
Mean of Detected	0.163	Mean of Detected	-2.703
SD of Detected	0.2	SD of Detected	1.697
Minimum Non-Detect	0.042	Minimum Non-Detect	-3.17
Maximum Non-Detect	0.05	Maximum Non-Detect	-2.996

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	8
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	2
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	80.00%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.848	Shapiro Wilk Test Statistic	0.855
5% Shapiro Wilk Critical Value	0.748	5% Shapiro Wilk Critical Value	0.748
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.0792	Mean	-3.339
SD	0.136	SD	1.124
95% DL/2 (t) UCL	0.158	95% H-Stat (DL/2) UCL	0.23

Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-3.484
		SD in Log Scale	1.188
		Mean in Original Scale	0.0761
		SD in Original Scale	0.138
		95% Percentile Bootstrap UCL	0.151
		95% BCA Bootstrap UCL	0.193

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.337	Data appear Normal at 5% Significance Level	
Theta Star	0.483		
nu star	2.699		

A-D Test Statistic	0.418	Nonparametric Statistics	
5% A-D Critical Value	0.673	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.673	Mean	0.0748
5% K-S Critical Value	0.406	SD	0.131
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.0479
		95% KM (t) UCL	0.163
Assuming Gamma Distribution		95% KM (z) UCL	0.154
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.155
Minimum	0.015	95% KM (bootstrap t) UCL	0.192
Maximum	0.44	95% KM (BCA) UCL	0.232
Mean	0.167	95% KM (Percentile Bootstrap) UCL	0.232
Median	0.17	95% KM (Chebyshev) UCL	0.284
SD	0.116	97.5% KM (Chebyshev) UCL	0.374
k star	1.153	99% KM (Chebyshev) UCL	0.551
Theta star	0.145		
Nu star	23.06	Potential UCLs to Use	
AppChi2	13.13	95% KM (t) UCL	0.163
95% Gamma Approximate UCL	0.293	95% KM (Percentile Bootstrap) UCL	0.232
95% Adjusted Gamma UCL	N/A		

Note: DL/2 is not a recommended method.

BIS(2-CHLOROISOPROPYL) ETHER (SWMU F)

General Statistics			
Number of Valid Samples	10	Number of Detected Data	5
Number of Unique Samples	5	Number of Non-Detect Data	5
		Percent Non-Detects	50.00%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.037	Minimum Detected	-3.297
Maximum Detected	0.62	Maximum Detected	-0.478
Mean of Detected	0.214	Mean of Detected	-2.051
SD of Detected	0.238	SD of Detected	1.162
Minimum Non-Detect	0.37	Minimum Non-Detect	-0.994
Maximum Non-Detect	0.42	Maximum Non-Detect	-0.868

Note: Data have multiple DLs - Use of KM Method is recommended	Number treated as Non-Detect	9
For all methods (except KM, DL/2, and ROS Methods),	Number treated as Detected	1
Observations < Largest ND are treated as NDs	Single DL Non-Detect Percentage	90.00%

UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.796	Shapiro Wilk Test Statistic	0.923
5% Shapiro Wilk Critical Value	0.762	5% Shapiro Wilk Critical Value	0.762
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.206	Mean	-1.836
SD	0.159	SD	0.808
95% DL/2 (t) UCL	0.298	95% H-Stat (DL/2) UCL	1.3
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-2.248
		SD in Log Scale	0.83
		Mean in Original Scale	0.152
		SD in Original Scale	0.173
		95% Percentile Bootstrap UCL	0.251
		95% BCA Bootstrap UCL	0.282
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.579	Data appear Normal at 5% Significance Level	
Theta Star	0.37		
nu star	5.791		
A-D Test Statistic	0.343	Nonparametric Statistics	
5% A-D Critical Value	0.69	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.69	Mean	0.164
5% K-S Critical Value	0.364	SD	0.167
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.0651
		95% KM (t) UCL	0.283
Assuming Gamma Distribution		95% KM (z) UCL	0.271
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.283
Minimum	0.037	95% KM (bootstrap t) UCL	0.346
Maximum	0.62	95% KM (BCA) UCL	0.274
Mean	0.212	95% KM (Percentile Bootstrap) UCL	0.275
Median	0.204	95% KM (Chebyshev) UCL	0.447
SD	0.16	97.5% KM (Chebyshev) UCL	0.57
k star	1.523	99% KM (Chebyshev) UCL	0.811
Theta star	0.139		
Nu star	30.46	Potential UCLs to Use	
AppChi2	18.85	95% KM (t) UCL	0.283
95% Gamma Approximate UCL	0.342	95% KM (Percentile Bootstrap) UCL	0.275
95% Adjusted Gamma UCL	0.373		

Note: DL/2 is not a recommended method.

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General UCL Statistics for Data Sets with Non-Detects

User Selected Options
From File WorkSheet.wst
Full Precision OFF
Confidence Coefficient 95%
Number of Bootstrap Operations 2000

1,2-DICHLOROPROPANE (SWMU H)

General Statistics			
Number of Valid Samples	10	Number of Detected Data	8
Number of Unique Samples	8	Number of Non-Detect Data	2
		Percent Non-Detects	20.00%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.21	Minimum Detected	-1.561
Maximum Detected	2.8	Maximum Detected	1.03
Mean of Detected	1.603	Mean of Detected	0.25
SD of Detected	0.865	SD of Detected	0.846
Minimum Non-Detect	0.046	Minimum Non-Detect	-3.079
Maximum Non-Detect	0.0465	Maximum Non-Detect	-3.068
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	2
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	8
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	20.00%
UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.977	Shapiro Wilk Test Statistic	0.835
5% Shapiro Wilk Critical Value	0.818	5% Shapiro Wilk Critical Value	0.818
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	1.287	Mean	-0.553
SD	1.012	SD	1.851
95% DL/2 (t) UCL	1.874	95% H-Stat (DL/2) UCL	30.2
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	1.169	Mean in Log Scale	-0.111
SD	1.153	SD in Log Scale	1.065
95% MLE (t) UCL	1.837	Mean in Original Scale	1.324
95% MLE (Tiku) UCL	1.867	SD in Original Scale	0.962
		95% Percentile Bootstrap UCL	1.831
		95% BCA Bootstrap UCL	1.782
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	1.589	Data appear Normal at 5% Significance Level	
Theta Star	1.009		
nu star	25.42		
A-D Test Statistic	0.409	Nonparametric Statistics	
5% A-D Critical Value	0.723	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.723	Mean	1.324
5% K-S Critical Value	0.297	SD	0.913
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.309
		95% KM (t) UCL	1.89
Assuming Gamma Distribution		95% KM (z) UCL	1.832
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	1.878
Minimum	0.21	95% KM (bootstrap t) UCL	1.867
Maximum	2.8	95% KM (BCA) UCL	2.03
Mean	1.37	95% KM (Percentile Bootstrap) UCL	1.93
Median	1.45	95% KM (Chebyshev) UCL	2.669
SD	0.907	97.5% KM (Chebyshev) UCL	3.252
k star	1.425	99% KM (Chebyshev) UCL	4.395
Theta star	0.961		
Nu star	28.51	Potential UCLs to Use	
AppChi2	17.32	95% KM (t) UCL	1.89
95% Gamma Approximate UCL	2.254	95% KM (Percentile Bootstrap) UCL	1.93
95% Adjusted Gamma UCL	2.468		

Note: DL/2 is not a recommended method.

**** BIS(2-CHLOROISOPROPYL) ETHER has FOD of 1:10 (1%), which is less than the allowable threshold for ProUCL, therefore no UCL was calculated.**

Appendix C

Summary Statistics for All Groundwater Wells

Table C-1
Summary Statistics for All Groundwater Wells
BASF Wyandotte
Wyandotte, Michigan

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
AOC5-MIP-07								
	1,2-DICHLOROETHANE	107-06-2	ug/l	1 : 1	23	23	23.0000	AOC5-MIP-07
	1,2-DICHLOROPROPANE	78-87-5	ug/l	1 : 1	230	230	230.0000	AOC5-MIP-07
	ACETONE	67-64-1	ug/l	1 : 1	6.5	6.5	6.5000	AOC5-MIP-07
	BENZENE	71-43-2	ug/l	1 : 1	0.97	0.97	0.9700	AOC5-MIP-07
	BIS(2-CHLOROETHYL) ETHER	111-44-4	ug/l	1 : 1	3100	3100	3100.0000	AOC5-MIP-07
	BIS(2-CHLOROISOPROPYL) ETHER	108-60-1	ug/l	1 : 1	2400	2400	2400.0000	AOC5-MIP-07
	CHLOROBENZENE	108-90-7	ug/l	1 : 1	1.3	1.3	1.3000	AOC5-MIP-07
	METHYLENE CHLORIDE	75-09-2	ug/l	1 : 1	3.7	3.7	3.7000	AOC5-MIP-07
	TOLUENE	108-88-3	ug/l	1 : 1	0.83	0.83	0.8300	AOC5-MIP-07
AOC5-MIP-08								
	1,2-DICHLOROETHANE	107-06-2	ug/l	1 : 1	200000	200000	200000.0000	AOC5-MIP-08
	1,2-DICHLOROPROPANE	78-87-5	ug/l	1 : 1	1300000	1300000	1300000.0000	AOC5-MIP-08
	BIS(2-CHLOROETHYL) ETHER	111-44-4	ug/l	1 : 2	145000	145000	145000.0000	AOC5-MIP-08
	BIS(2-CHLOROISOPROPYL) ETHER	108-60-1	ug/l	1 : 2	280000	280000	280000.0000	AOC5-MIP-08
	METHYLENE CHLORIDE	75-09-2	ug/l	1 : 1	24000	24000	24000.0000	AOC5-MIP-08
AOC5-MIP-13								
	1,2-DICHLOROETHANE	107-06-2	ug/l	1 : 1	41000	41000	41000.0000	AOC5-MIP-13
	1,2-DICHLOROPROPANE	78-87-5	ug/l	1 : 1	1100000	1100000	1100000.0000	AOC5-MIP-13
	ACETONE	67-64-1	ug/l	1 : 1	19000	19000	19000.0000	AOC5-MIP-13
	BIS(2-CHLOROETHYL) ETHER	111-44-4	ug/l	1 : 1	20000	20000	20000.0000	AOC5-MIP-13
	METHYLENE CHLORIDE	75-09-2	ug/l	1 : 1	23000	23000	23000.0000	AOC5-MIP-13
AOC5-MIP-17								
	1,2-DICHLOROPROPANE	78-87-5	ug/l	1 : 1	1400000	1400000	1400000.0000	AOC5-MIP-17
	ACETONE	67-64-1	ug/l	1 : 1	42000	42000	42000.0000	AOC5-MIP-17
	BIS(2-CHLOROETHYL) ETHER	111-44-4	ug/l	1 : 2	43000	43000	43000.0000	AOC5-MIP-17
	BIS(2-CHLOROISOPROPYL) ETHER	108-60-1	ug/l	1 : 2	345000	345000	345000.0000	AOC5-MIP-17
	BIS(2-ETHYLHEXYL) PHTHALATE	117-81-7	ug/l	1 : 2	4400	4400	4400.0000	AOC5-MIP-17
	METHYLENE CHLORIDE	75-09-2	ug/l	1 : 1	28000	28000	28000.0000	AOC5-MIP-17

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Summary Statistics for All Groundwater Wells
BASF Wyandotte

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
AOC5-MIP-25								
	1,2-DICHLOROPROPANE	78-87-5	ug/l	1 : 1	2400000	2400000	2400000.0000	AOC5-MIP-25
	ACETONE	67-64-1	ug/l	1 : 1	68000	68000	68000.0000	AOC5-MIP-25
	BIS(2-CHLOROETHYL) ETHER	111-44-4	ug/l	1 : 2	8400	8400	8400.0000	AOC5-MIP-25
	BIS(2-CHLOROISOPROPYL) ETHER	108-60-1	ug/l	1 : 2	485000	485000	485000.0000	AOC5-MIP-25
	BIS(2-ETHYLHEXYL) PHTHALATE	117-81-7	ug/l	1 : 2	16000	16000	16000.0000	AOC5-MIP-25
	CHLOROFORM	67-66-3	ug/l	1 : 1	15000	15000	15000.0000	AOC5-MIP-25
	METHYLENE CHLORIDE	75-09-2	ug/l	1 : 1	53000	53000	53000.0000	AOC5-MIP-25
AOC-6								
	CHROMIUM	7440-47-3	ug/L	1 : 1	9.5	9.5	9.5000	AOC-6
	TETRACHLOROETHENE	127-18-4	ug/l	1 : 1	0.47	0.47	0.4700	AOC-6
	TRICHLOROETHENE	79-01-6	ug/l	1 : 1	0.42	0.42	0.4200	AOC-6
BG-MW-1								
	BARIUM	7440-39-3	ug/l	4 : 4	15.3	17.2	16.4125	BG-MW-1
	CHROMIUM	7440-47-3	ug/l	5 : 5	1.7	24.4	9.8500	BG-MW-1
	COBALT	7440-48-4	ug/l	2 : 4	1.45	2.2	1.8250	BG-MW-1
	COPPER	7440-50-8	ug/l	2 : 4	4.7	8.3	6.5000	BG-MW-1
	LEAD	7439-92-1	ug/l	1 : 5	3.7	3.7	3.7000	BG-MW-1
	NICKEL	7440-02-0	ug/l	4 : 5	8.2	12.45	11.0875	BG-MW-1
	THALLIUM	7440-28-0	ug/l	1 : 5	5.3	5.3	5.3000	BG-MW-1
	ZINC	7440-66-6	ug/l	1 : 4	9.55	9.55	9.5500	BG-MW-1
CMS-MW-1								
	ACETONE	67-64-1	ug/l	1 : 1	940	940	940.0000	CMS-MW-1
	TOTAL DISSOLVED SOLIDS	TDS	ug/L	1 : 1	3200000	3200000	3200000.0000	CMS-MW-1
CMS-MW-10								
	TOTAL DISSOLVED SOLIDS	TDS	ug/L	1 : 1	4600000	4600000	4600000.0000	CMS-MW-10
CMS-MW-11								
	TOTAL DISSOLVED SOLIDS	TDS	ug/L	1 : 1	16000000	16000000	16000000.0000	CMS-MW-11
CMS-MW-12								

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
	CARBON DISULFIDE	75-15-0	ug/l	1 : 1	1.5	1.5	1.5000	CMS-MW-12
	TOTAL DISSOLVED SOLIDS	TDS	ug/L	1 : 1	11000000	11000000	11000000.0000	CMS-MW-12
CMS-MW-13F								
	NAPHTHALENE	91-20-3	ug/l	1 : 1	19	19	19.0000	CMS-MW-13F
	TOTAL DISSOLVED SOLIDS	TDS	ug/L	1 : 1	5000000	5000000	5000000.0000	CMS-MW-13F
	Total LMW PAHs	Total LMW	ug/l	1 : 1	19	19	19.0000	CMS-MW-13F
	TOTAL PAHs	Total PAHs	ug/l	1 : 1	19	19	19.0000	CMS-MW-13F
CMS-MW-13S								
	2,4-DIMETHYLPHENOL	105-67-9	ug/l	1 : 1	5.5	5.5	5.5000	CMS-MW-13S
	2-PICOLINE	109-06-8	ug/l	1 : 1	29	29	29.0000	CMS-MW-13S
	ACETONE	67-64-1	ug/l	1 : 1	83	83	83.0000	CMS-MW-13S
	BENZENE	71-43-2	ug/l	1 : 1	66	66	66.0000	CMS-MW-13S
	O-XYLENE	95-47-6	ug/l	1 : 1	0.68	0.68	0.6800	CMS-MW-13S
	PYRIDINE	110-86-1	ug/l	1 : 1	3.6	3.6	3.6000	CMS-MW-13S
	TOTAL DISSOLVED SOLIDS	TDS	ug/L	1 : 1	7900000	7900000	7900000.0000	CMS-MW-13S
	TOTAL XYLENES	TOTAL	ug/l	1 : 1	0.68	0.68	0.6800	CMS-MW-13S
CMS-MW-14S								
	1,2-DICHLOROPROPANE	78-87-5	ug/l	1 : 1	0.52	0.52	0.5200	CMS-MW-14S
	ACETONE	67-64-1	ug/l	1 : 1	465	465	465.0000	CMS-MW-14S
	BIS(2-CHLOROISOPROPYL) ETHER	108-60-1	ug/l	1 : 1	5.9	5.9	5.9000	CMS-MW-14S
	NAPHTHALENE	91-20-3	ug/l	1 : 1	5.65	5.65	5.6500	CMS-MW-14S
	TOTAL DISSOLVED SOLIDS	TDS	ug/L	1 : 1	2950000	2950000	2950000.0000	CMS-MW-14S
	Total LMW PAHs	Total LMW	ug/l	1 : 1	5.65	5.65	5.6500	CMS-MW-14S
	TOTAL PAHs	Total PAHs	ug/l	1 : 1	5.65	5.65	5.6500	CMS-MW-14S
CMS-MW-15								
	1,4-DIOXANE	123-91-1	ug/l	1 : 1	4.8	4.8	4.8000	CMS-MW-15
	ETHYLBENZENE	100-41-4	ug/l	1 : 1	2.8	2.8	2.8000	CMS-MW-15
	STYRENE	100-42-5	ug/l	1 : 1	3.6	3.6	3.6000	CMS-MW-15
	TOTAL DISSOLVED SOLIDS	TDS	ug/L	1 : 1	740000	740000	740000.0000	CMS-MW-15
CMS-MW-16								

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
	ACETONE	67-64-1	ug/l	1 : 1	1500	1500	1500.0000	CMS-MW-16
	ARSENIC	7440-38-2	ug/l	1 : 1	273	273	273.0000	CMS-MW-16
	BARIUM	7440-39-3	ug/l	1 : 1	12.8	12.8	12.8000	CMS-MW-16
	BENZENE	71-43-2	ug/l	1 : 1	21	21	21.0000	CMS-MW-16
	CARBON DISULFIDE	75-15-0	ug/l	1 : 1	15	15	15.0000	CMS-MW-16
	CHROMIUM	7440-47-3	ug/l	1 : 1	63.8	63.8	63.8000	CMS-MW-16
	COPPER	7440-50-8	ug/l	1 : 1	8.4	8.4	8.4000	CMS-MW-16
	DISSOLVED ORGANIC CARBON	DOC	ug/L	1 : 1	230000	230000	230000.0000	CMS-MW-16
	LEAD	7439-92-1	ug/l	1 : 1	4.3	4.3	4.3000	CMS-MW-16
	SELENIUM	7782-49-2	ug/l	1 : 1	6	6	6.0000	CMS-MW-16
	TOTAL CYANIDE	57-12-5	ug/L	1 : 1	980	980	980.0000	CMS-MW-16
	TOTAL DISSOLVED SOLIDS	TDS	ug/L	1 : 1	5600000	5600000	5600000.0000	CMS-MW-16
	VANADIUM	7440-62-2	ug/l	1 : 1	52.8	52.8	52.8000	CMS-MW-16
	ZINC	7440-66-6	ug/l	1 : 1	25.4	25.4	25.4000	CMS-MW-16
CMS-MW-18								
	TOTAL DISSOLVED SOLIDS	TDS	ug/L	1 : 1	4500000	4500000	4500000.0000	CMS-MW-18
CMS-MW-2								
	1,1-DICHLOROETHENE	75-35-4	ug/l	2 : 6	0.27	0.505	0.3875	CMS-MW-2
	1,2-DICHLOROBENZENE	95-50-1	ug/l	1 : 6	1.1	1.1	1.1000	CMS-MW-2
	1,2-DICHLOROPROPANE	78-87-5	ug/l	1 : 6	0.16	0.16	0.1600	CMS-MW-2
	2-BUTANONE	78-93-3	ug/l	4 : 6	1.5	11	6.0500	CMS-MW-2
	2-METHYLNAPHTHALENE	91-57-6	ug/l	4 : 6	0.69	1	0.8113	CMS-MW-2
	3-METHYLPHENOL	108-39-4	ug/l	1 : 3	3.4	3.4	3.4000	CMS-MW-2
	3-METHYLPHENOL & 4-METHYLPHENOL	65794-96-9	ug/l	3 : 3	1.6	2.3	1.8667	CMS-MW-2
	4-METHYLPHENOL	106-44-5	ug/l	1 : 3	3.4	3.4	3.4000	CMS-MW-2
	ACETONE	67-64-1	ug/l	6 : 6	7	48	33.8333	CMS-MW-2
	ACETOPHENONE	98-86-2	ug/l	4 : 6	0.56	0.99	0.6988	CMS-MW-2
	ANTHRACENE	120-12-7	ug/l	3 : 6	0.22	0.41	0.3333	CMS-MW-2
	BARIUM	7440-39-3	ug/L	5 : 5	230	618.5	446.9000	CMS-MW-2
	BENZALDEHYDE	100-52-7	ug/l	1 : 5	0.76	0.76	0.7600	CMS-MW-2
	BENZENE	71-43-2	ug/l	5 : 6	2.7	13	6.6600	CMS-MW-2

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
	BERYLLIUM	7440-41-7	ug/l	1 : 5	0.3	0.3	0.3000	CMS-MW-2
	BIS(2-CHLOROISOPROPYL) ETHER	108-60-1	ug/l	1 : 6	1.2	1.2	1.2000	CMS-MW-2
	BIS(2-ETHYLHEXYL) PHTHALATE	117-81-7	ug/l	1 : 6	2.185	2.185	2.1850	CMS-MW-2
	CAPROLACTAM	105-60-2	ug/l	2 : 5	1.6	2	1.8000	CMS-MW-2
	CHLORIDE	16887-00-6	ug/L	3 : 3	311000	538000	389666.6667	CMS-MW-2
	CHLOROBENZENE	108-90-7	ug/l	5 : 6	0.7	2.2	1.2880	CMS-MW-2
	CHLOROMETHANE	74-87-3	ug/l	2 : 6	0.175	0.59	0.3825	CMS-MW-2
	CHROMIUM	7440-47-3	ug/l	3 : 5	1.7	6.6	3.7000	CMS-MW-2
	COPPER	7440-50-8	ug/l	1 : 5	6.8	6.8	6.8000	CMS-MW-2
	CYCLOHEXANE	110-82-7	ug/l	1 : 5	0.145	0.145	0.1450	CMS-MW-2
	DIBENZOFURAN	132-64-9	ug/l	4 : 6	0.91	1.4	1.1525	CMS-MW-2
	DISSOLVED ORGANIC CARBON	DOC	ug/L	2 : 2	9000	13000	11000.0000	CMS-MW-2
	FLUORANTHENE	206-44-0	ug/l	2 : 6	0.2	0.2	0.2000	CMS-MW-2,
	FLUORENE	86-73-7	ug/l	3 : 6	0.39	0.61	0.4650	CMS-MW-2
	LEAD	7439-92-1	ug/l	2 : 5	2.7	7.1	4.9000	CMS-MW-2
	METHANE	74-82-8	ug/l	1 : 1	16000	16000	16000.0000	CMS-MW-2
	NAPHTHALENE	91-20-3	ug/l	4 : 6	3	4.5	3.5250	CMS-MW-2
	NICKEL	7440-02-0	ug/L	5 : 5	4.2	67.1	19.5200	CMS-MW-2
	NITRITE	14797-65-0	ug/L	1 : 1	8200	8200	8200.0000	CMS-MW-2
	PHENANTHRENE	85-01-8	ug/l	4 : 6	1.8	4.5	3.1500	CMS-MW-2
	PHENOL	108-95-2	ug/l	5 : 6	18.5	30	23.9000	CMS-MW-2
	SELENIUM	7782-49-2	ug/l	2 : 5	2.55	5.5	4.0250	CMS-MW-2
	SULFATE	14808-79-8	ug/L	3 : 3	23400	106000	75133.3333	CMS-MW-2
	TOLUENE	108-88-3	ug/l	5 : 6	0.48	29	6.7660	CMS-MW-2
	TOTAL CYANIDE	57-12-5	ug/L	1 : 1	15	15	15.0000	CMS-MW-2
	TOTAL DISSOLVED SOLIDS	TDS	ug/L	1 : 1	2000000	2000000	2000000.0000	CMS-MW-2
	Total HMW PAHs	Total HMW	ug/l	2 : 5	0.2	0.2	0.2000	CMS-MW-2,
	Total LMW PAHs	Total LMW	ug/l	4 : 5	8.31	19.3	13.5850	CMS-MW-2
	TOTAL METHYLPHENOL	TOTAL	ug/l	4 : 5	1.6	6.8	3.1000	CMS-MW-2
	TOTAL PAHs	Total PAHs	ug/l	4 : 5	11.22	31.3	19.1850	CMS-MW-2
	VANADIUM	7440-62-2	ug/L	4 : 5	2.1	4.5	3.1750	CMS-MW-2

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
	VINYL CHLORIDE	75-01-4	ug/l	2 : 6	0.53	0.77	0.6500	CMS-MW-2
	ZINC	7440-66-6	ug/L	3 : 5	21.1	49	34.6333	CMS-MW-2
CMS-MW-3								
	TOTAL DISSOLVED SOLIDS	TDS	ug/L	1 : 1	3100000	3100000	3100000.0000	CMS-MW-3
CMS-MW-4								
	ARSENIC	7440-38-2	ug/l	1 : 1	8.7	8.7	8.7000	CMS-MW-4
	BARIUM	7440-39-3	ug/l	1 : 1	82.4	82.4	82.4000	CMS-MW-4
	BIS(2-CHLOROETHYL) ETHER	111-44-4	ug/l	1 : 1	730	730	730.0000	CMS-MW-4
	CHLORIDE	16887-00-6	ug/L	1 : 1	1950000	1950000	1950000.0000	CMS-MW-4
	CYCLOHEXANE	110-82-7	ug/l	1 : 1	0.16	0.16	0.1600	CMS-MW-4
	DISSOLVED ORGANIC CARBON	DOC	ug/L	1 : 1	45000	45000	45000.0000	CMS-MW-4
	SULFATE	14808-79-8	ug/L	1 : 1	53900	53900	53900.0000	CMS-MW-4
	TOTAL CYANIDE	57-12-5	ug/L	1 : 1	39	39	39.0000	CMS-MW-4
	TOTAL DISSOLVED SOLIDS	TDS	ug/L	1 : 1	2900000	2900000	2900000.0000	CMS-MW-4
	VANADIUM	7440-62-2	ug/l	1 : 1	3.5	3.5	3.5000	CMS-MW-4
CMS-MW-5								
	TOTAL DISSOLVED SOLIDS	TDS	ug/L	1 : 1	4400000	4400000	4400000.0000	CMS-MW-5
CMS-MW-6								
	TOTAL DISSOLVED SOLIDS	TDS	ug/L	1 : 1	21000000	21000000	21000000.0000	CMS-MW-6
CMS-MW-7								
	TOTAL DISSOLVED SOLIDS	TDS	ug/L	1 : 1	5700000	5700000	5700000.0000	CMS-MW-7
CMS-MW-8								
	TOTAL DISSOLVED SOLIDS	TDS	ug/L	1 : 1	12000000	12000000	12000000.0000	CMS-MW-8
CMS-MW-9								
	TOTAL DISSOLVED SOLIDS	TDS	ug/L	1 : 1	5000000	5000000	5000000.0000	CMS-MW-9
ENSR BG-MW-1								
	ARSENIC	7440-38-2	ug/L	1 : 1	3.5	3.5	3.5000	ENSR BG-MW-1
	BARIUM	7440-39-3	ug/L	1 : 1	49	49	49.0000	ENSR BG-MW-1
	CHLORIDE	16887-00-6	ug/L	1 : 1	180000	180000	180000.0000	ENSR BG-MW-1

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	CHROMIUM	7440-47-3	ug/L	1 : 1	2.1	2.1	2.1000	ENSR BG-MW-1
	COBALT	7440-48-4	ug/L	1 : 1	3.1	3.1	3.1000	ENSR BG-MW-1
	COPPER	7440-50-8	ug/L	1 : 1	4.1	4.1	4.1000	ENSR BG-MW-1
	METHANE	74-82-8	ug/l	1 : 1	13	13	13.0000	ENSR BG-MW-1
	NICKEL	7440-02-0	ug/L	1 : 1	44	44	44.0000	ENSR BG-MW-1
	SULFATE	14808-79-8	ug/L	1 : 1	1800000	1800000	1800000.0000	ENSR BG-MW-1
	THALLIUM	7440-28-0	ug/L	1 : 1	10	10	10.0000	ENSR BG-MW-1
	ZINC	7440-66-6	ug/L	1 : 1	24	24	24.0000	ENSR BG-MW-1
EQUIPMENT BLANK								
	2-METHYLNAPHTHALENE	91-57-6	ug/l	1 : 6	0.97	0.97	0.9700	EQUIPMENT
	2-METHYLPHENOL	95-48-7	ug/l	1 : 6	0.56	0.56	0.5600	EQUIPMENT
	3-METHYLPHENOL	108-39-4	ug/l	1 : 3	3.7	3.7	3.7000	EQUIPMENT
	4-METHYLPHENOL	106-44-5	ug/l	1 : 3	3.7	3.7	3.7000	EQUIPMENT
	ACETONE	67-64-1	ug/l	1 : 4	1.5	1.5	1.5000	EQUIPMENT
	ACETOPHENONE	98-86-2	ug/l	1 : 6	0.98	0.98	0.9800	EQUIPMENT
	ANTHRACENE	120-12-7	ug/l	1 : 6	0.36	0.36	0.3600	EQUIPMENT
	BENZALDEHYDE	100-52-7	ug/l	1 : 6	0.92	0.92	0.9200	EQUIPMENT
	BIS(2-ETHYLHEXYL) PHTHALATE	117-81-7	ug/l	3 : 6	1.3	8	3.5833	EQUIPMENT
	CAPROLACTAM	105-60-2	ug/l	1 : 6	2	2	2.0000	EQUIPMENT
	CARBON DISULFIDE	75-15-0	ug/l	1 : 4	0.65	0.65	0.6500	EQUIPMENT
	DIBENZOFURAN	132-64-9	ug/l	1 : 6	1.3	1.3	1.3000	EQUIPMENT
	DISSOLVED ORGANIC CARBON	DOC	ug/L	1 : 1	1000	1000	1000.0000	EQUIPMENT
	FLUORANTHENE	206-44-0	ug/l	1 : 6	0.21	0.21	0.2100	EQUIPMENT
	FLUORENE	86-73-7	ug/l	1 : 6	0.6	0.6	0.6000	EQUIPMENT
	METHYLENE CHLORIDE	75-09-2	ug/l	1 : 4	0.52	0.52	0.5200	EQUIPMENT
	NAPHTHALENE	91-20-3	ug/l	1 : 6	4.5	4.5	4.5000	EQUIPMENT
	PHENANTHRENE	85-01-8	ug/l	1 : 6	4.4	4.4	4.4000	EQUIPMENT
	PHENOL	108-95-2	ug/l	1 : 6	26	26	26.0000	EQUIPMENT
	TERPHENYL-D14	1718-51-0	ug/l	1 : 1	16	16	16.0000	EQUIPMENT
	THALLIUM	7440-28-0	ug/l	1 : 7	5.5	5.5	5.5000	EQUIPMENT
	Total HMW PAHs	Total HMW	ug/l	1 : 5	0.21	0.21	0.2100	EQUIPMENT

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
	Total LMW PAHs	Total LMW	ug/l	1 : 5	10.83	10.83	10.8300	EQUIPMENT
	TOTAL METHYLPHENOL	TOTAL	ug/l	1 : 5	7.96	7.96	7.9600	EQUIPMENT
	TOTAL PAHs	Total PAHs	ug/l	1 : 5	11.04	11.04	11.0400	EQUIPMENT
	ZINC	7440-66-6	ug/l	1 : 7	8.9	8.9	8.9000	EQUIPMENT
ERB-1								
	BENZENE	71-43-2	ug/l	1 : 1	0.25	0.25	0.2500	ERB-1
	BROMODICHLOROMETHANE	75-27-4	ug/l	1 : 1	1.2	1.2	1.2000	ERB-1
	CHLOROBENZENE	108-90-7	ug/l	1 : 1	0.34	0.34	0.3400	ERB-1
	CHLOROFORM	67-66-3	ug/l	1 : 1	38	38	38.0000	ERB-1
	METHYLENE CHLORIDE	75-09-2	ug/l	1 : 1	13	13	13.0000	ERB-1
	STYRENE	100-42-5	ug/l	1 : 1	0.28	0.28	0.2800	ERB-1
	TOLUENE	108-88-3	ug/l	1 : 1	0.6	0.6	0.6000	ERB-1
GTI SB-11								
	BENZENE	71-43-2	ug/l	1 : 1	2	2	2.0000	GTI SB-11
GTI SB-16								
	BENZENE	71-43-2	ug/l	1 : 1	68	68	68.0000	GTI SB-16
GTI SB-3								
	BENZENE	71-43-2	ug/l	1 : 1	1.6	1.6	1.6000	GTI SB-3
	STYRENE	100-42-5	ug/l	1 : 1	1.9	1.9	1.9000	GTI SB-3
GTI-TPW-1								
	ACETOPHENONE	98-86-2	ug/l	1 : 1	2.99	2.99	2.9900	GTI-TPW-1
	ARSENIC	7440-38-2	ug/L	1 : 1	6	6	6.0000	GTI-TPW-1
	BARIUM	7440-39-3	ug/L	1 : 1	67	67	67.0000	GTI-TPW-1
	CHROMIUM	7440-47-3	ug/L	1 : 1	4	4	4.0000	GTI-TPW-1
	IRON	7439-89-6	ug/L	1 : 1	132	132	132.0000	GTI-TPW-1
	MAGNESIUM	7439-95-4	ug/L	1 : 1	4300	4300	4300.0000	GTI-TPW-1
	M-XYLENE & P-XYLENE	M/P-	ug/l	1 : 1	31.9	31.9	31.9000	GTI-TPW-1
	TOTAL DISSOLVED SOLIDS	TDS	ug/L	1 : 1	792000	792000	792000.0000	GTI-TPW-1
	TOTAL XYLENES	TOTAL	ug/l	1 : 1	31.9	31.9	31.9000	GTI-TPW-1
P15N								

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
	1,2-DICHLOROPROPANE	78-87-5	ug/l	1 : 1	66.3	66.3	66.3000	P15N
	ARSENIC	7440-38-2	ug/L	1 : 1	33	33	33.0000	P15N
	BARIUM	7440-39-3	ug/L	1 : 1	95	95	95.0000	P15N
	BIS(2-CHLOROISOPROPYL) ETHER	108-60-1	ug/l	1 : 1	10.4	10.4	10.4000	P15N
	NAPHTHALENE	91-20-3	ug/l	1 : 1	3.76	3.76	3.7600	P15N
	NICKEL	7440-02-0	ug/L	1 : 1	5	5	5.0000	P15N
	TOTAL DISSOLVED SOLIDS	TDS	ug/L	1 : 1	772000	772000	772000.0000	P15N
	Total LMW PAHs	Total LMW	ug/l	1 : 1	3.76	3.76	3.7600	P15N
	TOTAL PAHs	Total PAHs	ug/l	1 : 1	3.76	3.76	3.7600	P15N
	VANADIUM	7440-62-2	ug/L	1 : 1	13	13	13.0000	P15N
P26N								
	1,4-DIOXANE	123-91-1	ug/l	3 : 3	7.9	75	30.9667	P26N
	2,4-DIMETHYLPHENOL	105-67-9	ug/l	1 : 3	1.9	1.9	1.9000	P26N
	2-BUTANONE	78-93-3	ug/l	1 : 3	2	2	2.0000	P26N
	ACETOPHENONE	98-86-2	ug/l	1 : 3	2	2	2.0000	P26N
	ARSENIC	7440-38-2	ug/l	1 : 2	6.9	6.9	6.9000	P26N
	BARIUM	7440-39-3	ug/l	2 : 2	171	202	186.5000	P26N
	BENZENE	71-43-2	ug/l	1 : 3	150	150	150.0000	P26N
	BIS(2-CHLOROETHYL) ETHER	111-44-4	ug/l	3 : 3	91	310	170.3333	P26N
	CADMIUM	7440-43-9	ug/l	2 : 2	0.78	0.8	0.7900	P26N
	CHLORIDE	16887-00-6	ug/L	1 : 1	26800000	26800000	26800000.0000	P26N
	CHROMIUM	7440-47-3	ug/l	1 : 2	9.3	9.3	9.3000	P26N
	COBALT	7440-48-4	ug/l	1 : 2	1.8	1.8	1.8000	P26N
	COPPER	7440-50-8	ug/l	2 : 2	8.3	10.4	9.3500	P26N
	DISSOLVED ORGANIC CARBON	DOC	ug/L	1 : 1	16000	16000	16000.0000	P26N
	LEAD	7439-92-1	ug/l	1 : 2	2.2	2.2	2.2000	P26N
	NICKEL	7440-02-0	ug/l	1 : 2	1.5	1.5	1.5000	P26N
	SULFATE	14808-79-8	ug/L	1 : 1	759000	759000	759000.0000	P26N
	THALLIUM	7440-28-0	ug/l	2 : 2	6.2	7.6	6.9000	P26N
	TOTAL CYANIDE	57-12-5	ug/L	2 : 2	98	120	109.0000	P26N
	VANADIUM	7440-62-2	ug/l	2 : 2	37.1	43.7	40.4000	P26N

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
	VINYL CHLORIDE	75-01-4	ug/l	2 : 3	1.2	4.6	2.9000	P26N
	ZINC	7440-66-6	ug/l	2 : 2	9.1	11.1	10.1000	P26N
P-34-N								
	1,4-DIOXANE	123-91-1	ug/l	3 : 5	3	3.6	3.2000	P-34-N
	ARSENIC	7440-38-2	ug/L	6 : 12	11.2	270	74.6000	P-34-N
	BARIUM	7440-39-3	ug/L	6 : 12	93	190	146.0833	P-34-N
	CADMIUM	7440-43-9	ug/L	3 : 12	1.3	1.9	1.6000	P-34-N
	CHROMIUM	7440-47-3	ug/L	5 : 12	8	50	30.2000	P-34-N
	COPPER	7440-50-8	ug/L	4 : 12	18	57	41.0000	P-34-N
	DIETHYL PHTHALATE	84-66-2	ug/l	1 : 4	1.7	1.7	1.7000	P-34-N
	LEAD	7439-92-1	ug/L	6 : 12	12	60	26.9833	P-34-N
	NICKEL	7440-02-0	ug/L	3 : 12	48	67.5	56.8333	P-34-N
	TOTAL CYANIDE	57-12-5	ug/L	6 : 6	5	22	18.3333	P-34-N, P-34-N
	VANADIUM	7440-62-2	ug/L	4 : 12	26	87	60.2500	P-34-N
	ZINC	7440-66-6	ug/L	5 : 12	42	330	141.1000	P-34-N
P35N								
	ARSENIC	7440-38-2	ug/l	1 : 1	8.5	8.5	8.5000	P35N
	BARIUM	7440-39-3	ug/l	1 : 1	228	228	228.0000	P35N
	CADMIUM	7440-43-9	ug/l	1 : 1	1.1	1.1	1.1000	P35N
	CHROMIUM	7440-47-3	ug/l	1 : 1	23.9	23.9	23.9000	P35N
	COBALT	7440-48-4	ug/l	1 : 1	5.5	5.5	5.5000	P35N
	LEAD	7439-92-1	ug/l	1 : 1	65.2	65.2	65.2000	P35N
	NICKEL	7440-02-0	ug/l	1 : 1	32.5	32.5	32.5000	P35N
	THALLIUM	7440-28-0	ug/l	1 : 1	6.2	6.2	6.2000	P35N
	VANADIUM	7440-62-2	ug/l	1 : 1	15.2	15.2	15.2000	P35N
P35NR								
	ANTIMONY	7440-36-0	ug/l	1 : 3	6.7	6.7	6.7000	P35NR
	BARIUM	7440-39-3	ug/l	3 : 3	62.3	88.7	71.4667	P35NR
	CHROMIUM	7440-47-3	ug/l	1 : 3	6.1	6.1	6.1000	P35NR
	COPPER	7440-50-8	ug/l	2 : 3	2.4	10.5	6.4500	P35NR

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
	LEAD	7439-92-1	ug/l	1 : 3	2	2	2.0000	P35NR
	NICKEL	7440-02-0	ug/l	2 : 3	9.5	23.3	16.4000	P35NR
	ZINC	7440-66-6	ug/l	3 : 3	7.2	46.2	21.3667	P35NR
P36N								
	ARSENIC	7440-38-2	ug/L	1 : 1	77	77	77.0000	P36N
	BARIUM	7440-39-3	ug/L	1 : 1	332	332	332.0000	P36N
	BIS(2-ETHYLHEXYL) PHTHALATE	117-81-7	ug/l	1 : 1	102	102	102.0000	P36N
	DIETHYL PHTHALATE	84-66-2	ug/l	1 : 1	2.66	2.66	2.6600	P36N
	IRON	7439-89-6	ug/L	1 : 1	1000	1000	1000.0000	P36N
	MAGNESIUM	7439-95-4	ug/L	1 : 1	16100	16100	16100.0000	P36N
	TOTAL DISSOLVED SOLIDS	TDS	ug/L	1 : 1	2590000	2590000	2590000.0000	P36N
PM1NA								
	2,6-DICHLOROPHENOL	87-65-0	ug/l	3 : 4	2.4	2.9	2.7000	PM1NA
	3-METHYLPHENOL	108-39-4	ug/l	3 : 4	1.2	4.2	2.4667	PM1NA
	4-METHYLPHENOL	106-44-5	ug/l	3 : 4	1.2	4.2	2.4667	PM1NA
	ACETONE	67-64-1	ug/l	1 : 2	9	9	9.0000	PM1NA
	ANTIMONY	7440-36-0	ug/L	1 : 8	17	17	17.0000	PM1NA
	ARSENIC	7440-38-2	ug/L	4 : 8	21.5	610	425.3750	PM1NA
	BARIUM	7440-39-3	ug/L	4 : 8	58.5	186	106.6250	PM1NA
	BENZENE	71-43-2	ug/l	1 : 4	1.9	1.9	1.9000	PM1NA
	BIS(2-ETHYLHEXYL) PHTHALATE	117-81-7	ug/l	1 : 2	19	19	19.0000	PM1NA
	CADMIUM	7440-43-9	ug/L	2 : 8	2.1	20	11.0500	PM1NA
	CARBON DISULFIDE	75-15-0	ug/l	4 : 4	1.5	3.5	2.4000	PM1NA
	CHROMIUM	7440-47-3	ug/L	4 : 8	24	140	66.8750	PM1NA
	COPPER	7440-50-8	ug/L	3 : 8	18	110	66.6667	PM1NA
	LEAD	7439-92-1	ug/L	4 : 8	10	89	50.0000	PM1NA
	MERCURY	7439-97-6	ug/L	2 : 8	0.36	1	0.6800	PM1NA
	NICKEL	7440-02-0	ug/L	3 : 8	47.5	150	105.8333	PM1NA
	TOTAL CYANIDE	57-12-5	ug/L	4 : 4	68	15000	7297.0000	PM1NA
	TOTAL METHYLPHENOL	TOTAL	ug/l	3 : 4	2.4	8.4	4.9333	PM1NA
	VANADIUM	7440-62-2	ug/L	4 : 8	34.5	85	54.6250	PM1NA

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
	ZINC	7440-66-6	ug/L	3 : 8	48	450	186.6667	PM1NA
PM1NB								
	CARBON DISULFIDE	75-15-0	ug/l	1 : 1	3.1	3.1	3.1000	PM1NB
PM3NB								
	1,4-DIOXANE	123-91-1	ug/l	1 : 1	3.2	3.2	3.2000	PM3NB
	BIS(2-CHLOROISOPROPYL) ETHER	108-60-1	ug/l	1 : 1	39	39	39.0000	PM3NB
	CARBON DISULFIDE	75-15-0	ug/l	1 : 1	0.63	0.63	0.6300	PM3NB
PM4NA								
	ANTIMONY	7440-36-0	ug/L	1 : 1	13	13	13.0000	PM4NA
	ARSENIC	7440-38-2	ug/L	1 : 1	300	300	300.0000	PM4NA
	BARIUM	7440-39-3	ug/L	1 : 1	100	100	100.0000	PM4NA
	BENZENE	71-43-2	ug/l	1 : 2	1.1	1.1	1.1000	PM4NA
	CARBON DISULFIDE	75-15-0	ug/l	1 : 2	1.4	1.4	1.4000	PM4NA
	CHLORIDE	16887-00-6	ug/L	1 : 1	22000000	22000000	22000000.0000	PM4NA
	CHROMIUM	7440-47-3	ug/L	1 : 1	41	41	41.0000	PM4NA
	COBALT	7440-48-4	ug/L	1 : 1	3.3	3.3	3.3000	PM4NA
	COPPER	7440-50-8	ug/L	1 : 1	4.7	4.7	4.7000	PM4NA
	METHANE	74-82-8	ug/l	1 : 1	6800	6800	6800.0000	PM4NA
	NICKEL	7440-02-0	ug/L	1 : 1	53	53	53.0000	PM4NA
	SULFATE	14808-79-8	ug/L	1 : 1	1200000	1200000	1200000.0000	PM4NA
	TOLUENE	108-88-3	ug/l	1 : 2	13	13	13.0000	PM4NA
	TOTAL DISSOLVED SOLIDS	TDS	ug/L	1 : 1	43000000	43000000	43000000.0000	PM4NA
	VANADIUM	7440-62-2	ug/L	1 : 1	66	66	66.0000	PM4NA
	ZINC	7440-66-6	ug/L	1 : 1	33	33	33.0000	PM4NA
RFI-MW1								
	1,4-DIOXANE	123-91-1	ug/l	5 : 5	120	210	172.0000	RFI-MW1
	ACETONE	67-64-1	ug/l	1 : 2	240	240	240.0000	RFI-MW1
	ANTIMONY	7440-36-0	ug/L	1 : 9	5.6	5.6	5.6000	RFI-MW1
	ARSENIC	7440-38-2	ug/L	3 : 9	3.5	6.75	5.5500	RFI-MW1
	BARIUM	7440-39-3	ug/L	5 : 9	185	290	248.0000	RFI-MW1

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
	BENZENE	71-43-2	ug/l	1 : 6	120	120	120.0000	RFI-MW1
	BROMOMETHANE	74-83-9	ug/l	1 : 6	2.7	2.7	2.7000	RFI-MW1
	CADMIUM	7440-43-9	ug/L	2 : 9	0.43	1.1	0.7650	RFI-MW1
	CARBON DISULFIDE	75-15-0	ug/l	1 : 6	0.16	0.16	0.1600	RFI-MW1
	CHLORIDE	16887-00-6	ug/L	1 : 1	18500000	18500000	18500000.0000	RFI-MW1
	CHROMIUM	7440-47-3	ug/L	3 : 9	1.8	55	21.9667	RFI-MW1
	COBALT	7440-48-4	ug/L	1 : 9	1.25	1.25	1.2500	RFI-MW1
	COPPER	7440-50-8	ug/L	1 : 9	20	20	20.0000	RFI-MW1
	METHANE	74-82-8	ug/l	1 : 1	7750	7750	7750.0000	RFI-MW1
	NICKEL	7440-02-0	ug/L	1 : 9	3.9	3.9	3.9000	RFI-MW1
	SULFATE	14808-79-8	ug/L	1 : 1	725000	725000	725000.0000	RFI-MW1
	THALLIUM	7440-28-0	ug/L	1 : 9	7.65	7.65	7.6500	RFI-MW1
	TOLUENE	108-88-3	ug/l	1 : 6	120	120	120.0000	RFI-MW1
	TOTAL CYANIDE	57-12-5	ug/L	4 : 4	27	53	41.5000	RFI-MW1
	TOTAL DISSOLVED SOLIDS	TDS	ug/L	1 : 1	30000000	30000000	30000000.0000	RFI-MW1
	VANADIUM	7440-62-2	ug/L	1 : 9	5.5	5.5	5.5000	RFI-MW1
	VINYL CHLORIDE	75-01-4	ug/l	3 : 6	0.75	9.4	3.7500	RFI-MW1
	ZINC	7440-66-6	ug/L	1 : 7	17	17	17.0000	RFI-MW1
RFI-MW10								
	ACETONE	67-64-1	ug/l	1 : 4	1.5	1.5	1.5000	RFI-MW10
	ARSENIC	7440-38-2	ug/L	8 : 12	8.3	19	13.8188	RFI-MW10
	BARIUM	7440-39-3	ug/L	8 : 12	700	1055	883.8750	RFI-MW10
	BIS(2-ETHYLHEXYL) PHTHALATE	117-81-7	ug/l	3 : 7	0.98	1.5	1.1933	RFI-MW10
	CAPROLACTAM	105-60-2	ug/l	1 : 4	1.3	1.3	1.3000	RFI-MW10
	CHLORIDE	16887-00-6	ug/L	2 : 2	865000	927000	896000.0000	RFI-MW10
	CHROMIUM	7440-47-3	ug/L	1 : 12	14	14	14.0000	RFI-MW10
	DISSOLVED ORGANIC CARBON	DOC	ug/L	1 : 1	15500	15500	15500.0000	RFI-MW10
	METHYLENE CHLORIDE	75-09-2	ug/l	1 : 8	0.44	0.44	0.4400	RFI-MW10
	NICKEL	7440-02-0	ug/l	1 : 12	4.3	4.3	4.3000	RFI-MW10
	PHENANTHRENE	85-01-8	ug/l	1 : 7	0.51	0.51	0.5100	RFI-MW10
	SELENIUM	7782-49-2	ug/l	1 : 12	2.45	2.45	2.4500	RFI-MW10

Table C-1
Summary Statistics for All Groundwater Wells
BASF Wyandotte

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
	SULFATE	14808-79-8	ug/L	2 : 2	6100	6600	6350.0000	RFI-MW10
	THALLIUM	7440-28-0	ug/l	1 : 12	8.2	8.2	8.2000	RFI-MW10
	TOTAL CYANIDE	57-12-5	ug/L	4 : 5	5	13.55	8.3875	RFI-MW10
	Total LMW PAHs	Total LMW	ug/l	1 : 7	0.51	0.51	0.5100	RFI-MW10
	TOTAL PAHs	Total PAHs	ug/l	1 : 7	0.51	0.51	0.5100	RFI-MW10
	ZINC	7440-66-6	ug/L	1 : 12	22	22	22.0000	RFI-MW10
RFI-MW10F								
	2-BUTANONE	78-93-3	ug/l	3 : 4	2.9	3.8	3.3000	RFI-MW10F
	2-METHYLNAPHTHALENE	91-57-6	ug/l	2 : 4	6.6	11	8.8000	RFI-MW10F
	ACETONE	67-64-1	ug/l	1 : 4	51	51	51.0000	RFI-MW10F
	ANTIMONY	7440-36-0	ug/l	2 : 4	6.1	6.6	6.3500	RFI-MW10F
	ARSENIC	7440-38-2	ug/l	4 : 4	7.8	82.2	57.3750	RFI-MW10F
	BARIUM	7440-39-3	ug/l	4 : 4	68.7	179	128.1750	RFI-MW10F
	BENZENE	71-43-2	ug/l	4 : 4	9.9	23	15.2250	RFI-MW10F
	CAPROLACTAM	105-60-2	ug/l	1 : 4	24	24	24.0000	RFI-MW10F
	CARBON DISULFIDE	75-15-0	ug/l	3 : 4	1.5	3.2	2.5667	RFI-MW10F
	CHLORIDE	16887-00-6	ug/L	2 : 2	477000	592000	534500.0000	RFI-MW10F
	CHLOROMETHANE	74-87-3	ug/l	1 : 4	0.17	0.17	0.1700	RFI-MW10F
	CHROMIUM	7440-47-3	ug/l	2 : 4	3	4.1	3.5500	RFI-MW10F
	COPPER	7440-50-8	ug/l	2 : 4	9.4	10.4	9.9000	RFI-MW10F
	CYCLOHEXANE	110-82-7	ug/l	2 : 4	0.48	0.48	0.4800	RFI-MW10F, RFI-
	DISSOLVED ORGANIC CARBON	DOC	ug/L	1 : 1	25000	25000	25000.0000	RFI-MW10F
	ETHYLBENZENE	100-41-4	ug/l	1 : 4	0.3	0.3	0.3000	RFI-MW10F
	LEAD	7439-92-1	ug/l	3 : 3	2	5.1	3.2667	RFI-MW10F
	METHYLCYCLOHEXANE	108-87-2	ug/l	1 : 4	0.56	0.56	0.5600	RFI-MW10F
	METHYLENE CHLORIDE	75-09-2	ug/l	1 : 4	27	27	27.0000	RFI-MW10F
	NAPHTHALENE	91-20-3	ug/l	4 : 4	590	1600	1060.0000	RFI-MW10F
	NICKEL	7440-02-0	ug/l	3 : 4	6.7	13.9	9.6000	RFI-MW10F
	PHENANTHRENE	85-01-8	ug/l	1 : 4	12	12	12.0000	RFI-MW10F
	PHENOL	108-95-2	ug/l	1 : 4	20	20	20.0000	RFI-MW10F
	SELENIUM	7782-49-2	ug/l	1 : 3	4.6	4.6	4.6000	RFI-MW10F

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
	STYRENE	100-42-5	ug/l	3 : 4	0.71	2.1	1.2300	RFI-MW10F
	SULFATE	14808-79-8	ug/L	2 : 2	297000	309000	303000.0000	RFI-MW10F
	THALLIUM	7440-28-0	ug/l	1 : 3	6.3	6.3	6.3000	RFI-MW10F
	TOLUENE	108-88-3	ug/l	4 : 4	4.7	9.3	6.3500	RFI-MW10F
	TOTAL CYANIDE	57-12-5	ug/L	1 : 1	480	480	480.0000	RFI-MW10F
	Total LMW PAHs	Total LMW	ug/l	4 : 4	592.9	2111	1305.6250	RFI-MW10F
	TOTAL PAHs	Total PAHs	ug/l	4 : 4	592.9	2111	1305.6250	RFI-MW10F
	TOTAL XYLENES	TOTAL	ug/l	3 : 4	3	7.1	4.5667	RFI-MW10F
	VANADIUM	7440-62-2	ug/l	4 : 4	17.3	72.9	51.1750	RFI-MW10F
	XYLENES	1330-20-7	ug/l	3 : 4	3	7.1	4.5667	RFI-MW10F
	ZINC	7440-66-6	ug/l	3 : 4	9.4	14.7	12.0667	RFI-MW10F
RFI-MW10I								
	2-BUTANONE	78-93-3	ug/l	4 : 4	3.4	39	14.0250	RFI-MW10I
	2-METHYLNAPHTHALENE	91-57-6	ug/l	1 : 4	5.5	5.5	5.5000	RFI-MW10I
	2-METHYLPHENOL	95-48-7	ug/l	1 : 4	5.9	5.9	5.9000	RFI-MW10I
	3-METHYLPHENOL	108-39-4	ug/l	1 : 1	810	810	810.0000	RFI-MW10I
	3-METHYLPHENOL & 4-METHYLPHENOL	65794-96-9	ug/l	3 : 3	190	250	223.3333	RFI-MW10I
	4-METHYL-2-PENTANONE (MIBK)	108-10-1	ug/l	4 : 4	7.7	16	12.9250	RFI-MW10I, RFI-
	4-METHYLPHENOL	106-44-5	ug/l	1 : 1	810	810	810.0000	RFI-MW10I
	ACETONE	67-64-1	ug/l	2 : 4	8.8	140	74.4000	RFI-MW10I
	ANTIMONY	7440-36-0	ug/l	2 : 4	4.7	7.4	6.0500	RFI-MW10I
	ARSENIC	7440-38-2	ug/l	4 : 4	142	314	203.0000	RFI-MW10I
	BARIUM	7440-39-3	ug/l	4 : 4	11.7	65.9	26.0000	RFI-MW10I
	BENZENE	71-43-2	ug/l	4 : 4	3	4.9	3.7250	RFI-MW10I
	CADMIUM	7440-43-9	ug/l	2 : 4	0.47	1.2	0.8350	RFI-MW10I
	CARBON DISULFIDE	75-15-0	ug/l	3 : 4	12	23	19.0000	RFI-MW10I
	CHLORIDE	16887-00-6	ug/L	2 : 2	1990000	2510000	2250000.0000	RFI-MW10I
	CHROMIUM	7440-47-3	ug/l	3 : 4	9.7	59.2	26.6333	RFI-MW10I
	COBALT	7440-48-4	ug/l	2 : 4	2	8.3	5.1500	RFI-MW10I
	COPPER	7440-50-8	ug/l	3 : 4	1.9	30.3	12.2333	RFI-MW10I
	DISSOLVED ORGANIC CARBON	DOC	ug/L	1 : 1	250000	250000	250000.0000	RFI-MW10I

Table C-1
Summary Statistics for All Groundwater Wells
BASF Wyandotte

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
	ETHYLBENZENE	100-41-4	ug/l	1 : 4	0.51	0.51	0.5100	RFI-MW10I
	LEAD	7439-92-1	ug/l	1 : 4	14.7	14.7	14.7000	RFI-MW10I
	METHYLENE CHLORIDE	75-09-2	ug/l	2 : 4	4	17	10.5000	RFI-MW10I
	NAPHTHALENE	91-20-3	ug/l	4 : 4	8.7	36	21.1750	RFI-MW10I
	NICKEL	7440-02-0	ug/l	4 : 4	60.6	197	102.3500	RFI-MW10I
	PHENANTHRENE	85-01-8	ug/l	1 : 4	15	15	15.0000	RFI-MW10I
	PHENOL	108-95-2	ug/l	4 : 4	200	870	512.5000	RFI-MW10I
	SELENIUM	7782-49-2	ug/l	2 : 4	4.4	8.3	6.3500	RFI-MW10I
	SULFATE	14808-79-8	ug/L	2 : 2	736000	875000	805500.0000	RFI-MW10I
	TOLUENE	108-88-3	ug/l	3 : 4	5.7	8.6	7.0333	RFI-MW10I
	TOTAL CYANIDE	57-12-5	ug/L	1 : 1	2000	2000	2000.0000	RFI-MW10I
	Total LMW PAHs	Total LMW	ug/l	4 : 4	20.7	301	169.7250	RFI-MW10I
	TOTAL METHYLPHENOL	TOTAL	ug/l	4 : 4	235.9	1634	669.9750	RFI-MW10I
	TOTAL PAHs	Total PAHs	ug/l	4 : 4	20.7	301	169.7250	RFI-MW10I
	TOTAL XYLENES	TOTAL	ug/l	1 : 4	2.5	2.5	2.5000	RFI-MW10I
	VANADIUM	7440-62-2	ug/l	4 : 4	61.9	230	108.4500	RFI-MW10I
	XYLENES	1330-20-7	ug/l	1 : 4	2.5	2.5	2.5000	RFI-MW10I
	ZINC	7440-66-6	ug/l	3 : 4	25.5	126	59.0333	RFI-MW10I
RFI-MW11								
	1,2-DICHLOROPROPANE	78-87-5	ug/l	1 : 8	0.19	0.19	0.1900	RFI-MW11
	ANTIMONY	7440-36-0	ug/L	3 : 12	4.2	10	7.5667	RFI-MW11
	ARSENIC	7440-38-2	ug/L	5 : 12	6	76	44.4300	RFI-MW11
	BARIUM	7440-39-3	ug/L	8 : 12	98	225	179.5625	RFI-MW11
	BIS(2-ETHYLHEXYL) PHTHALATE	117-81-7	ug/l	4 : 6	1.2	3.5	2.5000	RFI-MW11
	CADMIUM	7440-43-9	ug/L	3 : 12	2.8	4.3	3.7000	RFI-MW11
	CHLORIDE	16887-00-6	ug/L	2 : 2	146000	168000	157000.0000	RFI-MW11
	CHLOROMETHANE	74-87-3	ug/l	1 : 8	0.15	0.15	0.1500	RFI-MW11
	CHROMIUM	7440-47-3	ug/L	5 : 12	3.3	110	63.8600	RFI-MW11
	COBALT	7440-48-4	ug/l	1 : 12	1.2	1.2	1.2000	RFI-MW11
	COPPER	7440-50-8	ug/L	3 : 12	320	420	370.0000	RFI-MW11
	DISSOLVED ORGANIC CARBON	DOC	ug/L	1 : 1	13000	13000	13000.0000	RFI-MW11

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
	LEAD	7439-92-1	ug/L	4 : 12	19	220	162.2500	RFI-MW11, RFI-
	MERCURY	7439-97-6	ug/L	4 : 8	0.69	5.6	4.2475	RFI-MW11
	NICKEL	7440-02-0	ug/L	4 : 12	3.35	130	90.8375	RFI-MW11, RFI-
	SULFATE	14808-79-8	ug/L	2 : 2	34300	39900	37100.0000	RFI-MW11
	THALLIUM	7440-28-0	ug/l	1 : 12	11.8	11.8	11.8000	RFI-MW11
	TOTAL CYANIDE	57-12-5	ug/L	4 : 5	9	52	27.2500	RFI-MW11
	VANADIUM	7440-62-2	ug/L	3 : 12	72	79	74.6667	RFI-MW11
	ZINC	7440-66-6	ug/L	3 : 12	69	600	308.6667	RFI-MW11
RFI-MW11F								
	ARSENIC	7440-38-2	ug/l	4 : 4	20	29.7	24.8750	RFI-MW11F
	BARIUM	7440-39-3	ug/l	4 : 4	25.6	39.3	33.2500	RFI-MW11F
	BENZENE	71-43-2	ug/l	2 : 4	0.45	0.95	0.7000	RFI-MW11F
	BIS(2-ETHYLHEXYL) PHTHALATE	117-81-7	ug/l	2 : 4	1	1.7	1.3500	RFI-MW11F
	CAPROLACTAM	105-60-2	ug/l	1 : 4	2.3	2.3	2.3000	RFI-MW11F
	CARBAZOLE	86-74-8	ug/l	1 : 4	0.6	0.6	0.6000	RFI-MW11F
	CARBON DISULFIDE	75-15-0	ug/l	1 : 4	0.52	0.52	0.5200	RFI-MW11F
	CHLORIDE	16887-00-6	ug/L	2 : 2	491000	558000	524500.0000	RFI-MW11F
	CYCLOHEXANE	110-82-7	ug/l	1 : 4	0.51	0.51	0.5100	RFI-MW11F
	DI-N-BUTYL PHTHALATE	84-74-2	ug/l	1 : 4	0.63	0.63	0.6300	RFI-MW11F
	DISSOLVED ORGANIC CARBON	DOC	ug/L	1 : 1	12000	12000	12000.0000	RFI-MW11F
	FLUORANTHENE	206-44-0	ug/l	1 : 4	0.69	0.69	0.6900	RFI-MW11F
	FLUORENE	86-73-7	ug/l	1 : 4	0.73	0.73	0.7300	RFI-MW11F
	LEAD	7439-92-1	ug/l	1 : 4	1.9	1.9	1.9000	RFI-MW11F
	METHYLCYCLOHEXANE	108-87-2	ug/l	1 : 4	0.56	0.56	0.5600	RFI-MW11F
	NAPHTHALENE	91-20-3	ug/l	1 : 4	6.1	6.1	6.1000	RFI-MW11F
	NICKEL	7440-02-0	ug/l	4 : 4	2	5	3.3000	RFI-MW11F
	PHENANTHRENE	85-01-8	ug/l	2 : 4	0.45	0.6	0.5250	RFI-MW11F
	PYRENE	129-00-0	ug/l	1 : 4	0.51	0.51	0.5100	RFI-MW11F
	SULFATE	14808-79-8	ug/L	2 : 2	334000	365000	349500.0000	RFI-MW11F
	THALLIUM	7440-28-0	ug/l	2 : 4	5.2	5.3	5.2500	RFI-MW11F
	TOLUENE	108-88-3	ug/l	1 : 4	0.21	0.21	0.2100	RFI-MW11F

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
	TOTAL CYANIDE	57-12-5	ug/L	1 : 1	200	200	200.0000	RFI-MW11F
	Total HMW PAHs	Total HMW	ug/l	1 : 4	1.2	1.2	1.2000	RFI-MW11F
	Total LMW PAHs	Total LMW	ug/l	2 : 4	11.33	16.55	13.9400	RFI-MW11F
	TOTAL PAHs	Total PAHs	ug/l	2 : 4	12.53	36.55	24.5400	RFI-MW11F
	VANADIUM	7440-62-2	ug/l	1 : 4	3.1	3.1	3.1000	RFI-MW11F
	ZINC	7440-66-6	ug/l	1 : 4	12.3	12.3	12.3000	RFI-MW11F
RFI-MW12								
	1,4-DIOXANE	123-91-1	ug/l	1 : 7	180	180	180.0000	RFI-MW12
	2-BUTANONE	78-93-3	ug/l	6 : 8	5.6	22	15.4333	RFI-MW12
	3-METHYLPHENOL	108-39-4	ug/l	5 : 5	84	210	120.6000	RFI-MW12
	3-METHYLPHENOL & 4-METHYLPHENOL	65794-96-9	ug/l	2 : 3	110	130	120.0000	RFI-MW12
	4-METHYL-2-PENTANONE (MIBK)	108-10-1	ug/l	1 : 9	0.4	0.4	0.4000	RFI-MW12
	4-METHYLPHENOL	106-44-5	ug/l	5 : 5	84	210	120.6000	RFI-MW12
	ACETONE	67-64-1	ug/l	7 : 8	35	230	111.7143	RFI-MW12
	ANTIMONY	7440-36-0	ug/l	3 : 13	4.4	6.9	5.9000	RFI-MW12
	ARSENIC	7440-38-2	ug/L	9 : 13	38	460	314.7778	RFI-MW12
	BARIUM	7440-39-3	ug/L	9 : 13	35	117	82.7333	RFI-MW12
	BENZENE	71-43-2	ug/l	1 : 9	0.31	0.31	0.3100	RFI-MW12
	CADMIUM	7440-43-9	ug/l	3 : 13	0.59	1.3	0.8433	RFI-MW12
	CAPROLACTAM	105-60-2	ug/l	1 : 4	12	12	12.0000	RFI-MW12
	CARBON DISULFIDE	75-15-0	ug/l	6 : 9	1.3	16	5.0000	RFI-MW12
	CHLORIDE	16887-00-6	ug/L	3 : 3	7400000	11600000	9413333.3333	RFI-MW12
	CHROMIUM	7440-47-3	ug/L	9 : 13	19	90.4	64.8222	RFI-MW12
	COBALT	7440-48-4	ug/l	3 : 13	3.3	4.9	4.3333	RFI-MW12
	COPPER	7440-50-8	ug/L	5 : 13	3.3	32	15.1600	RFI-MW12
	DISSOLVED ORGANIC CARBON	DOC	ug/L	1 : 1	220000	220000	220000.0000	RFI-MW12
	LEAD	7439-92-1	ug/L	2 : 12	15	18	16.5000	RFI-MW12
	MERCURY	7439-97-6	ug/L	4 : 8	2.9	7.45	4.3875	RFI-MW12
	METHANE	74-82-8	ug/l	1 : 1	17000	17000	17000.0000	RFI-MW12
	METHYLENE CHLORIDE	75-09-2	ug/l	1 : 9	12	12	12.0000	RFI-MW12
	NICKEL	7440-02-0	ug/L	9 : 13	46	310	223.4444	RFI-MW12

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
	PHENOL	108-95-2	ug/l	7 : 8	370	1100	772.8571	RFI-MW12
	SELENIUM	7782-49-2	ug/L	5 : 13	5.6	10.4	7.6100	RFI-MW12
	SULFATE	14808-79-8	ug/L	2 : 3	188000	332000	260000.0000	RFI-MW12
	THALLIUM	7440-28-0	ug/l	2 : 13	4.8	5.9	5.3500	RFI-MW12
	TOLUENE	108-88-3	ug/l	3 : 9	0.23	16	5.5233	RFI-MW12
	TOTAL CYANIDE	57-12-5	ug/L	5 : 5	6	1800	939.2000	RFI-MW12
	TOTAL METHYLPHENOL	TOTAL	ug/l	7 : 8	110	420	206.5714	RFI-MW12
	VANADIUM	7440-62-2	ug/L	9 : 13	42	400	308.3333	RFI-MW12
	ZINC	7440-66-6	ug/l	4 : 13	8.5	150	53.6250	RFI-MW12
RFI-MW12F								
	2-BUTANONE	78-93-3	ug/l	4 : 4	9.4	30	18.8500	RFI-MW12F
	3-METHYLPHENOL	108-39-4	ug/l	1 : 1	19	19	19.0000	RFI-MW12F
	3-METHYLPHENOL & 4-METHYLPHENOL	65794-96-9	ug/l	3 : 3	49	67	58.3333	RFI-MW12F
	4-METHYL-2-PENTANONE (MIBK)	108-10-1	ug/l	4 : 4	0.81	3.4	2.0775	RFI-MW12F
	4-METHYLPHENOL	106-44-5	ug/l	1 : 1	19	19	19.0000	RFI-MW12F
	ACETONE	67-64-1	ug/l	4 : 4	79	330	169.7500	RFI-MW12F
	ARSENIC	7440-38-2	ug/l	1 : 3	6.1	6.1	6.1000	RFI-MW12F
	BARIUM	7440-39-3	ug/l	4 : 4	310	435	377.5000	RFI-MW12F
	BENZENE	71-43-2	ug/l	1 : 4	0.96	0.96	0.9600	RFI-MW12F
	BIS(2-ETHYLHEXYL) PHTHALATE	117-81-7	ug/l	1 : 4	3.6	3.6	3.6000	RFI-MW12F
	CAPROLACTAM	105-60-2	ug/l	1 : 4	36	36	36.0000	RFI-MW12F
	CARBON DISULFIDE	75-15-0	ug/l	1 : 4	1.3	1.3	1.3000	RFI-MW12F
	CHLORIDE	16887-00-6	ug/L	2 : 2	747000	941000	844000.0000	RFI-MW12F
	COPPER	7440-50-8	ug/l	2 : 4	30.8	37.5	34.1500	RFI-MW12F
	CYCLOHEXANE	110-82-7	ug/l	3 : 4	1.4	2.8	2.1667	RFI-MW12F
	DISSOLVED ORGANIC CARBON	DOC	ug/L	1 : 1	73000	73000	73000.0000	RFI-MW12F
	LEAD	7439-92-1	ug/l	3 : 4	6.8	18	12.0000	RFI-MW12F
	METHYL ACETATE	79-20-9	ug/l	1 : 4	5.4	5.4	5.4000	RFI-MW12F
	METHYLCYCLOHEXANE	108-87-2	ug/l	2 : 4	2.1	2.3	2.2000	RFI-MW12F
	METHYLENE CHLORIDE	75-09-2	ug/l	1 : 4	3.7	3.7	3.7000	RFI-MW12F
	NICKEL	7440-02-0	ug/l	4 : 4	45.1	167	111.5250	RFI-MW12F

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
	PHENOL	108-95-2	ug/l	4 : 4	110	410	277.5000	RFI-MW12F
	SELENIUM	7782-49-2	ug/l	2 : 3	6	7.2	6.6000	RFI-MW12F
	SULFATE	14808-79-8	ug/L	2 : 2	18300	30700	24500.0000	RFI-MW12F
	THALLIUM	7440-28-0	ug/l	1 : 3	4.9	4.9	4.9000	RFI-MW12F
	TOLUENE	108-88-3	ug/l	4 : 4	0.89	2.1	1.5975	RFI-MW12F
	TOTAL CYANIDE	57-12-5	ug/L	1 : 1	3.4	3.4	3.4000	RFI-MW12F
	TOTAL METHYLPHENOL	TOTAL	ug/l	4 : 4	38	67	53.2500	RFI-MW12F
	TOTAL XYLENES	TOTAL	ug/l	1 : 4	2	2	2.0000	RFI-MW12F
	XYLENES	1330-20-7	ug/l	1 : 4	2	2	2.0000	RFI-MW12F
	ZINC	7440-66-6	ug/l	2 : 4	7.8	8	7.9000	RFI-MW12F
RFI-MW13								
	1,2-DICHLOROETHANE	107-06-2	ug/l	2 : 2	22	28	25.0000	RFI-MW13
	1,4-DIOXANE	123-91-1	ug/l	1 : 1	240	240	240.0000	RFI-MW13
	ARSENIC	7440-38-2	ug/L	2 : 3	4.8	9.9	7.3500	RFI-MW13
	BARIUM	7440-39-3	ug/L	2 : 3	130	160	145.0000	RFI-MW13
	BENZENE	71-43-2	ug/l	1 : 2	8.4	8.4	8.4000	RFI-MW13
	CARBON DISULFIDE	75-15-0	ug/l	1 : 2	0.78	0.78	0.7800	RFI-MW13
	CHLORIDE	16887-00-6	ug/L	1 : 1	19000000	19000000	19000000.0000	RFI-MW13
	CHROMIUM	7440-47-3	ug/L	2 : 3	40	54	47.0000	RFI-MW13
	COPPER	7440-50-8	ug/L	2 : 3	5.7	15	10.3500	RFI-MW13
	LEAD	7439-92-1	ug/L	1 : 3	3.2	3.2	3.2000	RFI-MW13
	METHANE	74-82-8	ug/l	1 : 1	9800	9800	9800.0000	RFI-MW13
	NICKEL	7440-02-0	ug/L	1 : 3	8.4	8.4	8.4000	RFI-MW13
	SULFATE	14808-79-8	ug/L	1 : 1	680000	680000	680000.0000	RFI-MW13
	THALLIUM	7440-28-0	ug/L	1 : 3	7.8	7.8	7.8000	RFI-MW13
	TOLUENE	108-88-3	ug/l	1 : 2	76	76	76.0000	RFI-MW13
	TOTAL CYANIDE	57-12-5	ug/L	1 : 1	46	46	46.0000	RFI-MW13
	TOTAL DISSOLVED SOLIDS	TDS	ug/L	1 : 1	31000000	31000000	31000000.0000	RFI-MW13
	VANADIUM	7440-62-2	ug/L	1 : 3	7.2	7.2	7.2000	RFI-MW13
	ZINC	7440-66-6	ug/L	2 : 3	35	180	107.5000	RFI-MW13
RFI-MW14								

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
	2,4,6-TRIBROMOPHENOL	118-79-6	ug/l	1 : 1	16	16	16.0000	RFI-MW14
	BIS(2-CHLOROETHYL) ETHER	111-44-4	ug/l	1 : 1	1.4	1.4	1.4000	RFI-MW14
	CHLORIDE	16887-00-6	ug/L	1 : 1	50300000	50300000	50300000.0000	RFI-MW14
	DISSOLVED ORGANIC CARBON	DOC	ug/L	1 : 1	7000	7000	7000.0000	RFI-MW14
	NITROBENZENE-D5	4165-60-0	ug/l	1 : 1	8.9	8.9	8.9000	RFI-MW14
	PHENOL-D5	4165-62-2	ug/l	1 : 1	13	13	13.0000	RFI-MW14
	SULFATE	14808-79-8	ug/L	1 : 1	1120000	1120000	1120000.0000	RFI-MW14
	TERPHENYL-D14	1718-51-0	ug/l	1 : 1	9.7	9.7	9.7000	RFI-MW14
	TOTAL DISSOLVED SOLIDS	TDS	ug/L	1 : 1	76500000	76500000	76500000.0000	RFI-MW14
RFI-MW15								
	ARSENIC	7440-38-2	ug/L	1 : 3	84	84	84.0000	RFI-MW15
	BARIUM	7440-39-3	ug/L	2 : 3	140	230	185.0000	RFI-MW15
	CADMIUM	7440-43-9	ug/L	1 : 3	3.75	3.75	3.7500	RFI-MW15
	CHLORIDE	16887-00-6	ug/L	1 : 1	11000000	11000000	11000000.0000	RFI-MW15
	CHROMIUM	7440-47-3	ug/L	2 : 3	120	250	185.0000	RFI-MW15
	COBALT	7440-48-4	ug/L	1 : 3	18	18	18.0000	RFI-MW15
	COPPER	7440-50-8	ug/L	2 : 3	19	130	74.5000	RFI-MW15
	LEAD	7439-92-1	ug/L	1 : 3	62	62	62.0000	RFI-MW15
	MERCURY	7439-97-6	ug/L	1 : 2	1.2	1.2	1.2000	RFI-MW15
	METHANE	74-82-8	ug/l	1 : 1	15	15	15.0000	RFI-MW15
	NICKEL	7440-02-0	ug/L	2 : 3	150	1500	825.0000	RFI-MW15
	SULFATE	14808-79-8	ug/L	1 : 1	930000	930000	930000.0000	RFI-MW15
	THALLIUM	7440-28-0	ug/L	1 : 3	9.6	9.6	9.6000	RFI-MW15
	TOLUENE	108-88-3	ug/l	1 : 2	18	18	18.0000	RFI-MW15
	TOTAL CYANIDE	57-12-5	ug/L	1 : 1	69	69	69.0000	RFI-MW15
	VANADIUM	7440-62-2	ug/L	1 : 3	95	95	95.0000	RFI-MW15
	ZINC	7440-66-6	ug/L	1 : 3	540	540	540.0000	RFI-MW15
RFI-MW16								
	1,4-DIOXANE	123-91-1	ug/l	1 : 1	39	39	39.0000	RFI-MW16
	2-BUTANONE	78-93-3	ug/l	1 : 1	43	43	43.0000	RFI-MW16
	ACETONE	67-64-1	ug/l	1 : 1	540	540	540.0000	RFI-MW16

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
	ARSENIC	7440-38-2	ug/L	1 : 2	42	42	42.0000	RFI-MW16
	BARIUM	7440-39-3	ug/L	1 : 2	240	240	240.0000	RFI-MW16
	CARBON DISULFIDE	75-15-0	ug/l	1 : 1	3.4	3.4	3.4000	RFI-MW16
	CHROMIUM	7440-47-3	ug/L	1 : 2	23.8	23.8	23.8000	RFI-MW16
	COPPER	7440-50-8	ug/L	1 : 2	18	18	18.0000	RFI-MW16
	LEAD	7439-92-1	ug/L	1 : 2	3	3	3.0000	RFI-MW16
	NICKEL	7440-02-0	ug/L	1 : 2	44	44	44.0000	RFI-MW16
	PHENOL	108-95-2	ug/l	1 : 1	350	350	350.0000	RFI-MW16
	SELENIUM	7782-49-2	ug/L	1 : 2	7.05	7.05	7.0500	RFI-MW16
	TOLUENE	108-88-3	ug/l	1 : 1	2	2	2.0000	RFI-MW16
	TOTAL CYANIDE	57-12-5	ug/L	1 : 1	390	390	390.0000	RFI-MW16
	VANADIUM	7440-62-2	ug/L	1 : 2	190	190	190.0000	RFI-MW16
RFI-MW18								
	1,4-DIOXANE	123-91-1	ug/l	1 : 1	3.8	3.8	3.8000	RFI-MW18
RFI-MW2								
	1,4-DIOXANE	123-91-1	ug/l	1 : 3	4	4	4.0000	RFI-MW2
	3-METHYLPHENOL	108-39-4	ug/l	3 : 3	18	95	56.0000	RFI-MW2
	4-METHYLPHENOL	106-44-5	ug/l	3 : 3	18	95	56.0000	RFI-MW2
	ACETONE	67-64-1	ug/l	1 : 2	27	27	27.0000	RFI-MW2
	ARSENIC	7440-38-2	ug/L	4 : 8	8.35	44	20.8375	RFI-MW2
	BARIUM	7440-39-3	ug/L	4 : 8	400	650	498.7500	RFI-MW2
	BENZENE	71-43-2	ug/l	2 : 4	0.28	0.77	0.5250	RFI-MW2
	BIS(2-CHLOROETHYL) ETHER	111-44-4	ug/l	4 : 4	24	45	33.0000	RFI-MW2
	CADMIUM	7440-43-9	ug/L	4 : 8	1.1	6.8	3.2750	RFI-MW2
	CARBON DISULFIDE	75-15-0	ug/l	3 : 4	0.12	0.59	0.2833	RFI-MW2
	CHROMIUM	7440-47-3	ug/L	4 : 8	30	180	80.0000	RFI-MW2
	COPPER	7440-50-8	ug/L	3 : 8	42	140	81.0000	RFI-MW2
	LEAD	7439-92-1	ug/L	2 : 8	10	46	28.0000	RFI-MW2
	NICKEL	7440-02-0	ug/L	3 : 8	44	170	88.3333	RFI-MW2
	PHENOL	108-95-2	ug/l	1 : 3	5.3	5.3	5.3000	RFI-MW2
	TOTAL CYANIDE	57-12-5	ug/L	4 : 4	9	22	13.0000	RFI-MW2

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
	TOTAL METHYLPHENOL	TOTAL	ug/l	3 : 3	36	190	112.0000	RFI-MW2
	VANADIUM	7440-62-2	ug/L	3 : 8	24	130	61.3333	RFI-MW2
	ZINC	7440-66-6	ug/L	3 : 8	41	310	142.3333	RFI-MW2
RFI-MW21								
	ACETONE	67-64-1	ug/l	1 : 1	2100	2100	2100.0000	RFI-MW21
	PHENOL	108-95-2	ug/l	1 : 1	18	18	18.0000	RFI-MW21
RFI-MW22								
	1,4-DIOXANE	123-91-1	ug/l	3 : 8	56	110	84.3333	RFI-MW22
	2,4,5-TP (SILVEX)	93-72-1	ug/l	1 : 4	0.86	0.86	0.8600	RFI-MW22
	2-BUTANONE	78-93-3	ug/l	4 : 6	32	80	50.0000	RFI-MW22
	3-METHYLPHENOL	108-39-4	ug/l	1 : 6	34	34	34.0000	RFI-MW22
	3-METHYLPHENOL & 4-METHYLPHENOL	65794-96-9	ug/l	3 : 3	30	34	32.3333	RFI-MW22
	4-METHYLPHENOL	106-44-5	ug/l	1 : 6	34	34	34.0000	RFI-MW22
	ACETONE	67-64-1	ug/l	9 : 10	1000	14000	6566.6667	RFI-MW22
	ARSENIC	7440-38-2	ug/L	9 : 13	101	335	208.8889	RFI-MW22, RFI-
	BARIUM	7440-39-3	ug/L	9 : 13	109	150	128.3333	RFI-MW22
	BENZENE	71-43-2	ug/l	10 : 10	1600	2900	2340.0000	RFI-MW22
	BERYLLIUM	7440-41-7	ug/l	3 : 13	1.2	1.7	1.5333	RFI-MW22, RFI-
	BIS(2-CHLOROETHYL) ETHER	111-44-4	ug/l	8 : 10	37	120	87.2500	RFI-MW22
	CADMIUM	7440-43-9	ug/l	1 : 13	0.58	0.58	0.5800	RFI-MW22
	CHLORIDE	16887-00-6	ug/L	3 : 3	3490000	8900000	5370000.0000	RFI-MW22
	CHLOROBENZENE	108-90-7	ug/l	8 : 9	49	930	541.0000	RFI-MW22
	CHROMIUM	7440-47-3	ug/L	9 : 13	61	108	78.8889	RFI-MW22
	CIS-1,2-DICHLOROETHENE	156-59-2	ug/l	1 : 7	12	12	12.0000	RFI-MW22
	COBALT	7440-48-4	ug/l	5 : 13	3.8	6.2	4.6400	RFI-MW22
	COPPER	7440-50-8	ug/L	8 : 13	17	38.5	29.7500	RFI-MW22
	DISSOLVED ORGANIC CARBON	DOC	ug/L	2 : 2	260000	360000	310000.0000	RFI-MW22
	ETHYLBENZENE	100-41-4	ug/l	5 : 7	53	120	97.4000	RFI-MW22
	LEAD	7439-92-1	ug/L	8 : 13	2.8	14.7	7.1375	RFI-MW22
	METHANE	74-82-8	ug/l	1 : 1	14000	14000	14000.0000	RFI-MW22
	METHYLENE CHLORIDE	75-09-2	ug/l	2 : 8	21	38	29.5000	RFI-MW22

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
	NICKEL	7440-02-0	ug/L	9 : 13	18.3	114.5	59.4000	RFI-MW22
	O-TOLUIDINE	95-53-4	ug/l	1 : 5	86	86	86.0000	RFI-MW22
	PHENOL	108-95-2	ug/l	6 : 10	33	260	102.8333	RFI-MW22
	PYRIDINE	110-86-1	ug/l	1 : 5	41	41	41.0000	RFI-MW22
	SELENIUM	7782-49-2	ug/L	5 : 13	4.3	11	7.7900	RFI-MW22
	SULFATE	14808-79-8	ug/L	2 : 3	325000	383000	354000.0000	RFI-MW22
	TOLUENE	108-88-3	ug/l	8 : 10	69	100	84.6250	RFI-MW22
	TOTAL CYANIDE	57-12-5	ug/L	5 : 5	1500	46000	33300.0000	RFI-MW22
	TOTAL DISSOLVED SOLIDS	TDS	ug/L	1 : 1	15000000	15000000	15000000.0000	RFI-MW22
	TOTAL METHYLPHENOL	TOTAL	ug/l	4 : 8	30	68	41.2500	RFI-MW22
	TOTAL XYLENES	TOTAL	ug/l	4 : 7	37	53	44.7500	RFI-MW22
	VANADIUM	7440-62-2	ug/L	9 : 13	427	1150	712.6667	RFI-MW22
	VINYL CHLORIDE	75-01-4	ug/l	10 : 10	100	370	201.0000	RFI-MW22
	XYLENES	1330-20-7	ug/l	4 : 5	37	53	44.7500	RFI-MW22
	ZINC	7440-66-6	ug/L	6 : 13	22	72	42.6667	RFI-MW22
RFI-MW23								
	ACENAPHTHYLENE	208-96-8	ug/l	3 : 5	1.1	2.6	1.8667	RFI-MW23
	ACETOPHENONE	98-86-2	ug/l	1 : 4	2.2	2.2	2.2000	RFI-MW23
	ANTHRACENE	120-12-7	ug/l	1 : 4	3.4	3.4	3.4000	RFI-MW23
	ARSENIC	7440-38-2	ug/L	4 : 8	6.25	12.5	9.2250	RFI-MW23
	BAP-TE	BAP-TE	ug/l	5 : 5	6.3532	15.124	10.6004	RFI-MW23
	BARIUM	7440-39-3	ug/L	4 : 8	96.5	130	112.0000	RFI-MW23
	BENZENE	71-43-2	ug/l	1 : 5	0.12	0.12	0.1200	RFI-MW23
	BENZO(A)ANTHRACENE	56-55-3	ug/l	5 : 5	1.9	15	7.2600	RFI-MW23
	BENZO(A)PYRENE	50-32-8	ug/l	3 : 5	4.8	10	6.9667	RFI-MW23
	BENZO(B)FLUORANTHENE	205-99-2	ug/l	4 : 5	1.9	12	6.7500	RFI-MW23
	BENZO(GHI)PERYLENE	191-24-2	ug/l	3 : 5	2.5	4.8	3.4667	RFI-MW23
	BENZO(K)FLUORANTHENE	207-08-9	ug/l	3 : 5	2.8	6.4	4.4000	RFI-MW23
	BIS(2-ETHYLHEXYL) PHTHALATE	117-81-7	ug/l	1 : 4	1.4	1.4	1.4000	RFI-MW23
	CHLOROBENZENE	108-90-7	ug/l	3 : 5	0.47	0.78	0.5767	RFI-MW23
	CHROMIUM	7440-47-3	ug/L	3 : 8	7.2	35	18.0667	RFI-MW23

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
	CHRYSENE	218-01-9	ug/l	4 : 5	1.8	10	6.3000	RFI-MW23
	COPPER	7440-50-8	ug/L	1 : 8	23	23	23.0000	RFI-MW23
	DIBENZ(A,H)ANTHRACENE	53-70-3	ug/l	2 : 4	1	1.8	1.4000	RFI-MW23
	FLUORANTHENE	206-44-0	ug/l	5 : 5	4.5	44	22.7000	RFI-MW23
	INDENO(1,2,3-CD)PYRENE	193-39-5	ug/l	3 : 5	2.8	5.5	4.0333	RFI-MW23
	LEAD	7439-92-1	ug/L	1 : 8	6.1	6.1	6.1000	RFI-MW23
	PYRENE	129-00-0	ug/l	5 : 5	9.6	30	18.1200	RFI-MW23
	STYRENE	100-42-5	ug/l	1 : 5	0.12	0.12	0.1200	RFI-MW23
	Total Carcinogenic PAHs	Total cPAHs	ug/l	5 : 5	25.6	60.7	37.5000	RFI-MW23
	TOTAL CYANIDE	57-12-5	ug/L	4 : 4	1100	1400	1250.0000	RFI-MW23
	TOTAL DISSOLVED SOLIDS	TDS	ug/L	1 : 1	3200000	3200000	3200000.0000	RFI-MW23
	Total HMW PAHs	Total HMW	ug/l	5 : 5	52.4	139.5	82.4000	RFI-MW23
	Total LMW PAHs	Total LMW	ug/l	3 : 5	1.1	6.9	4.6667	RFI-MW23
	TOTAL PAHs	Total PAHs	ug/l	5 : 5	62.4	145.5	89.2000	RFI-MW23
	ZINC	7440-66-6	ug/L	1 : 8	120	120	120.0000	RFI-MW23
RFI-MW24								
	ARSENIC	7440-38-2	ug/L	1 : 17	8.1	8.1	8.1000	RFI-MW24
	BARIUM	7440-39-3	ug/L	10 : 16	24.2	110	57.5800	RFI-MW24
	BENZENE	71-43-2	ug/l	1 : 6	0.11	0.11	0.1100	RFI-MW24
	BIS(2-ETHYLHEXYL) PHTHALATE	117-81-7	ug/l	3 : 5	2	4.1	3.0667	RFI-MW24
	CHROMIUM	7440-47-3	ug/L	11 : 17	17	951	274.8273	RFI-MW24
	COBALT	7440-48-4	ug/l	4 : 16	1.3	4.6	2.5750	RFI-MW24
	COPPER	7440-50-8	ug/l	6 : 16	2.9	21.7	14.6333	RFI-MW24
	LEAD	7439-92-1	ug/L	5 : 17	4.3	7.1	5.5800	RFI-MW24
	METHYLENE CHLORIDE	75-09-2	ug/l	1 : 6	0.45	0.45	0.4500	RFI-MW24
	NICKEL	7440-02-0	ug/L	8 : 15	18.4	162	79.4875	RFI-MW24
	SELENIUM	7782-49-2	ug/L	1 : 17	7.25	7.25	7.2500	RFI-MW24
	TOTAL CYANIDE	57-12-5	ug/L	7 : 7	52	1100	523.1429	RFI-MW24
	VANADIUM	7440-62-2	ug/l	3 : 17	3.6	23	10.1000	RFI-MW24
	ZINC	7440-66-6	ug/l	4 : 16	8.6	51	29.8000	RFI-MW24
RFI-MW25								

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
	ARSENIC	7440-38-2	ug/L	4 : 13	7.8	26	18.2000	RFI-MW25
	BARIUM	7440-39-3	ug/L	6 : 12	127.5	265	191.2500	RFI-MW25
	CADMIUM	7440-43-9	ug/L	2 : 12	1.35	1.6	1.4750	RFI-MW25
	CHROMIUM	7440-47-3	ug/l	8 : 13	59.6	1400	571.2000	RFI-MW25
	COPPER	7440-50-8	ug/L	6 : 12	11	61	29.3333	RFI-MW25
	LEAD	7439-92-1	ug/L	5 : 13	3.6	17	9.7200	RFI-MW25
	NICKEL	7440-02-0	ug/L	7 : 13	57	214	143.6429	RFI-MW25
	TOTAL CYANIDE	57-12-5	ug/L	6 : 6	28	540	352.1667	RFI-MW25
	VANADIUM	7440-62-2	ug/L	3 : 13	57	91	69.6667	RFI-MW25
	ZINC	7440-66-6	ug/L	4 : 12	57	130	104.0000	RFI-MW25
RFI-MW26								
	ARSENIC	7440-38-2	ug/L	8 : 14	4.3	75	24.0250	RFI-MW26
	BARIUM	7440-39-3	ug/L	8 : 14	56.5	1500	606.3125	RFI-MW26
	BIS(2-ETHYLHEXYL) PHTHALATE	117-81-7	ug/l	1 : 5	18	18	18.0000	RFI-MW26
	CADMIUM	7440-43-9	ug/L	3 : 14	1.4	1.9	1.6667	RFI-MW26
	CHLORIDE	16887-00-6	ug/L	1 : 1	1200000	1200000	1200000.0000	RFI-MW26
	CHROMIUM	7440-47-3	ug/L	8 : 14	91.5	6400	2335.5313	RFI-MW26
	COBALT	7440-48-4	ug/L	2 : 13	1.5	52	26.7500	RFI-MW26
	COPPER	7440-50-8	ug/L	8 : 14	8.15	190	79.5813	RFI-MW26
	DIETHYL PHTHALATE	84-66-2	ug/l	1 : 5	22.9	22.9	22.9000	RFI-MW26
	IRON	7439-89-6	ug/L	1 : 1	23400	23400	23400.0000	RFI-MW26
	LEAD	7439-92-1	ug/L	6 : 14	6	53	20.5000	RFI-MW26
	MAGNESIUM	7439-95-4	ug/L	1 : 1	20200	20200	20200.0000	RFI-MW26
	MERCURY	7439-97-6	ug/L	1 : 13	0.39	0.39	0.3900	RFI-MW26
	METHANE	74-82-8	ug/l	1 : 1	4.4	4.4	4.4000	RFI-MW26
	NICKEL	7440-02-0	ug/L	8 : 14	48.5	2460	811.6875	RFI-MW26
	NITRATE	14797-55-8	ug/L	1 : 1	8900	8900	8900.0000	RFI-MW26
	SELENIUM	7782-49-2	ug/L	1 : 14	5.1	5.1	5.1000	RFI-MW26
	SULFATE	14808-79-8	ug/L	1 : 1	73500	73500	73500.0000	RFI-MW26
	THALLIUM	7440-28-0	ug/L	1 : 14	10.1	10.1	10.1000	RFI-MW26
	TOLUENE	108-88-3	ug/l	1 : 8	27	27	27.0000	RFI-MW26

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
	TOTAL CYANIDE	57-12-5	ug/L	4 : 6	7	320	136.5000	RFI-MW26
	TOTAL DISSOLVED SOLIDS	TDS	ug/L	1 : 1	12400000	12400000	12400000.0000	RFI-MW26
	VANADIUM	7440-62-2	ug/L	8 : 14	2.9	140	48.8625	RFI-MW26
	ZINC	7440-66-6	ug/L	5 : 14	54	280	148.6000	RFI-MW26
RFI-MW27								
	ARSENIC	7440-38-2	ug/L	1 : 12	5.9	5.9	5.9000	RFI-MW27
	BARIUM	7440-39-3	ug/L	6 : 12	180	250	216.6667	RFI-MW27
	BENZENE	71-43-2	ug/l	1 : 6	0.11	0.11	0.1100	RFI-MW27
	BIS(2-ETHYLHEXYL) PHTHALATE	117-81-7	ug/l	1 : 4	4.1	4.1	4.1000	RFI-MW27
	CADMIUM	7440-43-9	ug/L	2 : 12	1.1	1.15	1.1250	RFI-MW27
	CHROMIUM	7440-47-3	ug/L	6 : 12	6.5	35	18.5833	RFI-MW27
	COPPER	7440-50-8	ug/L	3 : 12	15	52	29.6667	RFI-MW27
	LEAD	7439-92-1	ug/L	1 : 12	7.3	7.3	7.3000	RFI-MW27
	SILVER	7440-22-4	ug/L	1 : 12	15	15	15.0000	RFI-MW27
	TOTAL CYANIDE	57-12-5	ug/L	5 : 6	6	48	26.8000	RFI-MW27
	VANADIUM	7440-62-2	ug/L	1 : 12	23	23	23.0000	RFI-MW27
	ZINC	7440-66-6	ug/L	3 : 12	41	340	146.6667	RFI-MW27
RFI-MW28								
	2,4-DIMETHYLPHENOL	105-67-9	ug/l	6 : 6	6.7	35	20.5333	RFI-MW28
	2-METHYLPHENOL	95-48-7	ug/l	4 : 6	3.3	7.3	5.2000	RFI-MW28
	3-METHYLPHENOL	108-39-4	ug/l	5 : 6	13	19	16.7000	RFI-MW28, RFI-
	4-METHYLPHENOL	106-44-5	ug/l	5 : 6	13	19	16.7000	RFI-MW28, RFI-
	ACETONE	67-64-1	ug/l	1 : 1	14	14	14.0000	RFI-MW28
	ARSENIC	7440-38-2	ug/L	10 : 16	29.9	59	41.7700	RFI-MW28
	BARIUM	7440-39-3	ug/L	10 : 16	27.35	86.25	50.8600	RFI-MW28
	BENZENE	71-43-2	ug/l	5 : 6	1.2	2.3	1.7000	RFI-MW28
	CADMIUM	7440-43-9	ug/L	10 : 16	0.5	2.9	1.4210	RFI-MW28
	CARBON DISULFIDE	75-15-0	ug/l	1 : 6	0.27	0.27	0.2700	RFI-MW28
	CHROMIUM	7440-47-3	ug/l	9 : 16	5.2	63	23.3111	RFI-MW28
	COBALT	7440-48-4	ug/l	3 : 16	1.3	1.9	1.6500	RFI-MW28
	COPPER	7440-50-8	ug/l	7 : 16	2.55	78	32.6357	RFI-MW28

Table C-1
Summary Statistics for All Groundwater Wells
BASF Wyandotte

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
	LEAD	7439-92-1	ug/L	6 : 16	3.1	21	8.2333	RFI-MW28
	NICKEL	7440-02-0	ug/L	6 : 16	3.1	46.5	19.3833	RFI-MW28
	PYRIDINE	110-86-1	ug/l	3 : 6	2.7	4.1	3.6333	RFI-MW28, RFI-
	SELENIUM	7782-49-2	ug/l	1 : 16	4.05	4.05	4.0500	RFI-MW28
	THALLIUM	7440-28-0	ug/l	3 : 16	9.1	13.8	11.0333	RFI-MW28
	TOTAL CYANIDE	57-12-5	ug/L	6 : 7	10	33	18.9167	RFI-MW28
	TOTAL METHYLPHENOL	TOTAL	ug/l	5 : 6	29.3	45.3	38.5600	RFI-MW28
	VANADIUM	7440-62-2	ug/l	9 : 16	2.1	110	31.3889	RFI-MW28
	ZINC	7440-66-6	ug/L	6 : 16	7.4	145	63.9833	RFI-MW28
RFI-MW29								
	ANTIMONY	7440-36-0	ug/L	2 : 12	7.35	7.65	7.5000	RFI-MW29
	ARSENIC	7440-38-2	ug/L	5 : 12	8.5	31	20.7000	RFI-MW29
	BARIUM	7440-39-3	ug/L	6 : 10	76.5	210	144.5833	RFI-MW29
	BIS(2-ETHYLHEXYL) PHTHALATE	117-81-7	ug/l	1 : 7	2.9	2.9	2.9000	RFI-MW29
	CADMIUM	7440-43-9	ug/L	3 : 12	1.1	1.4	1.2000	RFI-MW29
	CARBON DISULFIDE	75-15-0	ug/l	2 : 6	0.099	0.75	0.4245	RFI-MW29
	CHLOROFORM	67-66-3	ug/l	1 : 6	1.9	1.9	1.9000	RFI-MW29
	CHROMIUM	7440-47-3	ug/L	8 : 12	55	350	146.6250	RFI-MW29
	COPPER	7440-50-8	ug/L	6 : 12	15	54	38.3333	RFI-MW29
	LEAD	7439-92-1	ug/L	7 : 12	4.8	20	11.1857	RFI-MW29
	NICKEL	7440-02-0	ug/L	6 : 12	50	910	275.5833	RFI-MW29
	TOTAL CYANIDE	57-12-5	ug/L	5 : 6	8	33	19.1000	RFI-MW29
	VANADIUM	7440-62-2	ug/L	6 : 12	20	62	38.5000	RFI-MW29
	ZINC	7440-66-6	ug/L	4 : 12	37.25	130	96.0625	RFI-MW29
RFI-MW3								
	2-BUTANONE	78-93-3	ug/l	2 : 2	5.6	6.4	6.0000	RFI-MW3
	3-METHYLPHENOL	108-39-4	ug/l	3 : 4	7	39	18.3000	RFI-MW3
	4-METHYLPHENOL	106-44-5	ug/l	3 : 4	7	39	18.3000	RFI-MW3
	ACETONE	67-64-1	ug/l	2 : 3	17	22	19.5000	RFI-MW3
	ACETOPHENONE	98-86-2	ug/l	1 : 3	1.9	1.9	1.9000	RFI-MW3
	ARSENIC	7440-38-2	ug/L	4 : 8	19	30.5	23.7500	RFI-MW3

Table C-1
Summary Statistics for All Groundwater Wells
BASF Wyandotte

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
	BARIUM	7440-39-3	ug/L	4 : 8	1200	1600	1412.5000	RFI-MW3
	BIS(2-CHLOROETHYL) ETHER	111-44-4	ug/l	4 : 4	6.4	15	11.8500	RFI-MW3
	CADMIUM	7440-43-9	ug/L	1 : 8	3.3	3.3	3.3000	RFI-MW3
	CARBON DISULFIDE	75-15-0	ug/l	1 : 4	0.12	0.12	0.1200	RFI-MW3
	CHROMIUM	7440-47-3	ug/L	4 : 8	30	150	63.2500	RFI-MW3
	COPPER	7440-50-8	ug/L	3 : 8	32	120	64.0000	RFI-MW3
	LEAD	7439-92-1	ug/L	4 : 8	16	71	32.2500	RFI-MW3
	NICKEL	7440-02-0	ug/L	4 : 8	47	180	85.5000	RFI-MW3
	PHENOL	108-95-2	ug/l	1 : 2	1.5	1.5	1.5000	RFI-MW3
	TOLUENE	108-88-3	ug/l	2 : 4	0.16	0.31	0.2350	RFI-MW3
	TOTAL CYANIDE	57-12-5	ug/L	1 : 4	6	6	6.0000	RFI-MW3
	TOTAL METHYLPHENOL	TOTAL	ug/l	3 : 4	14	78	36.6000	RFI-MW3
	VANADIUM	7440-62-2	ug/L	4 : 8	35	130	62.5000	RFI-MW3
	ZINC	7440-66-6	ug/L	3 : 8	55.5	340	168.5000	RFI-MW3
RFI-MW4								
	1,4-DIOXANE	123-91-1	ug/l	7 : 8	5	19	12.7857	RFI-MW4
	ACENAPHTHENE	83-32-9	ug/l	1 : 7	0.61	0.61	0.6100	RFI-MW4
	ARSENIC	7440-38-2	ug/L	7 : 12	83.35	545	242.3357	RFI-MW4
	BARIUM	7440-39-3	ug/L	8 : 12	36	311	163.6875	RFI-MW4
	BIS(2-ETHYLHEXYL) PHTHALATE	117-81-7	ug/l	1 : 7	0.98	0.98	0.9800	RFI-MW4
	CARBON DISULFIDE	75-15-0	ug/l	4 : 8	0.1	0.39	0.2450	RFI-MW4
	CHLORIDE	16887-00-6	ug/L	2 : 2	2390000	2400000	2395000.0000	RFI-MW4
	CHROMIUM	7440-47-3	ug/L	3 : 12	5.8	22	14.2667	RFI-MW4
	COPPER	7440-50-8	ug/L	1 : 12	18	18	18.0000	RFI-MW4
	DISSOLVED ORGANIC CARBON	DOC	ug/L	1 : 1	22000	22000	22000.0000	RFI-MW4
	FLUORENE	86-73-7	ug/l	1 : 7	0.14	0.14	0.1400	RFI-MW4
	LEAD	7439-92-1	ug/L	2 : 12	3.9	4.3	4.1000	RFI-MW4
	SULFATE	14808-79-8	ug/L	2 : 2	78800	85800	82300.0000	RFI-MW4
	TOTAL CYANIDE	57-12-5	ug/L	5 : 5	17	130	67.4000	RFI-MW4
	TOTAL DISSOLVED SOLIDS	TDS	ug/L	1 : 1	4100000	4100000	4100000.0000	RFI-MW4
	Total LMW PAHs	Total LMW	ug/l	2 : 7	0.194	10.61	5.4020	RFI-MW4

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
	TOTAL PAHs	Total PAHs	ug/l	2 : 7	0.194	10.61	5.4020	RFI-MW4
	ZINC	7440-66-6	ug/L	2 : 12	50	52	51.0000	RFI-MW4
RFI-MW5								
	1,2-DICHLOROPROPANE	78-87-5	ug/l	7 : 8	0.2	1.1	0.5129	RFI-MW5
	2,4-DIMETHYLPHENOL	105-67-9	ug/l	3 : 6	0.835	1.4	1.1783	RFI-MW5
	2-BUTANONE	78-93-3	ug/l	7 : 8	5.95	9.9	7.7786	RFI-MW5
	2-METHYLNAPHTHALENE	91-57-6	ug/l	5 : 6	0.8	1.4	1.0640	RFI-MW5
	2-METHYLPHENOL	95-48-7	ug/l	8 : 8	2.3	3.8	2.8875	RFI-MW5
	3-METHYLPHENOL	108-39-4	ug/l	5 : 5	23	45	33.0000	RFI-MW5
	3-METHYLPHENOL & 4-METHYLPHENOL	65794-96-9	ug/l	3 : 3	24	34	27.6667	RFI-MW5
	4-METHYLPHENOL	106-44-5	ug/l	5 : 5	23	45	33.0000	RFI-MW5
	ACENAPHTHENE	83-32-9	ug/l	4 : 6	0.28	0.51	0.3600	RFI-MW5
	ACENAPHTHYLENE	208-96-8	ug/l	3 : 6	0.45	0.51	0.4800	RFI-MW5
	ACETONE	67-64-1	ug/l	7 : 8	43	140	76.8571	RFI-MW5
	ANTHRACENE	120-12-7	ug/l	1 : 6	0.1	0.1	0.1000	RFI-MW5
	BARIUM	7440-39-3	ug/L	8 : 12	851.5	1300	1044.5625	RFI-MW5
	BENZENE	71-43-2	ug/l	6 : 8	0.45	0.91	0.6675	RFI-MW5
	BERYLLIUM	7440-41-7	ug/l	1 : 12	0.475	0.475	0.4750	RFI-MW5
	BIS(2-CHLOROISOPROPYL) ETHER	108-60-1	ug/l	5 : 8	1.6	2.7	2.0800	RFI-MW5
	BIS(2-ETHYLHEXYL) PHTHALATE	117-81-7	ug/l	3 : 7	1.1	3	2.0000	RFI-MW5
	CAPROLACTAM	105-60-2	ug/l	3 : 4	1.1	34.5	12.6000	RFI-MW5
	CHLORIDE	16887-00-6	ug/L	2 : 2	4660000	8050000	6355000.0000	RFI-MW5
	CHLOROMETHANE	74-87-3	ug/l	2 : 8	0.15	0.23	0.1900	RFI-MW5
	CHROMIUM	7440-47-3	ug/l	3 : 12	1.8	30	12.8000	RFI-MW5
	COPPER	7440-50-8	ug/L	1 : 12	22	22	22.0000	RFI-MW5
	CYCLOHEXANE	110-82-7	ug/l	3 : 4	0.13	0.24	0.1733	RFI-MW5
	DISSOLVED ORGANIC CARBON	DOC	ug/L	2 : 2	8000	8000	8000.0000	RFI-MW5, RFI-
	FLUORENE	86-73-7	ug/l	2 : 6	0.26	0.32	0.2900	RFI-MW5
	NAPHTHALENE	91-20-3	ug/l	8 : 8	2.9	7.35	4.7063	RFI-MW5
	NICKEL	7440-02-0	ug/l	4 : 12	6.7	8.1	7.5750	RFI-MW5
	PHENANTHRENE	85-01-8	ug/l	4 : 6	0.49	0.53	0.5113	RFI-MW5

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
	PHENOL	108-95-2	ug/l	7 : 8	12	41	25.3571	RFI-MW5
	PYRENE	129-00-0	ug/l	1 : 6	0.22	0.22	0.2200	RFI-MW5
	SELENIUM	7782-49-2	ug/L	5 : 12	4.6	9.35	6.8200	RFI-MW5
	SULFATE	14808-79-8	ug/L	2 : 2	1100	2400	1750.0000	RFI-MW5
	TOLUENE	108-88-3	ug/l	6 : 8	0.28	0.61	0.3792	RFI-MW5
	TOTAL CYANIDE	57-12-5	ug/L	3 : 4	4.45	7	5.8167	RFI-MW5
	TOTAL DISSOLVED SOLIDS	TDS	ug/L	1 : 1	15000000	15000000	15000000.0000	RFI-MW5
	Total HMW PAHs	Total HMW	ug/l	1 : 6	0.22	0.22	0.2200	RFI-MW5
	Total LMW PAHs	Total LMW	ug/l	8 : 8	2.9	37.34	20.9469	RFI-MW5
	TOTAL METHYLPHENOL	TOTAL	ug/l	8 : 8	26.4	93.3	54.5125	RFI-MW5
	TOTAL PAHs	Total PAHs	ug/l	8 : 8	2.9	47.34	24.7304	RFI-MW5
	ZINC	7440-66-6	ug/L	1 : 12	76	76	76.0000	RFI-MW5
RFI-MW6								
	1,2-DICHLOROETHANE	107-06-2	ug/l	6 : 8	0.29	0.58	0.3817	RFI-MW6
	1,2-DICHLOROPROPANE	78-87-5	ug/l	8 : 8	9.1	35	19.2313	RFI-MW6
	2-BUTANONE	78-93-3	ug/l	3 : 6	0.705	0.92	0.8183	RFI-MW6
	2-METHYLNAPHTHALENE	91-57-6	ug/l	2 : 7	0.29	0.37	0.3300	RFI-MW6
	2-METHYLPHENOL	95-48-7	ug/l	1 : 7	0.63	0.63	0.6300	RFI-MW6
	3-METHYLPHENOL	108-39-4	ug/l	5 : 5	5.5	11	8.9400	RFI-MW6
	3-METHYLPHENOL & 4-METHYLPHENOL	65794-96-9	ug/l	3 : 3	9.1	15	12.7000	RFI-MW6
	4-METHYLPHENOL	106-44-5	ug/l	5 : 5	5.5	11	8.9400	RFI-MW6
	ACETONE	67-64-1	ug/l	4 : 7	1.5	19	9.0500	RFI-MW6
	ARSENIC	7440-38-2	ug/L	2 : 12	5.6	7.5	6.5500	RFI-MW6
	BARIUM	7440-39-3	ug/L	8 : 12	90	217	155.3750	RFI-MW6
	BERYLLIUM	7440-41-7	ug/l	1 : 12	0.35	0.35	0.3500	RFI-MW6
	BIS(2-CHLOROISOPROPYL) ETHER	108-60-1	ug/l	7 : 8	4.3	18	11.3286	RFI-MW6, RFI-
	CAPROLACTAM	105-60-2	ug/l	2 : 4	0.86	2.1	1.4800	RFI-MW6
	CARBON DISULFIDE	75-15-0	ug/l	3 : 8	0.29	0.75	0.4533	RFI-MW6
	CHLORIDE	16887-00-6	ug/L	2 : 2	3065000	3110000	3087500.0000	RFI-MW6
	CHROMIUM	7440-47-3	ug/L	4 : 12	11	33	18.0000	RFI-MW6
	COPPER	7440-50-8	ug/L	2 : 12	13	22	17.5000	RFI-MW6

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
	DISSOLVED ORGANIC CARBON	DOC	ug/L	2 : 2	6000	7000	6500.0000	RFI-MW6
	LEAD	7439-92-1	ug/L	1 : 12	7.9	7.9	7.9000	RFI-MW6
	MERCURY	7439-97-6	ug/L	3 : 8	0.26	0.65	0.4300	RFI-MW6
	NAPHTHALENE	91-20-3	ug/l	7 : 7	0.95	1.6	1.2250	RFI-MW6
	NICKEL	7440-02-0	ug/l	4 : 12	4.5	6.6	5.6750	RFI-MW6
	PHENANTHRENE	85-01-8	ug/l	4 : 7	0.39	1.4	0.6675	RFI-MW6
	PHENOL	108-95-2	ug/l	7 : 8	6.3	17	11.9429	RFI-MW6, RFI-
	SELENIUM	7782-49-2	ug/L	4 : 12	5.8	8.5	6.6375	RFI-MW6
	SULFATE	14808-79-8	ug/L	2 : 2	198000	214500	206250.0000	RFI-MW6
	TOLUENE	108-88-3	ug/l	5 : 8	0.16	0.2	0.1880	RFI-MW6, RFI-
	TOTAL CYANIDE	57-12-5	ug/L	5 : 5	7	30	15.8000	RFI-MW6
	Total LMW PAHs	Total LMW	ug/l	7 : 7	1.64	23.025	9.8436	RFI-MW6
	TOTAL METHYLPHENOL	TOTAL	ug/l	8 : 8	14.63	27	20.5863	RFI-MW6
	TOTAL PAHs	Total PAHs	ug/l	7 : 7	1.64	23.025	9.8436	RFI-MW6
	ZINC	7440-66-6	ug/L	2 : 12	62	77	69.5000	RFI-MW6
RFI-MW7								
	1,1,1-TRICHLOROETHANE	71-55-6	ug/l	5 : 5	7.1	69	36.0200	RFI-MW7
	1,1-DICHLOROETHANE	75-34-3	ug/l	5 : 5	3.6	12	9.2400	RFI-MW7, RFI-
	1,1-DICHLOROETHENE	75-35-4	ug/l	4 : 5	1.24	3.5	2.0225	RFI-MW7
	1,4-DIOXANE	123-91-1	ug/l	4 : 4	24	44	32.1250	RFI-MW7
	2-BUTANONE	78-93-3	ug/l	3 : 3	9	22	17.3333	RFI-MW7
	2-HEXANONE	591-78-6	ug/l	1 : 5	1.3	1.3	1.3000	RFI-MW7
	2-METHYLNAPHTHALENE	91-57-6	ug/l	4 : 4	42	110	86.0000	RFI-MW7, RFI-
	2-METHYLPHENOL	95-48-7	ug/l	4 : 3	2.6	11	5.3250	RFI-MW7
	3-METHYLPHENOL	108-39-4	ug/l	4 : 4	8.7	63	25.4500	RFI-MW7
	4-METHYL-2-PENTANONE (MIBK)	108-10-1	ug/l	1 : 5	0.91	0.91	0.9100	RFI-MW7
	4-METHYLPHENOL	106-44-5	ug/l	4 : 4	8.7	63	25.4500	RFI-MW7
	ACENAPHTHENE	83-32-9	ug/l	2 : 4	2.7	2.8	2.7500	RFI-MW7
	ACETONE	67-64-1	ug/l	4 : 5	44	108	77.2500	RFI-MW7
	ARSENIC	7440-38-2	ug/L	2 : 9	7.3	9.6	8.4500	RFI-MW7
	BARIUM	7440-39-3	ug/L	5 : 9	86	125	101.3500	RFI-MW7

Table C-1
Summary Statistics for All Groundwater Wells
BASF Wyandotte

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
	BENZENE	71-43-2	ug/l	3 : 5	0.39	0.83	0.5817	RFI-MW7
	BIS(2-ETHYLHEXYL) PHTHALATE	117-81-7	ug/l	1 : 3	13	13	13.0000	RFI-MW7
	CHLORIDE	16887-00-6	ug/L	1 : 1	5200000	5200000	5200000.0000	RFI-MW7
	CHROMIUM	7440-47-3	ug/L	5 : 9	1.1	36.75	23.6400	RFI-MW7
	COPPER	7440-50-8	ug/L	2 : 9	20	26.5	23.2500	RFI-MW7
	CYCLOHEXANE	110-82-7	ug/l	1 : 1	1.4	1.4	1.4000	RFI-MW7
	DIBENZOFURAN	132-64-9	ug/l	2 : 4	2.8	2.95	2.8750	RFI-MW7
	ETHYLBENZENE	100-41-4	ug/l	5 : 5	4.5	23.5	14.3000	RFI-MW7
	ISOPROPYLBENZENE	98-82-8	ug/l	1 : 1	4.8	4.8	4.8000	RFI-MW7
	LEAD	7439-92-1	ug/L	1 : 9	3.9	3.9	3.9000	RFI-MW7
	MERCURY	7439-97-6	ug/L	1 : 8	0.26	0.26	0.2600	RFI-MW7
	METHANE	74-82-8	ug/l	1 : 1	4800	4800	4800.0000	RFI-MW7
	METHYLCYCLOHEXANE	108-87-2	ug/l	1 : 1	2.8	2.8	2.8000	RFI-MW7
	M-XYLENE & P-XYLENE	M/P-	ug/l	4 : 4	6.9	40.5	25.4750	RFI-MW7
	NAPHTHALENE	91-20-3	ug/l	4 : 4	34	65.5	54.6250	RFI-MW7
	NICKEL	7440-02-0	ug/L	2 : 9	3.6	41	22.3000	RFI-MW7
	O-XYLENE	95-47-6	ug/l	4 : 4	3.6	18.5	11.6750	RFI-MW7
	PHENANTHRENE	85-01-8	ug/l	3 : 4	2.2	3.05	2.7500	RFI-MW7
	PHENOL	108-95-2	ug/l	3 : 4	45.5	310	151.8333	RFI-MW7
	SELENIUM	7782-49-2	ug/L	5 : 9	4.8	23.75	17.4600	RFI-MW7
	SULFATE	14808-79-8	ug/L	1 : 1	310000	310000	310000.0000	RFI-MW7
	TOLUENE	108-88-3	ug/l	4 : 5	1.55	17	5.8875	RFI-MW7
	TOTAL CYANIDE	57-12-5	ug/L	4 : 4	41	130	69.7500	RFI-MW7
	TOTAL DISSOLVED SOLIDS	TDS	ug/L	1 : 1	13000000	13000000	13000000.0000	RFI-MW7
	Total LMW PAHs	Total LMW	ug/l	4 : 4	126	181.35	159.0625	RFI-MW7
	TOTAL METHYLPHENOL	TOTAL	ug/l	4 : 4	20	137	56.2250	RFI-MW7
	TOTAL PAHs	Total PAHs	ug/l	4 : 4	126	181.35	159.0625	RFI-MW7
	TOTAL XYLENES	TOTAL	ug/l	5 : 5	10.5	59	34.1200	RFI-MW7
	VANADIUM	7440-62-2	ug/L	1 : 9	1.3	1.3	1.3000	RFI-MW7
	XYLENES	1330-20-7	ug/l	1 : 1	22	22	22.0000	RFI-MW7
	ZINC	7440-66-6	ug/L	1 : 9	47	47	47.0000	RFI-MW7

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
RFI-MW7F								
	1,2-DICHLOROETHANE	107-06-2	ug/l	1 : 4	0.3	0.3	0.3000	RFI-MW7F
	1,2-DICHLOROPROPANE	78-87-5	ug/l	4 : 4	0.92	13	5.2300	RFI-MW7F
	2-BUTANONE	78-93-3	ug/l	3 : 4	1.3	7.1	3.3667	RFI-MW7F
	3-METHYLPHENOL & 4-METHYLPHENOL	65794-96-9	ug/l	1 : 3	1	1	1.0000	RFI-MW7F
	ACETONE	67-64-1	ug/l	2 : 4	26	67	46.5000	RFI-MW7F
	BARIUM	7440-39-3	ug/l	4 : 4	409	604	491.7500	RFI-MW7F
	BERYLLIUM	7440-41-7	ug/l	1 : 3	0.31	0.31	0.3100	RFI-MW7F
	BIS(2-CHLOROISOPROPYL) ETHER	108-60-1	ug/l	4 : 4	1.9	9.4	4.6750	RFI-MW7F
	CAPROLACTAM	105-60-2	ug/l	3 : 4	1.2	40	14.3333	RFI-MW7F
	CHLORIDE	16887-00-6	ug/L	2 : 2	702000	993000	847500.0000	RFI-MW7F
	CHROMIUM	7440-47-3	ug/l	4 : 4	9.7	32.9	20.1750	RFI-MW7F
	COBALT	7440-48-4	ug/l	2 : 3	1.2	1.9	1.5500	RFI-MW7F
	COPPER	7440-50-8	ug/l	2 : 3	8.2	43.4	25.8000	RFI-MW7F
	CYCLOHEXANE	110-82-7	ug/l	1 : 4	0.13	0.13	0.1300	RFI-MW7F
	DISSOLVED ORGANIC CARBON	DOC	ug/L	1 : 1	4000	4000	4000.0000	RFI-MW7F
	LEAD	7439-92-1	ug/l	2 : 3	2.2	3	2.6000	RFI-MW7F
	NICKEL	7440-02-0	ug/l	4 : 4	2.1	12.8	5.7250	RFI-MW7F
	PHENANTHRENE	85-01-8	ug/l	3 : 4	0.34	1.2	0.7767	RFI-MW7F
	SELENIUM	7782-49-2	ug/l	3 : 4	5.2	8.7	7.3333	RFI-MW7F
	SULFATE	14808-79-8	ug/L	2 : 2	22400	33300	27850.0000	RFI-MW7F
	TOLUENE	108-88-3	ug/l	1 : 4	0.22	0.22	0.2200	RFI-MW7F
	TOTAL CYANIDE	57-12-5	ug/L	1 : 1	3.8	3.8	3.8000	RFI-MW7F
	Total LMW PAHs	Total LMW	ug/l	3 : 4	0.34	1.2	0.7767	RFI-MW7F
	TOTAL METHYLPHENOL	TOTAL	ug/l	1 : 4	1	1	1.0000	RFI-MW7F
	TOTAL PAHs	Total PAHs	ug/l	3 : 4	0.34	1.2	0.7767	RFI-MW7F
RFI-MW7I								
	ACENAPHTHENE	83-32-9	ug/l	3 : 4	0.31	0.46	0.4033	RFI-MW7I
	ARSENIC	7440-38-2	ug/l	1 : 4	7.1	7.1	7.1000	RFI-MW7I
	BARIUM	7440-39-3	ug/l	4 : 4	1760	3700	2605.0000	RFI-MW7I
	BERYLLIUM	7440-41-7	ug/l	1 : 4	0.42	0.42	0.4200	RFI-MW7I

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
	CADMIUM	7440-43-9	ug/l	3 : 4	0.43	0.59	0.4867	RFI-MW7I
	CAPROLACTAM	105-60-2	ug/l	1 : 4	1.1	1.1	1.1000	RFI-MW7I
	CARBON DISULFIDE	75-15-0	ug/l	3 : 4	0.37	1.1	0.6700	RFI-MW7I
	CHLORIDE	16887-00-6	ug/L	2 : 2	24900000	28200000	26550000.0000	RFI-MW7I
	CHROMIUM	7440-47-3	ug/l	1 : 4	7.4	7.4	7.4000	RFI-MW7I
	CYCLOHEXANE	110-82-7	ug/l	1 : 4	0.13	0.13	0.1300	RFI-MW7I
	DISSOLVED ORGANIC CARBON	DOC	ug/L	1 : 1	3000	3000	3000.0000	RFI-MW7I
	NICKEL	7440-02-0	ug/l	1 : 4	1.5	1.5	1.5000	RFI-MW7I
	PHENANTHRENE	85-01-8	ug/l	3 : 4	0.29	0.43	0.3733	RFI-MW7I
	SULFATE	14808-79-8	ug/L	2 : 2	310000	451000	380500.0000	RFI-MW7I
	THALLIUM	7440-28-0	ug/l	2 : 4	10.5	46.1	28.3000	RFI-MW7I
	TOTAL CYANIDE	57-12-5	ug/L	1 : 1	210	210	210.0000	RFI-MW7I
	Total LMW PAHs	Total LMW	ug/l	3 : 4	0.6	0.89	0.7767	RFI-MW7I
	TOTAL PAHs	Total PAHs	ug/l	3 : 4	0.6	0.89	0.7767	RFI-MW7I
RFI-MW8								
	ARSENIC	7440-38-2	ug/l	3 : 12	5.3	7.7	6.2833	RFI-MW8
	BARIUM	7440-39-3	ug/L	7 : 10	915	1090	1030.0000	RFI-MW8
	BIS(2-ETHYLHEXYL) PHTHALATE	117-81-7	ug/l	1 : 8	1.8	1.8	1.8000	RFI-MW8
	CADMIUM	7440-43-9	ug/L	3 : 12	0.78	1.15	0.9467	RFI-MW8
	CARBON DISULFIDE	75-15-0	ug/l	2 : 8	0.15	1.1	0.6250	RFI-MW8
	CHLORIDE	16887-00-6	ug/L	2 : 2	2900000	3045000	2972500.0000	RFI-MW8
	CHLOROFORM	67-66-3	ug/l	1 : 8	12	12	12.0000	RFI-MW8
	CHROMIUM	7440-47-3	ug/L	2 : 12	5.9	19.15	12.5250	RFI-MW8
	COPPER	7440-50-8	ug/L	1 : 12	33	33	33.0000	RFI-MW8
	DISSOLVED ORGANIC CARBON	DOC	ug/L	1 : 1	12000	12000	12000.0000	RFI-MW8
	LEAD	7439-92-1	ug/L	1 : 12	3.6	3.6	3.6000	RFI-MW8
	NICKEL	7440-02-0	ug/l	1 : 12	7.1	7.1	7.1000	RFI-MW8
	PHENOL	108-95-2	ug/l	1 : 8	4.8	4.8	4.8000	RFI-MW8
	THALLIUM	7440-28-0	ug/l	3 : 12	4.8	6.2	5.2667	RFI-MW8
	TOTAL CYANIDE	57-12-5	ug/L	1 : 4	10	10	10.0000	RFI-MW8
	VANADIUM	7440-62-2	ug/l	1 : 12	2.4	2.4	2.4000	RFI-MW8

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
	ZINC	7440-66-6	ug/L	3 : 12	19.9	152	68.3000	RFI-MW8
RFI-MW8F								
	1,1-DICHLOROETHANE	75-34-3	ug/l	1 : 5	39	39	39.0000	RFI-MW8F
	1,1-DICHLOROETHENE	75-35-4	ug/l	1 : 5	4.9	4.9	4.9000	RFI-MW8F
	1,4-DIOXANE	123-91-1	ug/l	1 : 5	12	12	12.0000	RFI-MW8F
	2-BUTANONE	78-93-3	ug/l	3 : 5	0.49	15	5.6633	RFI-MW8F
	2-METHYLNAPHTHALENE	91-57-6	ug/l	1 : 5	23	23	23.0000	RFI-MW8F
	3-METHYLPHENOL & 4-METHYLPHENOL	65794-96-9	ug/l	1 : 4	39	39	39.0000	RFI-MW8F
	4-METHYL-2-PENTANONE (MIBK)	108-10-1	ug/l	1 : 5	2.2	2.2	2.2000	RFI-MW8F
	ACENAPHTHENE	83-32-9	ug/l	1 : 5	2.1	2.1	2.1000	RFI-MW8F
	ACENAPHTHYLENE	208-96-8	ug/l	1 : 5	6.1	6.1	6.1000	RFI-MW8F
	ACETONE	67-64-1	ug/l	2 : 5	6	88	47.0000	RFI-MW8F
	ANTHRACENE	120-12-7	ug/l	1 : 5	2	2	2.0000	RFI-MW8F
	BARIUM	7440-39-3	ug/l	5 : 5	11.1	673	262.9200	RFI-MW8F
	BENZENE	71-43-2	ug/l	1 : 5	2.8	2.8	2.8000	RFI-MW8F
	BIS(2-ETHYLHEXYL) PHTHALATE	117-81-7	ug/l	1 : 5	2.3	2.3	2.3000	RFI-MW8F
	CARBAZOLE	86-74-8	ug/l	1 : 5	3.6	3.6	3.6000	RFI-MW8F
	CARBON DISULFIDE	75-15-0	ug/l	2 : 5	0.34	3.2	1.7700	RFI-MW8F
	CHLORIDE	16887-00-6	ug/L	3 : 3	50500	455000	194066.6667	RFI-MW8F
	CHLOROETHANE	75-00-3	ug/l	1 : 5	0.89	0.89	0.8900	RFI-MW8F
	COPPER	7440-50-8	ug/l	2 : 4	2.8	6.5	4.6500	RFI-MW8F
	CYCLOHEXANE	110-82-7	ug/l	2 : 5	0.17	1.3	0.7350	RFI-MW8F
	DIBENZOFURAN	132-64-9	ug/l	1 : 5	3.7	3.7	3.7000	RFI-MW8F
	ETHYLBENZENE	100-41-4	ug/l	1 : 5	17	17	17.0000	RFI-MW8F
	FLUORANTHENE	206-44-0	ug/l	1 : 5	1.8	1.8	1.8000	RFI-MW8F
	FLUORENE	86-73-7	ug/l	1 : 5	5	5	5.0000	RFI-MW8F
	ISOPROPYLBENZENE	98-82-8	ug/l	1 : 5	6	6	6.0000	RFI-MW8F
	LEAD	7439-92-1	ug/l	1 : 4	2.5	2.5	2.5000	RFI-MW8F
	NAPHTHALENE	91-20-3	ug/l	2 : 5	0.29	97	48.6450	RFI-MW8F
	NICKEL	7440-02-0	ug/l	4 : 5	1.4	22.1	7.3750	RFI-MW8F
	PENTACHLOROPHENOL	87-86-5	ug/l	3 : 5	1.8	3	2.3667	RFI-MW8F

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
	PHENANTHRENE	85-01-8	ug/l	2 : 5	0.21	7.8	4.0050	RFI-MW8F
	PHENOL	108-95-2	ug/l	2 : 5	1	200	100.5000	RFI-MW8F
	PYRENE	129-00-0	ug/l	1 : 5	1.3	1.3	1.3000	RFI-MW8F
	SELENIUM	7782-49-2	ug/l	2 : 5	3.6	3.8	3.7000	RFI-MW8F
	SULFATE	14808-79-8	ug/L	3 : 3	4800	170000	108933.3333	RFI-MW8F
	TOLUENE	108-88-3	ug/l	3 : 5	0.32	24	8.3000	RFI-MW8F
	Total HMW PAHs	Total HMW	ug/l	1 : 5	3.1	3.1	3.1000	RFI-MW8F
	Total LMW PAHs	Total LMW	ug/l	2 : 5	0.766	143	71.8830	RFI-MW8F
	TOTAL METHYLPHENOL	TOTAL	ug/l	1 : 5	39	39	39.0000	RFI-MW8F
	TOTAL PAHs	Total PAHs	ug/l	2 : 5	0.85	146.1	73.4750	RFI-MW8F
	TOTAL XYLENES	TOTAL	ug/l	1 : 5	77	77	77.0000	RFI-MW8F
	VANADIUM	7440-62-2	ug/l	3 : 5	3	4	3.6333	RFI-MW8F
	XYLENES	1330-20-7	ug/l	1 : 5	77	77	77.0000	RFI-MW8F
	ZINC	7440-66-6	ug/l	1 : 4	11.2	11.2	11.2000	RFI-MW8F
RFI-MW8I								
	1,1-BIPHENYL	92-52-4	ug/l	1 : 3	2.2	2.2	2.2000	RFI-MW8I
	1,1-DICHLOROETHANE	75-34-3	ug/l	3 : 3	12	31	24.3333	RFI-MW8I
	1,1-DICHLOROETHENE	75-35-4	ug/l	3 : 3	0.98	4.6	3.0267	RFI-MW8I
	1,4-DIOXANE	123-91-1	ug/l	1 : 3	12	12	12.0000	RFI-MW8I
	2,4-DIMETHYLPHENOL	105-67-9	ug/l	1 : 3	3.8	3.8	3.8000	RFI-MW8I
	2-BUTANONE	78-93-3	ug/l	3 : 3	2.7	13	8.3333	RFI-MW8I
	2-HEXANONE	591-78-6	ug/l	1 : 3	0.89	0.89	0.8900	RFI-MW8I
	2-METHYLNAPHTHALENE	91-57-6	ug/l	3 : 3	14	25	18.0000	RFI-MW8I
	3-METHYLPHENOL	108-39-4	ug/l	1 : 1	120	120	120.0000	RFI-MW8I
	3-METHYLPHENOL & 4-METHYLPHENOL	65794-96-9	ug/l	2 : 2	20	20	20.0000	RFI-MW8I, RFI-
	4-METHYL-2-PENTANONE (MIBK)	108-10-1	ug/l	3 : 3	1.4	2.2	1.7667	RFI-MW8I
	4-METHYLPHENOL	106-44-5	ug/l	1 : 1	120	120	120.0000	RFI-MW8I
	ACENAPHTHENE	83-32-9	ug/l	2 : 3	1.9	2.4	2.1500	RFI-MW8I
	ACENAPHTHYLENE	208-96-8	ug/l	3 : 3	3.6	9.7	5.8333	RFI-MW8I
	ACETONE	67-64-1	ug/l	2 : 3	32	38	35.0000	RFI-MW8I
	ANTHRACENE	120-12-7	ug/l	1 : 3	2.6	2.6	2.6000	RFI-MW8I

Table C-1
Summary Statistics for All Groundwater Wells
BASF Wyandotte

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
	BARIUM	7440-39-3	ug/l	3 : 3	417	742	616.0000	RFI-MW8I
	BENZENE	71-43-2	ug/l	3 : 3	2.1	2.3	2.2000	RFI-MW8I
	CADMIUM	7440-43-9	ug/l	1 : 3	0.57	0.57	0.5700	RFI-MW8I
	CAPROLACTAM	105-60-2	ug/l	1 : 3	8.4	8.4	8.4000	RFI-MW8I
	CARBAZOLE	86-74-8	ug/l	2 : 3	3.4	6.7	5.0500	RFI-MW8I
	CARBON DISULFIDE	75-15-0	ug/l	3 : 3	2.5	6.2	4.6333	RFI-MW8I
	CHLORIDE	16887-00-6	ug/L	1 : 1	415000	415000	415000.0000	RFI-MW8I
	CHLOROETHANE	75-00-3	ug/l	1 : 3	0.61	0.61	0.6100	RFI-MW8I
	CHLOROMETHANE	74-87-3	ug/l	1 : 3	0.25	0.25	0.2500	RFI-MW8I
	CHROMIUM	7440-47-3	ug/l	1 : 3	7.6	7.6	7.6000	RFI-MW8I
	COPPER	7440-50-8	ug/l	2 : 3	2	30.3	16.1500	RFI-MW8I
	CYCLOHEXANE	110-82-7	ug/l	3 : 3	0.27	1	0.6467	RFI-MW8I
	DIBENZOFURAN	132-64-9	ug/l	2 : 3	4.1	5.3	4.7000	RFI-MW8I
	DISSOLVED ORGANIC CARBON	DOC	ug/L	1 : 1	35000	35000	35000.0000	RFI-MW8I
	ETHYLBENZENE	100-41-4	ug/l	3 : 3	2.9	20	12.9667	RFI-MW8I
	FLUORANTHENE	206-44-0	ug/l	2 : 3	1.4	2.6	2.0000	RFI-MW8I
	FLUORENE	86-73-7	ug/l	2 : 3	3	6.6	4.8000	RFI-MW8I
	ISOPROPYLBENZENE	98-82-8	ug/l	3 : 3	0.87	6.3	3.9900	RFI-MW8I
	LEAD	7439-92-1	ug/l	1 : 3	29.2	29.2	29.2000	RFI-MW8I
	METHYL ACETATE	79-20-9	ug/l	1 : 3	3.1	3.1	3.1000	RFI-MW8I
	METHYLCYCLOHEXANE	108-87-2	ug/l	2 : 3	0.95	1.4	1.1750	RFI-MW8I
	METHYLENE CHLORIDE	75-09-2	ug/l	1 : 3	1.7	1.7	1.7000	RFI-MW8I
	NAPHTHALENE	91-20-3	ug/l	3 : 3	68	100	88.6667	RFI-MW8I
	NICKEL	7440-02-0	ug/l	2 : 3	22.7	30.6	26.6500	RFI-MW8I
	PHENANTHRENE	85-01-8	ug/l	3 : 3	4.9	9.1	6.6667	RFI-MW8I
	PHENOL	108-95-2	ug/l	3 : 3	39	250	129.6667	RFI-MW8I
	PYRENE	129-00-0	ug/l	2 : 3	1	2.1	1.5500	RFI-MW8I
	SULFATE	14808-79-8	ug/L	1 : 1	3600	3600	3600.0000	RFI-MW8I
	TOLUENE	108-88-3	ug/l	3 : 3	8.7	27	19.9000	RFI-MW8I
	Total HMW PAHs	Total HMW	ug/l	2 : 3	2.4	4.7	3.5500	RFI-MW8I
	Total LMW PAHs	Total LMW	ug/l	3 : 3	144.4	215.1	184.6667	RFI-MW8I

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
	TOTAL METHYLPHENOL	TOTAL	ug/l	3 : 3	20	240	93.3333	RFI-MW8I
	TOTAL PAHs	Total PAHs	ug/l	3 : 3	149.1	294.5	220.3667	RFI-MW8I
	TOTAL XYLENES	TOTAL	ug/l	3 : 3	15	84	56.6667	RFI-MW8I
	VINYL CHLORIDE	75-01-4	ug/l	1 : 3	0.36	0.36	0.3600	RFI-MW8I
	XYLENES	1330-20-7	ug/l	3 : 3	15	84	56.6667	RFI-MW8I
	ZINC	7440-66-6	ug/l	2 : 3	7	86.4	46.7000	RFI-MW8I
RFI-MW9								
	1,4-DIOXANE	123-91-1	ug/l	2 : 8	1.5	1.5	1.5000	RFI-MW9, RFI-
	ACETONE	67-64-1	ug/l	2 : 6	1.8	8.5	5.1500	RFI-MW9
	ARSENIC	7440-38-2	ug/L	8 : 13	18.1	25.5	22.2125	RFI-MW9
	BARIUM	7440-39-3	ug/L	9 : 13	136	215	169.7778	RFI-MW9, RFI-
	BENZALDEHYDE	100-52-7	ug/l	1 : 4	0.91	0.91	0.9100	RFI-MW9
	BIS(2-ETHYLHEXYL) PHTHALATE	117-81-7	ug/l	4 : 8	1.4	2.4	1.7750	RFI-MW9
	CADMIUM	7440-43-9	ug/l	2 : 13	0.45	4.5	2.4750	RFI-MW9
	CAPROLACTAM	105-60-2	ug/l	2 : 4	0.72	1.5	1.1100	RFI-MW9
	CARBON DISULFIDE	75-15-0	ug/l	1 : 9	0.51	0.51	0.5100	RFI-MW9
	CHLORIDE	16887-00-6	ug/L	3 : 3	3800000	6590000	5413333.3333	RFI-MW9
	CHLOROFORM	67-66-3	ug/l	1 : 9	5.1	5.1	5.1000	RFI-MW9
	CHLOROMETHANE	74-87-3	ug/l	1 : 9	0.22	0.22	0.2200	RFI-MW9
	CHROMIUM	7440-47-3	ug/L	3 : 13	4.1	88	48.3667	RFI-MW9
	COBALT	7440-48-4	ug/L	1 : 13	1.5	1.5	1.5000	RFI-MW9
	COPPER	7440-50-8	ug/L	1 : 13	24	24	24.0000	RFI-MW9
	DISSOLVED ORGANIC CARBON	DOC	ug/L	1 : 1	6000	6000	6000.0000	RFI-MW9
	METHANE	74-82-8	ug/l	1 : 1	1300	1300	1300.0000	RFI-MW9
	METHYLENE CHLORIDE	75-09-2	ug/l	1 : 9	0.67	0.67	0.6700	RFI-MW9
	NICKEL	7440-02-0	ug/L	4 : 13	1.6	64	29.0000	RFI-MW9
	PHENOL	108-95-2	ug/l	1 : 8	5.6	5.6	5.6000	RFI-MW9
	SULFATE	14808-79-8	ug/L	3 : 3	14000	489000	314666.6667	RFI-MW9
	THALLIUM	7440-28-0	ug/L	2 : 13	5.6	9.4	7.5000	RFI-MW9
	TOTAL CYANIDE	57-12-5	ug/L	2 : 4	6.3	10	8.1500	RFI-MW9
	ZINC	7440-66-6	ug/L	2 : 13	14	275	144.5000	RFI-MW9

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
RFI-MW9F								
	2-BUTANONE	78-93-3	ug/l	1 : 4	0.71	0.71	0.7100	RFI-MW9F
	2-METHYLNAPHTHALENE	91-57-6	ug/l	1 : 4	0.235	0.235	0.2350	RFI-MW9F
	4-METHYL-2-PENTANONE (MIBK)	108-10-1	ug/l	1 : 4	0.62	0.62	0.6200	RFI-MW9F
	ACETONE	67-64-1	ug/l	1 : 4	2.5	2.5	2.5000	RFI-MW9F
	ARSENIC	7440-38-2	ug/l	3 : 4	8.4	12.2	9.7333	RFI-MW9F
	BARIUM	7440-39-3	ug/l	3 : 4	3.9	9.2	5.9000	RFI-MW9F
	BIS(2-ETHYLHEXYL) PHTHALATE	117-81-7	ug/l	2 : 4	1.95	2.3	2.1250	RFI-MW9F
	CAPROLACTAM	105-60-2	ug/l	3 : 4	1.025	25	9.0750	RFI-MW9F
	CHLORIDE	16887-00-6	ug/L	1 : 1	140000	140000	140000.0000	RFI-MW9F
	CHLOROFORM	67-66-3	ug/l	4 : 4	0.17	0.585	0.3163	RFI-MW9F
	CHROMIUM	7440-47-3	ug/l	3 : 4	1.7	2.7	2.0667	RFI-MW9F
	DISSOLVED ORGANIC CARBON	DOC	ug/L	1 : 1	4000	4000	4000.0000	RFI-MW9F
	FLUORANTHENE	206-44-0	ug/l	2 : 4	0.19	0.215	0.2025	RFI-MW9F
	NAPHTHALENE	91-20-3	ug/l	1 : 4	1.5	1.5	1.5000	RFI-MW9F
	NICKEL	7440-02-0	ug/l	2 : 4	1.8	2.9	2.3500	RFI-MW9F
	PENTACHLOROPHENOL	87-86-5	ug/l	1 : 4	0.92	0.92	0.9200	RFI-MW9F
	PHENANTHRENE	85-01-8	ug/l	3 : 4	0.25	0.475	0.3683	RFI-MW9F
	PHENOL	108-95-2	ug/l	2 : 4	1.8	2	1.9000	RFI-MW9F
	PYRENE	129-00-0	ug/l	2 : 4	0.21	0.23	0.2200	RFI-MW9F
	SELENIUM	7782-49-2	ug/l	1 : 4	4.4	4.4	4.4000	RFI-MW9F
	SULFATE	14808-79-8	ug/L	1 : 1	78700	78700	78700.0000	RFI-MW9F
	TETRACHLOROETHENE	127-18-4	ug/l	4 : 4	1.65	2.5	2.1125	RFI-MW9F
	TOLUENE	108-88-3	ug/l	2 : 4	0.18	0.61	0.3950	RFI-MW9F
	TOTAL CYANIDE	57-12-5	ug/L	1 : 1	6.9	6.9	6.9000	RFI-MW9F
	Total HMW PAHs	Total HMW	ug/l	2 : 4	0.42	0.425	0.4225	RFI-MW9F
	Total LMW PAHs	Total LMW	ug/l	3 : 4	2.21	20.38	14.2800	RFI-MW9F
	TOTAL PAHs	Total PAHs	ug/l	3 : 4	2.635	40.38	21.2283	RFI-MW9F
	TRICHLOROETHENE	79-01-6	ug/l	1 : 4	0.34	0.34	0.3400	RFI-MW9F
	VANADIUM	7440-62-2	ug/l	3 : 4	15.4	17.3	16.3333	RFI-MW9F
RFI-MW9I								

Table C-1
Summary Statistics for All Groundwater Wells
BASF Wyandotte

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
	2-BUTANONE	78-93-3	ug/l	2 : 4	1.4	3.1	2.2500	RFI-MW9I
	2-HEXANONE	591-78-6	ug/l	2 : 4	0.43	0.47	0.4500	RFI-MW9I
	2-METHYLNAPHTHALENE	91-57-6	ug/l	3 : 4	1.9	16	7.6000	RFI-MW9I
	3-METHYLPHENOL	108-39-4	ug/l	1 : 1	37	37	37.0000	RFI-MW9I
	3-METHYLPHENOL & 4-METHYLPHENOL	65794-96-9	ug/l	3 : 3	20	34	25.1667	RFI-MW9I
	4-METHYL-2-PENTANONE (MIBK)	108-10-1	ug/l	2 : 4	0.95	1.4	1.1750	RFI-MW9I
	4-METHYLPHENOL	106-44-5	ug/l	1 : 1	37	37	37.0000	RFI-MW9I
	ACENAPHTHENE	83-32-9	ug/l	2 : 4	2.5	3	2.7500	RFI-MW9I
	ACENAPHTHYLENE	208-96-8	ug/l	2 : 4	1.2	11	6.1000	RFI-MW9I
	ACETONE	67-64-1	ug/l	1 : 4	19	19	19.0000	RFI-MW9I
	ANTHRACENE	120-12-7	ug/l	3 : 4	2.15	4.6	3.0167	RFI-MW9I
	ARSENIC	7440-38-2	ug/l	3 : 4	5.6	14.1	9.5500	RFI-MW9I
	BARIUM	7440-39-3	ug/l	4 : 4	63.5	107	86.0000	RFI-MW9I
	BENZENE	71-43-2	ug/l	4 : 4	0.7	1.6	0.9913	RFI-MW9I
	BERYLLIUM	7440-41-7	ug/l	1 : 3	0.36	0.36	0.3600	RFI-MW9I
	CARBON DISULFIDE	75-15-0	ug/l	4 : 4	1.1	2.9	1.6625	RFI-MW9I
	CHLORIDE	16887-00-6	ug/L	2 : 2	3170000	3360000	3265000.0000	RFI-MW9I
	CHROMIUM	7440-47-3	ug/l	1 : 3	2.3	2.3	2.3000	RFI-MW9I
	CYCLOHEXANE	110-82-7	ug/l	3 : 4	0.32	0.37	0.3433	RFI-MW9I
	DIBENZOFURAN	132-64-9	ug/l	2 : 4	2.8	4.9	3.8500	RFI-MW9I
	DISSOLVED ORGANIC CARBON	DOC	ug/L	1 : 1	37000	37000	37000.0000	RFI-MW9I
	ETHYLBENZENE	100-41-4	ug/l	1 : 4	0.22	0.22	0.2200	RFI-MW9I
	FLUORANTHENE	206-44-0	ug/l	2 : 4	1.6	4.6	3.1000	RFI-MW9I
	FLUORENE	86-73-7	ug/l	3 : 4	2.5	7.7	5.1667	RFI-MW9I
	ISOPROPYLBENZENE	98-82-8	ug/l	2 : 4	0.22	0.89	0.5550	RFI-MW9I
	LEAD	7439-92-1	ug/l	1 : 4	1.8	1.8	1.8000	RFI-MW9I
	METHYL ACETATE	79-20-9	ug/l	1 : 4	0.96	0.96	0.9600	RFI-MW9I
	METHYLCYCLOHEXANE	108-87-2	ug/l	1 : 4	0.57	0.57	0.5700	RFI-MW9I
	METHYLENE CHLORIDE	75-09-2	ug/l	3 : 4	2.05	9.6	4.6833	RFI-MW9I
	NAPHTHALENE	91-20-3	ug/l	4 : 4	6.3	99	31.6000	RFI-MW9I
	NICKEL	7440-02-0	ug/l	4 : 4	14.1	24.4	20.0250	RFI-MW9I

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
	PHENANTHRENE	85-01-8	ug/l	4 : 4	6.7	8.6	7.8750	RFI-MW9I
	PHENOL	108-95-2	ug/l	4 : 4	76.5	270	179.1250	RFI-MW9I
	PYRENE	129-00-0	ug/l	2 : 4	1.5	3.5	2.5000	RFI-MW9I
	SELENIUM	7782-49-2	ug/l	1 : 3	3.1	3.1	3.1000	RFI-MW9I
	SULFATE	14808-79-8	ug/L	2 : 2	197000	203000	200000.0000	RFI-MW9I
	THALLIUM	7440-28-0	ug/l	1 : 3	5.3	5.3	5.3000	RFI-MW9I
	TOLUENE	108-88-3	ug/l	4 : 4	2.7	3.9	3.2375	RFI-MW9I
	TOTAL CYANIDE	57-12-5	ug/L	1 : 1	34	34	34.0000	RFI-MW9I
	Total HMW PAHs	Total HMW	ug/l	2 : 4	3.1	8.1	5.6000	RFI-MW9I
	Total LMW PAHs	Total LMW	ug/l	4 : 4	70.9	288.8	145.3275	RFI-MW9I
	TOTAL METHYLPHENOL	TOTAL	ug/l	4 : 4	20	74	37.3750	RFI-MW9I
	TOTAL PAHs	Total PAHs	ug/l	4 : 4	74	296.9	168.2675	RFI-MW9I
	TOTAL XYLENES	TOTAL	ug/l	4 : 4	0.82	15	4.6975	RFI-MW9I
	VANADIUM	7440-62-2	ug/l	4 : 4	6.8	25.5	14.4250	RFI-MW9I
	XYLENES	1330-20-7	ug/l	4 : 4	0.82	15	4.6975	RFI-MW9I
	ZINC	7440-66-6	ug/l	1 : 4	9.2	9.2	9.2000	RFI-MW9I
STMHOUSE								
	2-BUTANONE	78-93-3	ug/l	1 : 1	0.39	0.39	0.3900	STMHOUSE
	4-METHYL-2-PENTANONE (MIBK)	108-10-1	ug/l	1 : 1	24	24	24.0000	STMHOUSE
	ACETONE	67-64-1	ug/l	1 : 1	2	2	2.0000	STMHOUSE
	BARIUM	7440-39-3	ug/l	1 : 1	23.7	23.7	23.7000	STMHOUSE
	BIS(2-ETHYLHEXYL) PHTHALATE	117-81-7	ug/l	1 : 1	3.1	3.1	3.1000	STMHOUSE
	BROMODICHLOROMETHANE	75-27-4	ug/l	1 : 1	7.8	7.8	7.8000	STMHOUSE
	BROMOFORM	75-25-2	ug/l	1 : 1	0.22	0.22	0.2200	STMHOUSE
	CAPROLACTAM	105-60-2	ug/l	1 : 1	0.93	0.93	0.9300	STMHOUSE
	CHLOROFORM	67-66-3	ug/l	1 : 1	16	16	16.0000	STMHOUSE
	DIBROMOCHLOROMETHANE	124-48-1	ug/l	1 : 1	3	3	3.0000	STMHOUSE
	METHYLENE CHLORIDE	75-09-2	ug/l	1 : 1	0.55	0.55	0.5500	STMHOUSE
	SELENIUM	7782-49-2	ug/l	1 : 1	3.1	3.1	3.1000	STMHOUSE
TMW2								
	PROPYLENE OXIDE	75-56-9	ug/L	1 : 1	2000	2000	2000.0000	TMW2

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Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
TMW-2D								
	PROPYLENE OXIDE	75-56-9	ug/L	1 : 1	1900	1900	1900.0000	TMW-2D
WHI1-3S								
	ACETONE	67-64-1	ug/l	1 : 1	1700	1700	1700.0000	WHI1-3S
	ACETOPHENONE	98-86-2	ug/l	1 : 1	1.93	1.93	1.9300	WHI1-3S
	ARSENIC	7440-38-2	ug/L	1 : 1	88	88	88.0000	WHI1-3S
	BARIUM	7440-39-3	ug/L	1 : 1	128	128	128.0000	WHI1-3S
	BENZENE	71-43-2	ug/l	1 : 1	681	681	681.0000	WHI1-3S
	CHROMIUM	7440-47-3	ug/L	1 : 1	122	122	122.0000	WHI1-3S
	COPPER	7440-50-8	ug/L	1 : 1	38	38	38.0000	WHI1-3S
	DIETHYL PHTHALATE	84-66-2	ug/l	1 : 1	1.09	1.09	1.0900	WHI1-3S
	IRON	7439-89-6	ug/L	1 : 1	23200	23200	23200.0000	WHI1-3S
	LEAD	7439-92-1	ug/L	1 : 1	13	13	13.0000	WHI1-3S
	MAGNESIUM	7439-95-4	ug/L	1 : 1	9100	9100	9100.0000	WHI1-3S
	NICKEL	7440-02-0	ug/L	1 : 1	47	47	47.0000	WHI1-3S
	PHENOL	108-95-2	ug/l	1 : 1	19.9	19.9	19.9000	WHI1-3S
	SELENIUM	7782-49-2	ug/L	1 : 1	7	7	7.0000	WHI1-3S
	TOTAL DISSOLVED SOLIDS	TDS	ug/L	1 : 1	5630000	5630000	5630000.0000	WHI1-3S
	VANADIUM	7440-62-2	ug/L	1 : 1	477	477	477.0000	WHI1-3S
	ZINC	7440-66-6	ug/L	1 : 1	61	61	61.0000	WHI1-3S
WHI2-1S								
	ARSENIC	7440-38-2	ug/L	2 : 2	36.75	38	37.3750	WHI2-1S
	BARIUM	7440-39-3	ug/L	1 : 1	109	109	109.0000	WHI2-1S
	BIS(2-ETHYLHEXYL) PHTHALATE	117-81-7	ug/l	1 : 1	810	810	810.0000	WHI2-1S
	CHROMIUM	7440-47-3	ug/L	1 : 2	45	45	45.0000	WHI2-1S
	COPPER	7440-50-8	ug/L	1 : 1	22	22	22.0000	WHI2-1S
	IRON	7439-89-6	ug/L	1 : 1	20100	20100	20100.0000	WHI2-1S
	LEAD	7439-92-1	ug/L	1 : 2	11	11	11.0000	WHI2-1S
	MAGNESIUM	7439-95-4	ug/L	1 : 1	41900	41900	41900.0000	WHI2-1S
	NICKEL	7440-02-0	ug/L	1 : 2	20	20	20.0000	WHI2-1S

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
	TOTAL DISSOLVED SOLIDS	TDS	ug/L	1 : 1	697000	697000	697000.0000	WHI2-1S
	VANADIUM	7440-62-2	ug/L	1 : 2	26	26	26.0000	WHI2-1S
	ZINC	7440-66-6	ug/L	1 : 1	49	49	49.0000	WHI2-1S
WHI2-2S								
	ACETOPHENONE	98-86-2	ug/l	1 : 1	1.13	1.13	1.1300	WHI2-2S
	ARSENIC	7440-38-2	ug/L	1 : 1	38	38	38.0000	WHI2-2S
	BARIUM	7440-39-3	ug/L	1 : 1	432	432	432.0000	WHI2-2S
	BIS(2-ETHYLHEXYL) PHTHALATE	117-81-7	ug/l	1 : 1	8.4	8.4	8.4000	WHI2-2S
	CADMIUM	7440-43-9	ug/L	1 : 1	8	8	8.0000	WHI2-2S
	CHROMIUM	7440-47-3	ug/L	1 : 1	62	62	62.0000	WHI2-2S
	COPPER	7440-50-8	ug/L	1 : 1	118	118	118.0000	WHI2-2S
	DIETHYL PHTHALATE	84-66-2	ug/l	1 : 1	4.35	4.35	4.3500	WHI2-2S
	IRON	7439-89-6	ug/L	1 : 1	144000	144000	144000.0000	WHI2-2S
	LEAD	7439-92-1	ug/L	1 : 1	239	239	239.0000	WHI2-2S
	MAGNESIUM	7439-95-4	ug/L	1 : 1	207000	207000	207000.0000	WHI2-2S
	MERCURY	7439-97-6	ug/L	1 : 1	33.4	33.4	33.4000	WHI2-2S
	NICKEL	7440-02-0	ug/L	1 : 1	40	40	40.0000	WHI2-2S
	TOTAL DISSOLVED SOLIDS	TDS	ug/L	1 : 1	11800000	11800000	11800000.0000	WHI2-2S
	VANADIUM	7440-62-2	ug/L	1 : 1	77	77	77.0000	WHI2-2S
	ZINC	7440-66-6	ug/L	1 : 1	666	666	666.0000	WHI2-2S
WHI2-3S								
	ANTIMONY	7440-36-0	ug/l	1 : 7	7.8	7.8	7.8000	WHI2-3S
	ARSENIC	7440-38-2	ug/L	7 : 7	9.6	77.6	47.5714	WHI2-3S
	BARIUM	7440-39-3	ug/L	5 : 5	43.9	143	81.1000	WHI2-3S
	BIS(2-ETHYLHEXYL) PHTHALATE	117-81-7	ug/l	1 : 1	121	121	121.0000	WHI2-3S
	CHROMIUM	7440-47-3	ug/L	3 : 7	3.4	9.3	6.2333	WHI2-3S
	COBALT	7440-48-4	ug/l	3 : 4	1.2	2	1.6333	WHI2-3S
	COPPER	7440-50-8	ug/L	2 : 5	3.8	8	5.9000	WHI2-3S
	DIETHYL PHTHALATE	84-66-2	ug/l	1 : 1	2.2	2.2	2.2000	WHI2-3S
	IRON	7439-89-6	ug/L	1 : 1	2680	2680	2680.0000	WHI2-3S
	LEAD	7439-92-1	ug/l	1 : 7	13.6	13.6	13.6000	WHI2-3S

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
	MAGNESIUM	7439-95-4	ug/L	1 : 1	21100	21100	21100.0000	WHI2-3S
	NICKEL	7440-02-0	ug/L	5 : 7	2.9	9	5.1800	WHI2-3S
	SELENIUM	7782-49-2	ug/l	1 : 7	2.9	2.9	2.9000	WHI2-3S
	THALLIUM	7440-28-0	ug/l	1 : 7	6.6	6.6	6.6000	WHI2-3S
	TOTAL CYANIDE	57-12-5	ug/L	1 : 1	44	44	44.0000	WHI2-3S
	TOTAL DISSOLVED SOLIDS	TDS	ug/L	1 : 1	1040000	1040000	1040000.0000	WHI2-3S
	VANADIUM	7440-62-2	ug/L	2 : 7	6	12.2	9.1000	WHI2-3S
	ZINC	7440-66-6	ug/L	4 : 5	9.4	43	18.5250	WHI2-3S
WHI3-1S								
	ACETOPHENONE	98-86-2	ug/l	1 : 1	1.01	1.01	1.0100	WHI3-1S
	ARSENIC	7440-38-2	ug/L	5 : 6	5.1	142	40.3000	WHI3-1S
	BARIUM	7440-39-3	ug/L	6 : 6	76.3	291	146.7583	WHI3-1S
	BIS(2-ETHYLHEXYL) PHTHALATE	117-81-7	ug/l	1 : 1	82.3	82.3	82.3000	WHI3-1S
	CADMIUM	7440-43-9	ug/L	3 : 6	0.41	1	0.6833	WHI3-1S
	CHLORIDE	16887-00-6	ug/L	1 : 1	120000	120000	120000.0000	WHI3-1S
	CHROMIUM	7440-47-3	ug/L	6 : 6	4.15	131	32.8750	WHI3-1S
	COBALT	7440-48-4	ug/l	4 : 5	1.4	8.1	3.2250	WHI3-1S
	COPPER	7440-50-8	ug/L	5 : 6	3.2	148	39.2600	WHI3-1S
	DIETHYL PHTHALATE	84-66-2	ug/l	1 : 1	2.41	2.41	2.4100	WHI3-1S
	IRON	7439-89-6	ug/L	1 : 1	163000	163000	163000.0000	WHI3-1S
	LEAD	7439-92-1	ug/L	6 : 6	3.95	216	51.4250	WHI3-1S
	MAGNESIUM	7439-95-4	ug/L	1 : 1	23000	23000	23000.0000	WHI3-1S
	MERCURY	7439-97-6	ug/L	1 : 1	0.6	0.6	0.6000	WHI3-1S
	METHANE	74-82-8	ug/l	1 : 1	5.6	5.6	5.6000	WHI3-1S
	NICKEL	7440-02-0	ug/L	6 : 6	4.35	108	27.1583	WHI3-1S
	NITRATE	14797-55-8	ug/L	1 : 1	22000	22000	22000.0000	WHI3-1S
	NITRITE	14797-65-0	ug/L	1 : 1	2800	2800	2800.0000	WHI3-1S
	SELENIUM	7782-49-2	ug/l	4 : 6	4.3	11.6	8.0750	WHI3-1S
	SULFATE	14808-79-8	ug/L	1 : 1	140000	140000	140000.0000	WHI3-1S
	TOLUENE	108-88-3	ug/l	1 : 2	35	35	35.0000	WHI3-1S
	TOTAL CYANIDE	57-12-5	ug/L	1 : 1	140	140	140.0000	WHI3-1S

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
	TOTAL DISSOLVED SOLIDS	TDS	ug/L	1 : 1	753000	753000	753000.0000	WHI3-1S
	VANADIUM	7440-62-2	ug/L	6 : 6	3.75	240	52.9583	WHI3-1S
	ZINC	7440-66-6	ug/L	5 : 6	15.5	465	136.9200	WHI3-1S
WHI3-2S								
	ARSENIC	7440-38-2	ug/L	1 : 1	44	44	44.0000	WHI3-2S
	BARIUM	7440-39-3	ug/L	1 : 1	191	191	191.0000	WHI3-2S
	BIS(2-ETHYLHEXYL) PHTHALATE	117-81-7	ug/l	1 : 1	16	16	16.0000	WHI3-2S
	CHROMIUM	7440-47-3	ug/L	1 : 1	42	42	42.0000	WHI3-2S
	COPPER	7440-50-8	ug/L	1 : 1	26	26	26.0000	WHI3-2S
	DINOSEB	88-85-7	ug/l	1 : 1	3.44	3.44	3.4400	WHI3-2S
	IRON	7439-89-6	ug/L	1 : 1	19400	19400	19400.0000	WHI3-2S
	LEAD	7439-92-1	ug/L	1 : 1	23	23	23.0000	WHI3-2S
	MAGNESIUM	7439-95-4	ug/L	1 : 1	10400	10400	10400.0000	WHI3-2S
	MERCURY	7439-97-6	ug/L	1 : 1	0.2	0.2	0.2000	WHI3-2S
	NICKEL	7440-02-0	ug/L	1 : 1	21	21	21.0000	WHI3-2S
	TOTAL DISSOLVED SOLIDS	TDS	ug/L	1 : 1	3230000	3230000	3230000.0000	WHI3-2S
	VANADIUM	7440-62-2	ug/L	1 : 1	42	42	42.0000	WHI3-2S
	ZINC	7440-66-6	ug/L	1 : 1	179	179	179.0000	WHI3-2S
WHI3-3S								
	ANTIMONY	7440-36-0	ug/l	1 : 6	5.7	5.7	5.7000	WHI3-3S
	ARSENIC	7440-38-2	ug/L	1 : 6	4	4	4.0000	WHI3-3S
	BARIUM	7440-39-3	ug/L	5 : 5	48.35	198	101.1900	WHI3-3S
	BIS(2-ETHYLHEXYL) PHTHALATE	117-81-7	ug/l	1 : 1	63.8	63.8	63.8000	WHI3-3S
	BUTYL BENZYL PHTHALATE	85-68-7	ug/l	1 : 1	1.56	1.56	1.5600	WHI3-3S
	CHROMIUM	7440-47-3	ug/L	6 : 6	1.9	6.8	3.8833	WHI3-3S
	COBALT	7440-48-4	ug/l	1 : 4	1.6	1.6	1.6000	WHI3-3S
	COPPER	7440-50-8	ug/L	3 : 5	2.1	8	5.8333	WHI3-3S
	DIETHYL PHTHALATE	84-66-2	ug/l	1 : 1	1.91	1.91	1.9100	WHI3-3S
	IRON	7439-89-6	ug/L	1 : 1	3390	3390	3390.0000	WHI3-3S
	LEAD	7439-92-1	ug/l	1 : 6	2.4	2.4	2.4000	WHI3-3S
	MAGNESIUM	7439-95-4	ug/L	1 : 1	52400	52400	52400.0000	WHI3-3S

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
	NICKEL	7440-02-0	ug/L	5 : 6	1.7	7	3.8600	WHI3-3S
	SELENIUM	7782-49-2	ug/l	2 : 6	3.9	6.7	5.3000	WHI3-3S
	THALLIUM	7440-28-0	ug/l	1 : 6	5.8	5.8	5.8000	WHI3-3S
	TOTAL CYANIDE	57-12-5	ug/L	1 : 1	6.2	6.2	6.2000	WHI3-3S
	TOTAL DISSOLVED SOLIDS	TDS	ug/L	1 : 1	2880000	2880000	2880000.0000	WHI3-3S
	VANADIUM	7440-62-2	ug/L	4 : 6	2.85	6	4.4625	WHI3-3S, WHI3-
	ZINC	7440-66-6	ug/L	3 : 5	14.5	20	18.1667	WHI3-3S, WHI3-
WHI4-1S								
	ANTIMONY	7440-36-0	ug/L	1 : 2	554	554	554.0000	WHI4-1S
	ARSENIC	7440-38-2	ug/L	1 : 2	103	103	103.0000	WHI4-1S
	BARIUM	7440-39-3	ug/L	2 : 2	26	708	367.0000	WHI4-1S
	CHLORIDE	16887-00-6	ug/L	1 : 1	140000	140000	140000.0000	WHI4-1S
	CHROMIUM	7440-47-3	ug/L	1 : 2	146	146	146.0000	WHI4-1S
	COPPER	7440-50-8	ug/L	2 : 2	19	8690	4354.5000	WHI4-1S
	IRON	7439-89-6	ug/L	1 : 1	354000	354000	354000.0000	WHI4-1S
	LEAD	7439-92-1	ug/L	2 : 2	8.5	5580	2794.2500	WHI4-1S
	MAGNESIUM	7439-95-4	ug/L	1 : 1	11300	11300	11300.0000	WHI4-1S
	MERCURY	7439-97-6	ug/L	1 : 1	10.2	10.2	10.2000	WHI4-1S
	METHANE	74-82-8	ug/l	1 : 1	19	19	19.0000	WHI4-1S
	NICKEL	7440-02-0	ug/L	1 : 2	81	81	81.0000	WHI4-1S
	SULFATE	14808-79-8	ug/L	1 : 1	67000	67000	67000.0000	WHI4-1S
	TOLUENE	108-88-3	ug/l	1 : 2	14	14	14.0000	WHI4-1S
	TOTAL DISSOLVED SOLIDS	TDS	ug/L	1 : 1	2020000	2020000	2020000.0000	WHI4-1S
	VANADIUM	7440-62-2	ug/L	1 : 2	171	171	171.0000	WHI4-1S
	ZINC	7440-66-6	ug/L	1 : 2	811	811	811.0000	WHI4-1S
WHI4-2S								
	ACETOPHENONE	98-86-2	ug/l	1 : 1	1.29	1.29	1.2900	WHI4-2S
	ANTIMONY	7440-36-0	ug/l	1 : 6	5.5	5.5	5.5000	WHI4-2S
	ARSENIC	7440-38-2	ug/L	4 : 6	4.7	30	12.8000	WHI4-2S
	BARIUM	7440-39-3	ug/L	5 : 5	87.3	294	134.0200	WHI4-2S
	BIS(2-ETHYLHEXYL) PHTHALATE	117-81-7	ug/l	1 : 1	26.8	26.8	26.8000	WHI4-2S

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
	BUTYL BENZYL PHTHALATE	85-68-7	ug/l	1 : 1	1.01	1.01	1.0100	WHI4-2S
	CADMIUM	7440-43-9	ug/L	2 : 5	0.49	2	1.2450	WHI4-2S
	CHROMIUM	7440-47-3	ug/L	4 : 6	2.2	30	10.4500	WHI4-2S
	COPPER	7440-50-8	ug/L	4 : 5	1.9	54	17.3000	WHI4-2S
	DIETHYL PHTHALATE	84-66-2	ug/l	1 : 1	2.05	2.05	2.0500	WHI4-2S
	IRON	7439-89-6	ug/L	1 : 1	20400	20400	20400.0000	WHI4-2S
	LEAD	7439-92-1	ug/L	6 : 6	1.8	316	79.1000	WHI4-2S
	MAGNESIUM	7439-95-4	ug/L	1 : 1	56600	56600	56600.0000	WHI4-2S
	MERCURY	7439-97-6	ug/L	1 : 1	0.8	0.8	0.8000	WHI4-2S
	NICKEL	7440-02-0	ug/L	4 : 6	2.1	22	7.6500	WHI4-2S
	SELENIUM	7782-49-2	ug/l	1 : 6	2.9	2.9	2.9000	WHI4-2S
	TOTAL DISSOLVED SOLIDS	TDS	ug/L	1 : 1	2410000	2410000	2410000.0000	WHI4-2S
	VANADIUM	7440-62-2	ug/L	3 : 6	6.2	42	18.7000	WHI4-2S
	ZINC	7440-66-6	ug/L	3 : 5	99.8	224	142.9333	WHI4-2S
WHI6-1F								
	1,1-DICHLOROETHANE	75-34-3	ug/l	1 : 4	0.27	0.27	0.2700	WHI6-1F
	1,4-DIOXANE	123-91-1	ug/l	4 : 4	4.1	42	20.4500	WHI6-1F
	ACENAPHTHENE	83-32-9	ug/l	3 : 4	0.36	0.63	0.4800	WHI6-1F
	ACENAPHTHYLENE	208-96-8	ug/l	2 : 4	0.26	0.41	0.3350	WHI6-1F
	ARSENIC	7440-38-2	ug/l	3 : 4	11.9	18.7	14.2333	WHI6-1F
	BARIUM	7440-39-3	ug/l	4 : 4	60.4	549	184.7250	WHI6-1F
	BIS(2-CHLOROETHYL) ETHER	111-44-4	ug/l	4 : 4	4	30	16.7500	WHI6-1F
	BIS(2-ETHYLHEXYL) PHTHALATE	117-81-7	ug/l	1 : 4	4	4	4.0000	WHI6-1F
	CARBON DISULFIDE	75-15-0	ug/l	2 : 4	0.31	0.71	0.5100	WHI6-1F
	CHLORIDE	16887-00-6	ug/L	2 : 2	1080000	9510000	5295000.0000	WHI6-1F
	CHLOROMETHANE	74-87-3	ug/l	1 : 4	0.22	0.22	0.2200	WHI6-1F
	CIS-1,2-DICHLOROETHENE	156-59-2	ug/l	1 : 4	0.5	0.5	0.5000	WHI6-1F
	COPPER	7440-50-8	ug/l	1 : 4	2.3	2.3	2.3000	WHI6-1F
	DISSOLVED ORGANIC CARBON	DOC	ug/L	1 : 1	12000	12000	12000.0000	WHI6-1F
	NICKEL	7440-02-0	ug/l	1 : 4	1.6	1.6	1.6000	WHI6-1F
	SELENIUM	7782-49-2	ug/l	1 : 4	2.7	2.7	2.7000	WHI6-1F

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
	SULFATE	14808-79-8	ug/L	2 : 2	205000	299000	252000.0000	WHI6-1F
	THALLIUM	7440-28-0	ug/l	2 : 4	5.5	6.2	5.8500	WHI6-1F
	TOTAL CYANIDE	57-12-5	ug/L	1 : 1	36	36	36.0000	WHI6-1F
	Total LMW PAHs	Total LMW	ug/l	3 : 4	0.71	10.36	4.0367	WHI6-1F
	TOTAL PAHs	Total PAHs	ug/l	3 : 4	0.71	10.36	4.0367	WHI6-1F
	ZINC	7440-66-6	ug/l	2 : 4	7.4	24.3	15.8500	WHI6-1F
WHI6-1S								
	1,4-DIOXANE	123-91-1	ug/l	2 : 4	2.8	4.4	3.6000	WHI6-1S
	ACENAPHTHENE	83-32-9	ug/l	1 : 4	0.53	0.53	0.5300	WHI6-1S
	ARSENIC	7440-38-2	ug/l	2 : 4	5.5	10.2	7.8500	WHI6-1S
	BARIUM	7440-39-3	ug/l	4 : 4	328.5	677	551.1250	WHI6-1S
	BIS(2-CHLOROETHYL) ETHER	111-44-4	ug/l	4 : 4	3.4	5.5	4.2750	WHI6-1S
	BIS(2-ETHYLHEXYL) PHTHALATE	117-81-7	ug/l	2 : 4	1.7	5.55	3.6250	WHI6-1S
	CARBON DISULFIDE	75-15-0	ug/l	2 : 4	0.39	0.76	0.5750	WHI6-1S
	CHLORIDE	16887-00-6	ug/L	2 : 2	5211000	14800000	10005500.0000	WHI6-1S
	CHROMIUM	7440-47-3	ug/l	1 : 4	2.2	2.2	2.2000	WHI6-1S
	COBALT	7440-48-4	ug/l	1 : 4	1.2	1.2	1.2000	WHI6-1S
	COPPER	7440-50-8	ug/l	1 : 4	8.5	8.5	8.5000	WHI6-1S
	DISSOLVED ORGANIC CARBON	DOC	ug/L	2 : 2	5000	16500	10750.0000	WHI6-1S
	LEAD	7439-92-1	ug/l	1 : 4	5.9	5.9	5.9000	WHI6-1S
	NAPHTHALENE	91-20-3	ug/l	1 : 4	0.38	0.38	0.3800	WHI6-1S
	NICKEL	7440-02-0	ug/l	1 : 4	7.4	7.4	7.4000	WHI6-1S
	SELENIUM	7782-49-2	ug/l	1 : 3	2.5	2.5	2.5000	WHI6-1S
	SULFATE	14808-79-8	ug/L	2 : 2	176000	326000	251000.0000	WHI6-1S
	THALLIUM	7440-28-0	ug/l	3 : 4	5.2	7.2	6.1333	WHI6-1S
	TOTAL CYANIDE	57-12-5	ug/L	1 : 1	23.25	23.25	23.2500	WHI6-1S
	Total LMW PAHs	Total LMW	ug/l	1 : 4	0.91	0.91	0.9100	WHI6-1S
	TOTAL PAHs	Total PAHs	ug/l	1 : 4	0.91	0.91	0.9100	WHI6-1S
	VANADIUM	7440-62-2	ug/l	1 : 4	3.6	3.6	3.6000	WHI6-1S
	ZINC	7440-66-6	ug/l	3 : 4	13.1	104	64.6333	WHI6-1S
WHI6-2F								

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
	1,4-DIOXANE	123-91-1	ug/l	2 : 4	2.2	2.2	2.2000	WHI6-2F, WHI6-
	2-BUTANONE	78-93-3	ug/l	3 : 4	0.63	3.4	1.6000	WHI6-2F
	3-METHYLPHENOL & 4-METHYLPHENOL	65794-96-9	ug/l	1 : 3	1	1	1.0000	WHI6-2F
	ACETONE	67-64-1	ug/l	2 : 4	2.5	50	26.2500	WHI6-2F
	ARSENIC	7440-38-2	ug/l	4 : 4	15	45.2	36.2500	WHI6-2F
	BARIUM	7440-39-3	ug/l	4 : 4	84.1	205	117.1000	WHI6-2F
	BIS(2-CHLOROETHYL) ETHER	111-44-4	ug/l	4 : 4	7.4	16	12.8500	WHI6-2F
	BIS(2-CHLOROISOPROPYL) ETHER	108-60-1	ug/l	4 : 4	1.1	1.7	1.5000	WHI6-2F
	BIS(2-ETHYLHEXYL) PHTHALATE	117-81-7	ug/l	1 : 4	0.88	0.88	0.8800	WHI6-2F
	CARBON DISULFIDE	75-15-0	ug/l	1 : 4	0.57	0.57	0.5700	WHI6-2F
	CHLORIDE	16887-00-6	ug/L	2 : 2	504000	598000	551000.0000	WHI6-2F
	CHLOROMETHANE	74-87-3	ug/l	1 : 4	0.3	0.3	0.3000	WHI6-2F
	CYCLOHEXANE	110-82-7	ug/l	2 : 4	0.14	0.5	0.3200	WHI6-2F
	DISSOLVED ORGANIC CARBON	DOC	ug/L	2 : 2	14000	16000	15000.0000	WHI6-2F
	METHYLCYCLOHEXANE	108-87-2	ug/l	1 : 4	0.56	0.56	0.5600	WHI6-2F
	NICKEL	7440-02-0	ug/l	2 : 4	1.7	1.8	1.7500	WHI6-2F
	PHENOL	108-95-2	ug/l	2 : 4	9.7	17	13.3500	WHI6-2F
	SULFATE	14808-79-8	ug/L	2 : 2	103000	153000	128000.0000	WHI6-2F
	THALLIUM	7440-28-0	ug/l	1 : 4	5.6	5.6	5.6000	WHI6-2F
	TOTAL CYANIDE	57-12-5	ug/L	1 : 1	34	34	34.0000	WHI6-2F
	TOTAL METHYLPHENOL	TOTAL	ug/l	1 : 4	1	1	1.0000	WHI6-2F
	VANADIUM	7440-62-2	ug/l	1 : 4	2.7	2.7	2.7000	WHI6-2F
	ZINC	7440-66-6	ug/l	1 : 4	6.7	6.7	6.7000	WHI6-2F
WHI6-2S								
	2-BUTANONE	78-93-3	ug/l	2 : 4	0.74	1.6	1.1700	WHI6-2S
	2-METHYLNAPHTHALENE	91-57-6	ug/l	1 : 4	6.1	6.1	6.1000	WHI6-2S
	3-METHYLPHENOL	108-39-4	ug/l	1 : 1	2.9	2.9	2.9000	WHI6-2S
	4-METHYLPHENOL	106-44-5	ug/l	1 : 1	2.9	2.9	2.9000	WHI6-2S
	ACENAPHTHENE	83-32-9	ug/l	1 : 4	1.1	1.1	1.1000	WHI6-2S
	ACENAPHTHYLENE	208-96-8	ug/l	1 : 4	1.5	1.5	1.5000	WHI6-2S
	ACETONE	67-64-1	ug/l	1 : 4	5.4	5.4	5.4000	WHI6-2S

Table C-1
Summary Statistics for All Groundwater Wells
BASF Wyandotte

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
	ANTHRACENE	120-12-7	ug/l	1 : 4	6.3	6.3	6.3000	WHI6-2S
	ARSENIC	7440-38-2	ug/l	4 : 4	4.7	24.6	10.0500	WHI6-2S
	BAP-TE	BAP-TE	ug/l	2 : 4	7.5631	11.15224	9.3577	WHI6-2S
	BARIUM	7440-39-3	ug/l	4 : 4	295	396	354.5000	WHI6-2S
	BENZO(A)ANTHRACENE	56-55-3	ug/l	2 : 4	0.27	7.8	4.0350	WHI6-2S
	BENZO(A)PYRENE	50-32-8	ug/l	1 : 4	5.6	5.6	5.6000	WHI6-2S
	BENZO(B)FLUORANTHENE	205-99-2	ug/l	2 : 4	0.25	8	4.1250	WHI6-2S
	BENZO(GHI)PERYLENE	191-24-2	ug/l	1 : 4	4.1	4.1	4.1000	WHI6-2S
	BENZO(K)FLUORANTHENE	207-08-9	ug/l	1 : 4	2.4	2.4	2.4000	WHI6-2S
	BERYLLIUM	7440-41-7	ug/l	1 : 4	1.6	1.6	1.6000	WHI6-2S
	BIS(2-CHLOROETHYL) ETHER	111-44-4	ug/l	1 : 4	15	15	15.0000	WHI6-2S
	BIS(2-ETHYLHEXYL) PHTHALATE	117-81-7	ug/l	2 : 4	2	6	4.0000	WHI6-2S
	CADMIUM	7440-43-9	ug/l	2 : 4	0.46	0.78	0.6200	WHI6-2S
	CARBAZOLE	86-74-8	ug/l	1 : 4	2.8	2.8	2.8000	WHI6-2S
	CARBON DISULFIDE	75-15-0	ug/l	1 : 4	0.33	0.33	0.3300	WHI6-2S
	CHLORIDE	16887-00-6	ug/L	2 : 2	468000	500000	484000.0000	WHI6-2S
	CHROMIUM	7440-47-3	ug/l	4 : 4	14.9	77	34.1500	WHI6-2S
	CHRYSENE	218-01-9	ug/l	2 : 4	0.24	9.1	4.6700	WHI6-2S
	COBALT	7440-48-4	ug/l	3 : 4	4.6	22.6	10.8333	WHI6-2S
	COPPER	7440-50-8	ug/l	4 : 4	10.9	75	29.7250	WHI6-2S
	DIBENZOFURAN	132-64-9	ug/l	1 : 4	5.8	5.8	5.8000	WHI6-2S
	DI-N-OCTYL PHTHALATE	117-84-0	ug/l	1 : 4	1.3	1.3	1.3000	WHI6-2S
	DISSOLVED ORGANIC CARBON	DOC	ug/L	2 : 2	7000	15000	11000.0000	WHI6-2S
	FLUORANTHENE	206-44-0	ug/l	3 : 4	0.45	27	9.3933	WHI6-2S
	FLUORENE	86-73-7	ug/l	1 : 4	3.7	3.7	3.7000	WHI6-2S
	INDENO(1,2,3-CD)PYRENE	193-39-5	ug/l	1 : 4	3.5	3.5	3.5000	WHI6-2S
	LEAD	7439-92-1	ug/l	4 : 4	4.6	41.6	16.1250	WHI6-2S
	NAPHTHALENE	91-20-3	ug/l	1 : 4	6.9	6.9	6.9000	WHI6-2S
	NICKEL	7440-02-0	ug/l	3 : 4	17.2	82.3	39.4667	WHI6-2S
	PHENANTHRENE	85-01-8	ug/l	2 : 4	0.29	22	11.1450	WHI6-2S
	PYRENE	129-00-0	ug/l	3 : 4	0.37	23	7.9900	WHI6-2S

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
	SELENIUM	7782-49-2	ug/l	1 : 4	2.7	2.7	2.7000	WHI6-2S
	SULFATE	14808-79-8	ug/L	2 : 2	17300	38900	28100.0000	WHI6-2S
	THALLIUM	7440-28-0	ug/l	1 : 4	4.7	4.7	4.7000	WHI6-2S
	TOLUENE	108-88-3	ug/l	1 : 4	0.44	0.44	0.4400	WHI6-2S
	Total Carcinogenic PAHs	Total cPAHs	ug/l	2 : 4	30.76	36.4	33.5800	WHI6-2S
	Total HMW PAHs	Total HMW	ug/l	3 : 4	42.09	90.5	67.8033	WHI6-2S
	Total LMW PAHs	Total LMW	ug/l	2 : 4	47.6	60.29	53.9450	WHI6-2S
	TOTAL METHYLPHENOL	TOTAL	ug/l	1 : 4	5.8	5.8	5.8000	WHI6-2S
	TOTAL PAHs	Total PAHs	ug/l	3 : 4	102.38	140.82	127.1000	WHI6-2S
	VANADIUM	7440-62-2	ug/l	4 : 4	18.1	106	45.6750	WHI6-2S
	ZINC	7440-66-6	ug/l	4 : 4	51.1	552	198.4750	WHI6-2S
WHI6-3F								
	1,1-DICHLOROETHENE	75-35-4	ug/l	2 : 2	1.7	2.3	2.0000	WHI6-3F
	1,4-DIOXANE	123-91-1	ug/l	3 : 3	21.5	160	74.8333	WHI6-3F
	ARSENIC	7440-38-2	ug/l	1 : 1	21.8	21.8	21.8000	WHI6-3F
	BARIUM	7440-39-3	ug/l	1 : 1	37.9	37.9	37.9000	WHI6-3F
	BENZENE	71-43-2	ug/l	2 : 2	16	18	17.0000	WHI6-3F
	BIS(2-CHLOROETHYL) ETHER	111-44-4	ug/l	3 : 3	510	730	600.0000	WHI6-3F
	BIS(2-CHLOROISOPROPYL) ETHER	108-60-1	ug/l	1 : 3	13	13	13.0000	WHI6-3F
	CAPROLACTAM	105-60-2	ug/l	1 : 3	22	22	22.0000	WHI6-3F
	CARBON DISULFIDE	75-15-0	ug/l	1 : 2	0.3	0.3	0.3000	WHI6-3F
	CHLORIDE	16887-00-6	ug/L	2 : 2	1150000	1975000	1562500.0000	WHI6-3F
	CHLOROBENZENE	108-90-7	ug/l	2 : 2	10	12	11.0000	WHI6-3F
	CHLOROMETHANE	74-87-3	ug/l	1 : 2	0.28	0.28	0.2800	WHI6-3F
	COPPER	7440-50-8	ug/l	1 : 1	2.2	2.2	2.2000	WHI6-3F
	CYCLOHEXANE	110-82-7	ug/l	1 : 2	0.4	0.4	0.4000	WHI6-3F
	DISSOLVED ORGANIC CARBON	DOC	ug/L	2 : 2	25000	70000	47500.0000	WHI6-3F
	ISOPROPYLBENZENE	98-82-8	ug/l	1 : 2	0.62	0.62	0.6200	WHI6-3F
	SULFATE	14808-79-8	ug/L	2 : 2	82050	223000	152525.0000	WHI6-3F
	TOTAL CYANIDE	57-12-5	ug/L	1 : 2	100	100	100.0000	WHI6-3F
	VANADIUM	7440-62-2	ug/l	1 : 1	4.3	4.3	4.3000	WHI6-3F

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
	VINYL CHLORIDE	75-01-4	ug/l	1 : 2	0.55	0.55	0.5500	WHI6-3F
WHI6-3S								
	1,4-DIOXANE	123-91-1	ug/l	1 : 2	6.4	6.4	6.4000	WHI6-3S
	BIS(2-CHLOROETHYL) ETHER	111-44-4	ug/l	2 : 2	4.5	7.9	6.2000	WHI6-3S
	BIS(2-ETHYLHEXYL) PHTHALATE	117-81-7	ug/l	1 : 2	3	3	3.0000	WHI6-3S
	CHLORIDE	16887-00-6	ug/L	1 : 1	49900000	49900000	49900000.0000	WHI6-3S
	DISSOLVED ORGANIC CARBON	DOC	ug/L	1 : 1	18000	18000	18000.0000	WHI6-3S
	SULFATE	14808-79-8	ug/L	1 : 1	972000	972000	972000.0000	WHI6-3S
	TOTAL CYANIDE	57-12-5	ug/L	1 : 1	25	25	25.0000	WHI6-3S
WHI6-4F								
	ARSENIC	7440-38-2	ug/l	3 : 4	45.8	93	62.6667	WHI6-4F
	BARIUM	7440-39-3	ug/l	4 : 4	67	2650	734.9000	WHI6-4F
	BIS(2-CHLOROETHYL) ETHER	111-44-4	ug/l	4 : 4	0.64	6.8	3.9100	WHI6-4F
	BIS(2-CHLOROISOPROPYL) ETHER	108-60-1	ug/l	3 : 4	0.82	0.95	0.8767	WHI6-4F
	CADMIUM	7440-43-9	ug/l	1 : 4	0.61	0.61	0.6100	WHI6-4F
	CHLORIDE	16887-00-6	ug/L	2 : 2	472000	765000	618500.0000	WHI6-4F
	DISSOLVED ORGANIC CARBON	DOC	ug/L	2 : 2	12000	12000	12000.0000	WHI6-4F, WHI6-
	NICKEL	7440-02-0	ug/l	1 : 4	2.1	2.1	2.1000	WHI6-4F
	SULFATE	14808-79-8	ug/L	2 : 2	105000	168000	136500.0000	WHI6-4F
	THALLIUM	7440-28-0	ug/l	1 : 4	6.7	6.7	6.7000	WHI6-4F
	TOTAL CYANIDE	57-12-5	ug/L	1 : 1	20	20	20.0000	WHI6-4F
WHI6-4S								
	1,4-DIOXANE	123-91-1	ug/l	2 : 4	1.4	1.8	1.6000	WHI6-4S
	ACENAPHTHENE	83-32-9	ug/l	3 : 4	0.5	1.3	0.9333	WHI6-4S
	ARSENIC	7440-38-2	ug/l	1 : 4	23.4	23.4	23.4000	WHI6-4S
	BAP-TE	BAP-TE	ug/l	1 : 4	0.078	0.078	0.0780	WHI6-4S
	BARIUM	7440-39-3	ug/l	4 : 4	114	2670	1698.5000	WHI6-4S
	BENZO(B)FLUORANTHENE	205-99-2	ug/l	1 : 4	0.78	0.78	0.7800	WHI6-4S
	BIS(2-CHLOROETHYL) ETHER	111-44-4	ug/l	4 : 4	1.2	6.6	3.5250	WHI6-4S
	BIS(2-ETHYLHEXYL) PHTHALATE	117-81-7	ug/l	1 : 4	3.5	3.5	3.5000	WHI6-4S

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
	BUTYL BENZYL PHTHALATE	85-68-7	ug/l	1 : 4	1.2	1.2	1.2000	WHI6-4S
	CADMIUM	7440-43-9	ug/l	2 : 4	0.5	0.51	0.5050	WHI6-4S
	CARBON DISULFIDE	75-15-0	ug/l	1 : 4	0.31	0.31	0.3100	WHI6-4S
	CHLORIDE	16887-00-6	ug/L	2 : 2	3570000	3780000	3675000.0000	WHI6-4S
	CHLOROFORM	67-66-3	ug/l	1 : 4	0.18	0.18	0.1800	WHI6-4S
	CHLOROMETHANE	74-87-3	ug/l	1 : 4	0.21	0.21	0.2100	WHI6-4S
	DI-N-OCTYL PHTHALATE	117-84-0	ug/l	1 : 4	1.6	1.6	1.6000	WHI6-4S
	DISSOLVED ORGANIC CARBON	DOC	ug/L	2 : 2	3000	12000	7500.0000	WHI6-4S
	NICKEL	7440-02-0	ug/l	2 : 4	3	19.2	11.1000	WHI6-4S
	SULFATE	14808-79-8	ug/L	2 : 2	570	1100	835.0000	WHI6-4S
	THALLIUM	7440-28-0	ug/l	3 : 4	6.3	8	6.9000	WHI6-4S
	Total Carcinogenic PAHs	Total cPAHs	ug/l	1 : 4	0.78	0.78	0.7800	WHI6-4S
	Total HMW PAHs	Total HMW	ug/l	1 : 4	0.78	0.78	0.7800	WHI6-4S
	Total LMW PAHs	Total LMW	ug/l	3 : 4	0.5	1.3	0.9333	WHI6-4S
	TOTAL PAHs	Total PAHs	ug/l	3 : 4	2.08	11	7.8600	WHI6-4S
WHI9-2F								
	1,2-DICHLOROPROPANE	78-87-5	ug/l	1 : 2	1.74	1.74	1.7400	WHI9-2F
	2-METHYLNAPHTHALENE	91-57-6	ug/l	1 : 1	2.63	2.63	2.6300	WHI9-2F
	ACETOPHENONE	98-86-2	ug/l	1 : 1	1.86	1.86	1.8600	WHI9-2F
	ANTIMONY	7440-36-0	ug/L	1 : 2	3.6	3.6	3.6000	WHI9-2F
	ARSENIC	7440-38-2	ug/L	2 : 2	33	41	37.0000	WHI9-2F
	BARIUM	7440-39-3	ug/L	2 : 2	11	75	43.0000	WHI9-2F
	BIS(2-CHLOROISOPROPYL) ETHER	108-60-1	ug/l	1 : 1	3.29	3.29	3.2900	WHI9-2F
	BIS(2-ETHYLHEXYL) PHTHALATE	117-81-7	ug/l	1 : 1	23.8	23.8	23.8000	WHI9-2F
	CADMIUM	7440-43-9	ug/L	2 : 2	1	2.9	1.9500	WHI9-2F
	CHLORIDE	16887-00-6	ug/L	1 : 1	200000	200000	200000.0000	WHI9-2F
	CHROMIUM	7440-47-3	ug/L	2 : 2	6.2	27	16.6000	WHI9-2F
	COPPER	7440-50-8	ug/L	2 : 2	83	409	246.0000	WHI9-2F
	DIETHYL PHTHALATE	84-66-2	ug/l	1 : 1	1.4	1.4	1.4000	WHI9-2F
	IRON	7439-89-6	ug/L	1 : 1	16800	16800	16800.0000	WHI9-2F
	LEAD	7439-92-1	ug/L	2 : 2	140	1100	620.0000	WHI9-2F

Area	Chemical (a)	CAS	Units	FOD (b)	Minimum Detected Concentration (c)	Maximum Detected Concentration (d)	Mean Concentration (e)	Location of Maximum Detected Concentration
	MAGNESIUM	7439-95-4	ug/L	1 : 1	7800	7800	7800.0000	WHI9-2F
	MERCURY	7439-97-6	ug/L	1 : 1	2	2	2.0000	WHI9-2F
	METHANE	74-82-8	ug/l	1 : 1	11000	11000	11000.0000	WHI9-2F
	NAPHTHALENE	91-20-3	ug/l	1 : 1	17.9	17.9	17.9000	WHI9-2F
	NICKEL	7440-02-0	ug/L	2 : 2	11	33	22.0000	WHI9-2F
	PHENANTHRENE	85-01-8	ug/l	1 : 1	1.23	1.23	1.2300	WHI9-2F
	SELENIUM	7782-49-2	ug/L	1 : 2	4	4	4.0000	WHI9-2F
	SULFATE	14808-79-8	ug/L	1 : 1	330000	330000	330000.0000	WHI9-2F
	TOLUENE	108-88-3	ug/l	1 : 2	30	30	30.0000	WHI9-2F
	TOTAL DISSOLVED SOLIDS	TDS	ug/L	1 : 1	1540000	1540000	1540000.0000	WHI9-2F
	Total LMW PAHs	Total LMW	ug/l	1 : 1	21.76	21.76	21.7600	WHI9-2F
	TOTAL PAHs	Total PAHs	ug/l	1 : 1	21.76	21.76	21.7600	WHI9-2F
	VANADIUM	7440-62-2	ug/L	2 : 2	52	83	67.5000	WHI9-2F
	ZINC	7440-66-6	ug/L	2 : 2	100	525	312.5000	WHI9-2F
WHI9-2S								
	BARIUM	7440-39-3	ug/L	1 : 1	564	564	564.0000	WHI9-2S
	BIS(2-ETHYLHEXYL) PHTHALATE	117-81-7	ug/l	1 : 1	1.13	1.13	1.1300	WHI9-2S
	DIETHYL PHTHALATE	84-66-2	ug/l	1 : 1	2.05	2.05	2.0500	WHI9-2S
	IRON	7439-89-6	ug/L	1 : 1	18800	18800	18800.0000	WHI9-2S
	MAGNESIUM	7439-95-4	ug/L	1 : 1	203000	203000	203000.0000	WHI9-2S
	NICKEL	7440-02-0	ug/L	1 : 1	5	5	5.0000	WHI9-2S
	TOTAL DISSOLVED SOLIDS	TDS	ug/L	1 : 1	8070000	8070000	8070000.0000	WHI9-2S
	ZINC	7440-66-6	ug/L	1 : 1	68	68	68.0000	WHI9-2S

Table C-1
Summary Statistics for All Groundwater Wells
BASF Wyandotte

Notes:

CAS - Chemical Abstract Service.
(a) Only chemicals with at least one positively detected result are reported.
(b) Frequency of detection - Number of detected samples: Number of total samples.
(c) Minimum detected concentration for each chemical, after duplicates have been averaged.
(d) Maximum detected concentration for each chemical, after duplicates have been averaged.
(e) Arithmetic mean concentration for each chemical, after duplicates have been averaged. Only detected results included.

Appendix D

Redevelopment Scenario – Spreadsheets and Calculation Worksheets

APPENDIX D-1

SELECTION OF GROUNDWATER COI FOR REDEVELOPMENT SCENARIO

Table D-1
Wells Used in Redevelopment Scenario Groundwater Contact Evaluation
BASF North Works Facility

AOC/SWMU	Wells in Vicinity	Data?	Downgradient Wells	Data?	Comment
AOC 1	TMW-1	Yes - limited (a)	P-26-N	Yes	
	TMW-3	No	WHI6-3F	Yes	
	TMW-5	No	WHI6-3S	Yes	
	PW1	Yes - limited (a)	WHI6-4F	Yes	
	PM2NC	Yes - limited (a)	WHI6-4S	Yes	
	DNR3	No	CMS-MW-14S	Yes	
			RFI-MW-14	Yes	
			RFI-MW-3	Yes	
			WHI6-2S	Yes	
AOC 2	RFI-MW-15	Yes	RFI-MW-5	Yes	
	RFI-MW-16	Yes	RFI-MW-4	Yes	
	CMS-MW-16	Yes	RFI-MW-6	Yes	
	WHI6-5S	Yes - limited (a)	CMS-MW-5	No	
	WHI6-5F	Yes - limited (a)	P40N	No	
	P25N	No			
	DNR 7	No			
	P2NC	No			
	PM1NC	No			
	DNR 6	No			
	P20N	No			
AOC 4	NA	NA	NA	NA	Excluded from Tier 2 RA - going directly to CMS.
AOC 5	AOC5-MIP-7	Yes	RFI-MW-7F	Yes	
	AOC5-MIP-8	Yes	RFI-MW-7I	Yes	
	AOC5-MIP-13	Yes	WHI7-2F	Yes	
	AOC5-MIP-17	Yes	WHI7-4F	Yes	
	AOC5-MIP-25	Yes	WHI7-4P	No	
	RFI-MW-21	Yes (b)	WHI7-4S	Yes	
			WHI73F	Yes	
			P1NB	No	
			PM1NB	Yes	
			RFI-MW-18	Yes	
			CMS-MW7	No	
			RFI-MW-8	Yes	
			RFI-MW-8F	Yes	
			RFI-MW-8I	Yes	
			P42N	No	
			P17N	No	
			P18N	No	
			RFI-MW7	Yes	
			CMS-MW-6	No	
AOC 6	PE-1-NA	No	CMS-MW-12	Yes	Groundwater in AOC 6 is captured by extraction wells. The closest downgradient wells are used to estimate interior AOC groundwater concentrations.
	PE-2-NA	No	CMS-MW-13F	Yes	
	PE-3-NA	No	CMS-MW-13S	Yes	
	PE-4-NA	No			
AOC 7A	CMS-MW-1	Yes	RFI-MW-22	Yes	
	RFI-MW-23	Yes	CMS-MW-2	Yes	
AOC 7B	WHI2-2S	Yes	TMW-4	Yes - limited (a)	
AOC 7C	AOC5-MIP-7	Yes	RFI-MW-7F	Yes	
	AOC5-MIP-8	Yes	RFI-MW-7I	Yes	
	AOC5-MIP-13	Yes			
	AOC5-MIP-17	Yes			
	AOC5-MIP-25	Yes			

Table D-1
Wells Used in Redevelopment Scenario Groundwater Contact Evaluation
BASF North Works Facility

SWMU F	P16N	No	WHI7-2F	No	
			P17N	No	
			CMS-MW-6	No	
			RFI-MW-6	Yes	
			RFI-MW-7	Yes	
			RFI-MW7F	Yes	
			RFI-MW-17	No	
			WHI7-1F	No	
			P40N	No	
			CMS-MW-5	No	
			WHI7-2F	No	
SWMU G	PE-1-NA	No	CMS-MW-12	Yes	Groundwater in SWMU G is captured by extraction wells. The closest downgradient wells are used to estimate interior SWMU groundwater concentrations.
	PE-2-NA	No	CMS-MW-13F	Yes	
	PE-3-NA	No	CMS-MW-13S	Yes	
	PE-4-NA	No			
SWMU H (west end)	AOC5-MIP-7	Yes			
	AOC5-MIP-8	Yes			
	AOC5-MIP-13	Yes			
	AOC5-MIP-17	Yes			
	AOC5-MIP-25	Yes			
SWMU H (central)	P43N	No			
	P1NB	No			
	PM1NB	Yes			
SWMU H (east end)	WHI7-3F	No	RFI-MW-8	Yes	
			RFI-MW-8F	Yes	
			RFI-MW-8I	Yes	
	P42N	No	CMS-MW-7	No	
			P18N	No	

Notes:
(a) - BASF storm sewer sampling data from 2007.
(b) - RFI-MW-21 is located in the northeastern corner of AOC 5, well away from the area of known high dichloropropane concentrations present in the southwestern corner of AOC 5.
Shading indicates well was selected to represent groundwater concentrations at AOC/SWMU for the utility worker redevelopment scenario.

TABLE D-2
SELECTION OF GROUNDWATER COI FOR REDEVELOPMENT SCENARIO
BASF NORTH WORKS FACILITY

Well	CAS No.	Chemical	units	Min	Max	Mean	FOD	Drinking Water Criterion (a)	Exceeds?
AOC5-MIP-07	67-64-1	ACETONE	ug/l	6.5	6.5	6.5	1 : 1	2100	No
AOC5-MIP-07	108-90-7	CHLOROBENZENE	ug/l	1.3	1.3	1.3	1 : 1	100	No
AOC5-MIP-07	78-87-5	1,2-DICHLOROPROPANE	ug/l	230	230	230	1 : 1	5	Yes
AOC5-MIP-07	108-60-1	BIS(2-CHLOROISOPROPYL) ETHER	ug/l	2400	2400	2400	1 : 1	8.3	Yes
AOC5-MIP-07	108-88-3	TOLUENE	ug/l	0.83	0.83	0.83	1 : 1	790	No
AOC5-MIP-07	107-06-2	1,2-DICHLOROETHANE	ug/l	23	23	23	1 : 1	5	Yes
AOC5-MIP-07	111-44-4	BIS(2-CHLOROETHYL) ETHER	ug/l	3100	3100	3100	1 : 1	8.3	Yes
AOC5-MIP-07	75-09-2	METHYLENE CHLORIDE	ug/l	3.7	3.7	3.7	1 : 1	5	No
AOC5-MIP-07	71-43-2	BENZENE	ug/l	0.97	0.97	0.97	1 : 1	5	No
AOC5-MIP-08	107-06-2	1,2-DICHLOROETHANE	ug/l	200000	200000	200000	1 : 1	5	Yes
AOC5-MIP-08	75-09-2	METHYLENE CHLORIDE	ug/l	24000	24000	24000	1 : 1	5	Yes
AOC5-MIP-08	108-60-1	BIS(2-CHLOROISOPROPYL) ETHER	ug/l	280000	280000	280000	1 : 2	8.3	Yes
AOC5-MIP-08	111-44-4	BIS(2-CHLOROETHYL) ETHER	ug/l	145000	145000	145000	1 : 2	8.3	Yes
AOC5-MIP-08	78-87-5	1,2-DICHLOROPROPANE	ug/l	1300000	1300000	1300000	1 : 1	5	Yes
AOC5-MIP-13	111-44-4	BIS(2-CHLOROETHYL) ETHER	ug/l	20000	20000	20000	1 : 1	8.3	Yes
AOC5-MIP-13	75-09-2	METHYLENE CHLORIDE	ug/l	23000	23000	23000	1 : 1	5	Yes
AOC5-MIP-13	67-64-1	ACETONE	ug/l	19000	19000	19000	1 : 1	2100	Yes
AOC5-MIP-13	78-87-5	1,2-DICHLOROPROPANE	ug/l	1100000	1100000	1100000	1 : 1	5	Yes
AOC5-MIP-13	107-06-2	1,2-DICHLOROETHANE	ug/l	41000	41000	41000	1 : 1	5	Yes
AOC5-MIP-17	117-81-7	BIS(2-ETHYLHEXYL) PHTHALATE	ug/l	4400	4400	4400	1 : 2	6	Yes
AOC5-MIP-17	67-64-1	ACETONE	ug/l	42000	42000	42000	1 : 1	2100	Yes
AOC5-MIP-17	75-09-2	METHYLENE CHLORIDE	ug/l	28000	28000	28000	1 : 1	5	Yes
AOC5-MIP-17	108-60-1	BIS(2-CHLOROISOPROPYL) ETHER	ug/l	345000	345000	345000	1 : 2	8.3	Yes
AOC5-MIP-17	78-87-5	1,2-DICHLOROPROPANE	ug/l	1400000	1400000	1400000	1 : 1	5	Yes
AOC5-MIP-17	111-44-4	BIS(2-CHLOROETHYL) ETHER	ug/l	43000	43000	43000	1 : 2	8.3	Yes
AOC5-MIP-25	67-64-1	ACETONE	ug/l	68000	68000	68000	1 : 1	2100	Yes
AOC5-MIP-25	67-66-3	CHLOROFORM	ug/l	15000	15000	15000	1 : 1	80	Yes
AOC5-MIP-25	111-44-4	BIS(2-CHLOROETHYL) ETHER	ug/l	8400	8400	8400	1 : 2	8.3	Yes
AOC5-MIP-25	75-09-2	METHYLENE CHLORIDE	ug/l	53000	53000	53000	1 : 1	5	Yes
AOC5-MIP-25	78-87-5	1,2-DICHLOROPROPANE	ug/l	2400000	2400000	2400000	1 : 1	5	Yes
AOC5-MIP-25	108-60-1	BIS(2-CHLOROISOPROPYL) ETHER	ug/l	485000	485000	485000	1 : 2	8.3	Yes
AOC5-MIP-25	117-81-7	BIS(2-ETHYLHEXYL) PHTHALATE	ug/l	16000	16000	16000	1 : 2	6	Yes
CMS-MW-1	67-64-1	ACETONE	ug/l	940	940	940	1 : 1	2100	No
CMS-MW-1	TDS	TOTAL DISSOLVED SOLIDS	ug/L	3200000	3200000	3200000	1 : 1	NA	No
CMS-MW-12	TDS	TOTAL DISSOLVED SOLIDS	ug/L	11000000	11000000	11000000	1 : 1	NA	No
CMS-MW-12	75-15-0	CARBON DISULFIDE	ug/l	1.5	1.5	1.5	1 : 1	2300	No
CMS-MW-13F	91-20-3	NAPHTHALENE	ug/l	19	19	19	1 : 1	1500	No
CMS-MW-13F	TDS	TOTAL DISSOLVED SOLIDS	ug/L	5000000	5000000	5000000	1 : 1	NA	No
CMS-MW-13S	71-43-2	BENZENE	ug/l	66	66	66	1 : 1	5	Yes
CMS-MW-13S	110-86-1	PYRIDINE	ug/l	3.6	3.6	3.6	1 : 1	21	No

TABLE D-2
SELECTION OF GROUNDWATER COI FOR REDEVELOPMENT SCENARIO
BASF NORTH WORKS FACILITY

Well	CAS No.	Chemical	units	Min	Max	Mean	FOD	Drinking Water Criterion (a)	Exceeds?
CMS-MW-13S	TOTAL XYLENES	TOTAL XYLENES	ug/l	0.68	0.68	0.68	1 : 1	280	No
CMS-MW-13S	TDS	TOTAL DISSOLVED SOLIDS	ug/L	7900000	7900000	7900000	1 : 1	NA	No
CMS-MW-13S	67-64-1	ACETONE	ug/l	83	83	83	1 : 1	2100	No
CMS-MW-13S	105-67-9	2,4-DIMETHYLPHENOL	ug/l	5.5	5.5	5.5	1 : 1	1000	No
CMS-MW-13S	109-06-8	2-PICOLINE	ug/l	29	29	29	1 : 1	21	Yes
CMS-MW-16	67-64-1	ACETONE	ug/l	1500	1500	1500	1 : 1	2100	No
CMS-MW-16	7440-50-8	COPPER	ug/l	8.4	8.4	8.4	1 : 1	1000	No
CMS-MW-16	7440-47-3	CHROMIUM	ug/l	63.8	63.8	63.8	1 : 1	100	No
CMS-MW-16	7782-49-2	SELENIUM	ug/l	6	6	6	1 : 1	50	No
CMS-MW-16	57-12-5	TOTAL CYANIDE	ug/L	980	980	980	1 : 1	200	Yes
CMS-MW-16	75-15-0	CARBON DISULFIDE	ug/l	15	15	15	1 : 1	2300	No
CMS-MW-16	7440-38-2	ARSENIC	ug/l	273	273	273	1 : 1	10	Yes
CMS-MW-16	7440-62-2	VANADIUM	ug/l	52.8	52.8	52.8	1 : 1	62	No
CMS-MW-16	71-43-2	BENZENE	ug/l	21	21	21	1 : 1	5	Yes
CMS-MW-16	7440-39-3	BARIUM	ug/l	12.8	12.8	12.8	1 : 1	2000	No
CMS-MW-16	7439-92-1	LEAD	ug/l	4.3	4.3	4.3	1 : 1	4	Yes
CMS-MW-16	7440-66-6	ZINC	ug/l	25.4	25.4	25.4	1 : 1	5000	No
PM1NB	75-15-0	CARBON DISULFIDE	ug/l	3.1	3.1	3.1	1 : 1	2300	No
PM2NC	7439-97-6	Mercury	ug/l	0.0601	0.103	0.08155	2 : 2	2	No
PM2NC	7440-66-6	Zinc	ug/l	44	44	44	1 : 1	5000	No
PM2NC	TOTAL XYLENES	TOTAL XYLENES	ug/l	549.6	17442	8995.8	2 : 2	280	Yes
PM2NC	111-44-4	Bis(2-chloroethyl)ether	ug/l	27.6	30.4	29	2 : 2	8.3	Yes
PM2NC	71-43-2	Benzene	ug/l	66.9	66.9	66.9	1 : 2	5	Yes
PM2NC	108-88-3	Toluene	ug/l	6420	8790	7605	2 : 2	790	Yes
PM2NC	91-20-3	Naphthalene	ug/l	11.8	27.8	19.8	2 : 2	1500	No
PM2NC	100-41-4	Ethylbenzene	ug/l	6930	7520	7225	2 : 2	74	Yes
PM2NC	1330-20-7	Total Xylenes	ug/l	274.8	8721	4497.9	2 : 2	280	Yes
PM2NC	95-47-6	o-Xylenes	ug/l	46.8	46.8	46.8	1 : 2	280	No
PW1	7439-97-6	Mercury	ug/l	0.00154	0.00154	0.00154	1 : 2	2	No
PW1	100-41-4	Ethylbenzene	ug/l	1	1	1	2 : 2	74	No
RFI-MW15	7440-39-3	BARIUM	ug/L	140	140	140	1 : 1	2000	No
RFI-MW15	7440-02-0	NICKEL	ug/L	1500	1500	1500	1 : 1	100	Yes
RFI-MW15	16887-00-6	CHLORIDE	ug/L	11000000	11000000	11000000	1 : 1	NA	No
RFI-MW15	74-82-8	METHANE	ug/l	15	15	15	1 : 1	NA	--
RFI-MW15	7440-47-3	CHROMIUM	ug/L	250	250	250	1 : 1	100	Yes
RFI-MW15	7440-28-0	THALLIUM	ug/L	9.6	9.6	9.6	1 : 1	2	Yes
RFI-MW15	108-88-3	TOLUENE	ug/l	18	18	18	1 : 1	790	No
RFI-MW15	7440-50-8	COPPER	ug/L	19	19	19	1 : 1	1000	No
RFI-MW15	14808-79-8	SULFATE	ug/L	930000	930000	930000	1 : 1	NA	No
RFI-MW15	7440-48-4	COBALT	ug/L	18	18	18	1 : 1	100	No

TABLE D-2
SELECTION OF GROUNDWATER COI FOR REDEVELOPMENT SCENARIO
BASF NORTH WORKS FACILITY

Well	CAS No.	Chemical	units	Min	Max	Mean	FOD	Drinking Water Criterion (a)	Exceeds?
RFI-MW16	7440-38-2	ARSENIC	ug/L	42	42	42	1 : 2	10	Yes
RFI-MW16	67-64-1	ACETONE	ug/l	540	540	540	1 : 1	2100	No
RFI-MW16	78-93-3	2-BUTANONE	ug/l	43	43	43	1 : 1	38000	No
RFI-MW16	123-91-1	1,4-DIOXANE	ug/l	39	39	39	1 : 1	350	No
RFI-MW16	7440-39-3	BARIUM	ug/L	240	240	240	1 : 2	2000	No
RFI-MW16	75-15-0	CARBON DISULFIDE	ug/l	3.4	3.4	3.4	1 : 1	2300	No
RFI-MW16	57-12-5	TOTAL CYANIDE	ug/L	390	390	390	1 : 1	200	Yes
RFI-MW16	108-95-2	PHENOL	ug/l	350	350	350	1 : 1	13000	No
RFI-MW16	7440-47-3	CHROMIUM	ug/L	23.8	23.8	23.8	1 : 2	100	No
RFI-MW16	7782-49-2	SELENIUM	ug/L	7.05	7.05	7.05	1 : 2	50	No
RFI-MW16	7440-50-8	COPPER	ug/L	18	18	18	1 : 2	1000	No
RFI-MW16	7440-62-2	VANADIUM	ug/L	190	190	190	1 : 2	62	Yes
RFI-MW16	108-88-3	TOLUENE	ug/l	2	2	2	1 : 1	790	No
RFI-MW16	7439-92-1	LEAD	ug/L	3	3	3	1 : 2	4	No
RFI-MW16	7440-02-0	NICKEL	ug/L	44	44	44	1 : 2	100	No
RFI-MW23	56-55-3	BENZO(A)ANTHRACENE	ug/l	3.3	3.3	3.3	1 : 1	8.5	No
RFI-MW23	TDS	TOTAL DISSOLVED SOLIDS	ug/L	3200000	3200000	3200000	1 : 1	NA	No
RFI-MW23	129-00-0	PYRENE	ug/l	9.6	9.6	9.6	1 : 1	140	No
RFI-MW23	206-44-0	FLUORANTHENE	ug/l	4.5	4.5	4.5	1 : 1	210	No
RFI-MW6	67-64-1	ACETONE	ug/l	1.5	1.7	1.6	2 : 4	2100	No
RFI-MW6	14808-79-8	SULFATE	ug/L	198000	214500	206250	2 : 2	NA	No
RFI-MW6	91-20-3	NAPHTHALENE	ug/l	0.95	1.2	1.04375	4 : 4	1500	No
RFI-MW6	108-95-2	PHENOL	ug/l	6.3	17	11.65	4 : 4	13000	No
RFI-MW6	78-93-3	2-BUTANONE	ug/l	0.705	0.92	0.818333	3 : 4	38000	No
RFI-MW6	7440-39-3	BARIUM	ug/l	193	217	202	4 : 4	2000	No
RFI-MW6	7782-49-2	SELENIUM	ug/l	5.8	8.5	6.833333	3 : 4	50	No
RFI-MW6	85-01-8	PHENANTHRENE	ug/l	0.39	0.48	0.423333	3 : 4	150	No
RFI-MW6	65794-96-9	3-METHYLPHENOL & 4-METHYLPHENOL	ug/l	9.1	15	12.7	3 : 3	1000	No
RFI-MW6	7440-02-0	NICKEL	ug/l	4.5	6.6	5.675	4 : 4	100	No
RFI-MW6	91-57-6	2-METHYLNAPHTHALENE	ug/l	0.29	0.37	0.33	2 : 4	750	No
RFI-MW6	108-88-3	TOLUENE	ug/l	0.18	0.2	0.193333	3 : 4	790	No
RFI-MW6	16887-00-6	CHLORIDE	ug/L	3065000	3110000	3087500	2 : 2	NA	No
RFI-MW6	107-06-2	1,2-DICHLOROETHANE	ug/l	0.29	0.32	0.31	4 : 4	5	No
RFI-MW6	108-60-1	BIS(2-CHLOROISOPROPYL) ETHER	ug/l	4.3	5.3	4.766667	3 : 4	8.3	No
RFI-MW6	57-12-5	TOTAL CYANIDE	ug/L	18	18	18	1 : 1	200	No
RFI-MW6	105-60-2	CAPROLACTAM	ug/l	0.86	2.1	1.48	2 : 4	17000	No
RFI-MW6	78-87-5	1,2-DICHLOROPROPANE	ug/l	9.1	9.95	9.4625	4 : 4	5	Yes
RFI-MW6	7440-41-7	BERYLLIUM	ug/l	0.35	0.35	0.35	1 : 4	4	No
RFI-MW6	75-15-0	CARBON DISULFIDE	ug/l	0.29	0.75	0.52	2 : 4	2300	No
RFI-MW7	14808-79-8	SULFATE	ug/L	310000	310000	310000	1 : 1	NA	No

TABLE D-2
SELECTION OF GROUNDWATER COI FOR REDEVELOPMENT SCENARIO
BASF NORTH WORKS FACILITY

Well	CAS No.	Chemical	units	Min	Max	Mean	FOD	Drinking Water Criterion (a)	Exceeds?
RFI-MW7	71-55-6	1,1,1-TRICHLOROETHANE	ug/l	13	13	13	1 : 1	200	No
RFI-MW7	7440-39-3	BARIUM	ug/L	86	86	86	1 : 1	2000	No
RFI-MW7	75-35-4	1,1-DICHLOROETHENE	ug/l	1.7	1.7	1.7	1 : 1	7	No
RFI-MW7	100-41-4	ETHYLBENZENE	ug/l	11	11	11	1 : 1	74	No
RFI-MW7	71-43-2	BENZENE	ug/l	0.83	0.83	0.83	1 : 1	5	No
RFI-MW7	7440-62-2	VANADIUM	ug/L	1.3	1.3	1.3	1 : 1	62	No
RFI-MW7	7782-49-2	SELENIUM	ug/L	4.8	4.8	4.8	1 : 1	50	No
RFI-MW7	1330-20-7	XYLENES	ug/l	22	22	22	1 : 1	280	No
RFI-MW7	108-10-1	4-METHYL-2-PENTANONE (MIBK)	ug/l	0.91	0.91	0.91	1 : 1	5200	No
RFI-MW7	98-82-8	ISOPROPYLBENZENE	ug/l	4.8	4.8	4.8	1 : 1	2300	No
RFI-MW7	16887-00-6	CHLORIDE	ug/L	5200000	5200000	5200000	1 : 1	NA	No
RFI-MW7	74-82-8	METHANE	ug/l	4800	4800	4800	1 : 1	NA	--
RFI-MW7	108-87-2	METHYLCYCLOHEXANE	ug/l	2.8	2.8	2.8	1 : 1	6300	No
RFI-MW7	75-34-3	1,1-DICHLOROETHANE	ug/l	12	12	12	1 : 1	2500	No
RFI-MW7	67-64-1	ACETONE	ug/l	44	44	44	1 : 1	2100	No
RFI-MW7	591-78-6	2-HEXANONE	ug/l	1.3	1.3	1.3	1 : 1	2900	No
RFI-MW7	7440-02-0	NICKEL	ug/L	3.6	3.6	3.6	1 : 1	100	No
RFI-MW7	TOTAL XYLENES	TOTAL XYLENES	ug/l	22	22	22	1 : 1	280	No
RFI-MW7	110-82-7	CYCLOHEXANE	ug/l	1.4	1.4	1.4	1 : 1	12000	No
RFI-MW7	108-88-3	TOLUENE	ug/l	17	17	17	1 : 1	790	No
RFI-MW7	7440-47-3	CHROMIUM	ug/L	1.1	1.1	1.1	1 : 1	100	No
RFI-MW7F	108-88-3	TOLUENE	ug/l	0.22	0.22	0.22	1 : 4	790	No
RFI-MW7F	7439-92-1	LEAD	ug/l	2.2	3	2.6	2 : 3	4	No
RFI-MW7F	65794-96-9	3-METHYLPHENOL & 4-METHYLPHENOL	ug/l	1	1	1	1 : 3	1000	No
RFI-MW7F	7440-48-4	COBALT	ug/l	1.2	1.9	1.55	2 : 3	100	No
RFI-MW7F	14808-79-8	SULFATE	ug/L	22400	33300	27850	2 : 2	NA	No
RFI-MW7F	110-82-7	CYCLOHEXANE	ug/l	0.13	0.13	0.13	1 : 4	12000	No
RFI-MW7F	78-87-5	1,2-DICHLOROPROPANE	ug/l	0.92	13	5.23	4 : 4	5	Yes
RFI-MW7F	7440-41-7	BERYLLIUM	ug/l	0.31	0.31	0.31	1 : 3	4	No
RFI-MW7F	105-60-2	CAPROLACTAM	ug/l	1.2	40	14.33333	3 : 4	17000	No
RFI-MW7F	67-64-1	ACETONE	ug/l	26	67	46.5	2 : 4	2100	No
RFI-MW7F	7440-02-0	NICKEL	ug/l	2.1	12.8	5.725	4 : 4	100	No
RFI-MW7F	7440-39-3	BARIUM	ug/l	409	604	491.75	4 : 4	2000	No
RFI-MW7F	7440-50-8	COPPER	ug/l	8.2	43.4	25.8	2 : 3	1000	No
RFI-MW7F	108-60-1	BIS(2-CHLOROISOPROPYL) ETHER	ug/l	1.9	9.4	4.675	4 : 4	8.3	Yes
RFI-MW7F	78-93-3	2-BUTANONE	ug/l	1.3	7.1	3.366667	3 : 4	38000	No
RFI-MW7F	7440-47-3	CHROMIUM	ug/l	9.7	32.9	20.175	4 : 4	100	No
RFI-MW7F	7782-49-2	SELENIUM	ug/l	5.2	8.7	7.333333	3 : 4	50	No
RFI-MW7F	107-06-2	1,2-DICHLOROETHANE	ug/l	0.3	0.3	0.3	1 : 4	5	No
RFI-MW7F	85-01-8	PHENANTHRENE	ug/l	0.34	1.2	0.776667	3 : 4	150	No

TABLE D-2
SELECTION OF GROUNDWATER COI FOR REDEVELOPMENT SCENARIO
BASF NORTH WORKS FACILITY

Well	CAS No.	Chemical	units	Min	Max	Mean	FOD	Drinking Water Criterion (a)	Exceeds?
RFI-MW7F	57-12-5	TOTAL CYANIDE	ug/L	3.8	3.8	3.8	1 : 1	200	No
RFI-MW7F	16887-00-6	CHLORIDE	ug/L	702000	993000	847500	2 : 2	NA	No
RFI-MW8	7440-62-2	VANADIUM	ug/l	2.4	2.4	2.4	1 : 4	62	No
RFI-MW8	7440-28-0	THALLIUM	ug/l	4.8	6.2	5.266667	3 : 4	2	Yes
RFI-MW8	7440-66-6	ZINC	ug/l	19.9	19.9	19.9	1 : 4	5000	No
RFI-MW8	7440-02-0	NICKEL	ug/l	7.1	7.1	7.1	1 : 4	100	No
RFI-MW8	7440-38-2	ARSENIC	ug/l	5.3	7.7	6.283333	3 : 4	10	No
RFI-MW8	7440-47-3	CHROMIUM	ug/l	5.9	5.9	5.9	1 : 4	100	No
RFI-MW8	7440-39-3	BARIUM	ug/l	1030	1090	1065	4 : 4	2000	No
RFI-MW8	7440-43-9	CADMIUM	ug/l	0.78	0.91	0.845	2 : 4	5	No
RFI-MW8	16887-00-6	CHLORIDE	ug/L	2900000	3045000	2972500	2 : 2	NA	No
RFI-MW8F	110-82-7	CYCLOHEXANE	ug/l	0.17	1.3	0.735	2 : 5	12000	No
RFI-MW8F	14808-79-8	SULFATE	ug/L	4800	170000	108933.3	3 : 3	NA	No
RFI-MW8F	7440-50-8	COPPER	ug/l	2.8	6.5	4.65	2 : 4	1000	No
RFI-MW8F	132-64-9	DIBENZOFURAN	ug/l	3.7	3.7	3.7	1 : 5	37	No
RFI-MW8F	75-00-3	CHLOROETHANE	ug/l	0.89	0.89	0.89	1 : 5	1700	No
RFI-MW8F	75-34-3	1,1-DICHLOROETHANE	ug/l	39	39	39	1 : 5	2500	No
RFI-MW8F	1330-20-7	XYLENES	ug/l	77	77	77	1 : 5	280	No
RFI-MW8F	75-35-4	1,1-DICHLOROETHENE	ug/l	4.9	4.9	4.9	1 : 5	7	No
RFI-MW8F	75-15-0	CARBON DISULFIDE	ug/l	0.34	3.2	1.77	2 : 5	2300	No
RFI-MW8F	86-74-8	CARBAZOLE	ug/l	3.6	3.6	3.6	1 : 5	350	No
RFI-MW8F	7440-66-6	ZINC	ug/l	11.2	11.2	11.2	1 : 4	5000	No
RFI-MW8F	16887-00-6	CHLORIDE	ug/L	50500	455000	194066.7	3 : 3	NA	No
RFI-MW8F	123-91-1	1,4-DIOXANE	ug/l	12	12	12	1 : 5	350	No
RFI-MW8F	108-88-3	TOLUENE	ug/l	0.32	24	8.3	3 : 5	790	No
RFI-MW8F	TOTAL XYLENES	TOTAL XYLENES	ug/l	77	77	77	1 : 5	280	No
RFI-MW8F	7440-62-2	VANADIUM	ug/l	3	4	3.633333	3 : 5	62	No
RFI-MW8F	117-81-7	BIS(2-ETHYLHEXYL) PHTHALATE	ug/l	2.3	2.3	2.3	1 : 5	6	No
RFI-MW8F	206-44-0	FLUORANTHENE	ug/l	1.8	1.8	1.8	1 : 5	210	No
RFI-MW8F	87-86-5	PENTACHLOROPHENOL	ug/l	1.8	3	2.366667	3 : 5	1	Yes
RFI-MW8F	83-32-9	ACENAPHTHENE	ug/l	2.1	2.1	2.1	1 : 5	3800	No
RFI-MW8F	86-73-7	FLUORENE	ug/l	5	5	5	1 : 5	2000	No
RFI-MW8F	67-64-1	ACETONE	ug/l	6	88	47	2 : 5	2100	No
RFI-MW8F	129-00-0	PYRENE	ug/l	1.3	1.3	1.3	1 : 5	140	No
RFI-MW8F	7439-92-1	LEAD	ug/l	2.5	2.5	2.5	1 : 4	4	No
RFI-MW8F	100-41-4	ETHYLBENZENE	ug/l	17	17	17	1 : 5	74	No
RFI-MW8F	85-01-8	PHENANTHRENE	ug/l	0.21	7.8	4.005	2 : 5	150	No
RFI-MW8F	108-95-2	PHENOL	ug/l	1	200	100.5	2 : 5	13000	No
RFI-MW8F	91-57-6	2-METHYLNAPHTHALENE	ug/l	23	23	23	1 : 5	750	No
RFI-MW8F	7440-39-3	BARIUM	ug/l	11.1	673	262.92	5 : 5	2000	No

TABLE D-2
SELECTION OF GROUNDWATER COI FOR REDEVELOPMENT SCENARIO
BASF NORTH WORKS FACILITY

Well	CAS No.	Chemical	units	Min	Max	Mean	FOD	Drinking Water Criterion (a)	Exceeds?
RFI-MW8F	7440-02-0	NICKEL	ug/l	1.4	22.1	7.375	4 : 5	100	No
RFI-MW8F	108-10-1	4-METHYL-2-PENTANONE (MIBK)	ug/l	2.2	2.2	2.2	1 : 5	5200	No
RFI-MW8F	208-96-8	ACENAPHTHYLENE	ug/l	6.1	6.1	6.1	1 : 5	150	No
RFI-MW8F	7782-49-2	SELENIUM	ug/l	3.6	3.8	3.7	2 : 5	50	No
RFI-MW8F	120-12-7	ANTHRACENE	ug/l	2	2	2	1 : 5	43	No
RFI-MW8F	78-93-3	2-BUTANONE	ug/l	0.49	15	5.663333	3 : 5	38000	No
RFI-MW8F	98-82-8	ISOPROPYLBENZENE	ug/l	6	6	6	1 : 5	2300	No
RFI-MW8F	65794-96-9	3-METHYLPHENOL & 4-METHYLPHENOL	ug/l	39	39	39	1 : 4	1000	No
RFI-MW8F	91-20-3	NAPHTHALENE	ug/l	0.29	97	48.645	2 : 5	1500	No
RFI-MW8F	71-43-2	BENZENE	ug/l	2.8	2.8	2.8	1 : 5	5	No
TMW1	100-41-4	Ethylbenzene	ug/l	15000	17100	16050	2 : 2	74	Yes
TMW1	108-88-3	Toluene	ug/l	1500	2190	1845	2 : 2	790	Yes
TMW1	1330-20-7	Total Xylenes	ug/l	352	880	616	2 : 2	280	Yes
TMW1	7439-97-6	Mercury	ug/l	0.00123	0.00123	0.00123	1 : 2	2	No
TMW1	95-47-6	o-Xylenes	ug/l	176	440	308	2 : 2	280	Yes
TMW1	71-43-2	Benzene	ug/l	3910	4060	3985	2 : 2	5	Yes
TMW1	7440-38-2	Arsenic	ug/l	36	36	36	1 : 1	10	Yes
TMW1	91-20-3	Naphthalene	ug/l	876	1340	1108	2 : 2	1500	No
TMW1	111-44-4	Bis(2-chloroethyl)ether	ug/l	40.1	46.9	43.5	2 : 2	8.3	Yes
TMW1	7440-50-8	Copper	ug/l	1.6	1.6	1.6	1 : 1	1000	No
TMW1	TOTAL XYLENES	TOTAL XYLENES	ug/l	704	1760	1232	2 : 2	280	Yes
TMW1	7440-66-6	Zinc	ug/l	88	88	88	1 : 1	5000	No
TMW4	95-47-6	o-Xylenes	ug/l	1.18	1.18	1.18	1 : 1	280	No
TMW4	108-88-3	TOLUENE	ug/l	2180	2180	2180	1 : 2	790	Yes
TMW4	7440-38-2	Arsenic	ug/l	5.4	5.4	5.4	1 : 1	10	No
TMW4	TOTAL XYLENES	TOTAL XYLENES	ug/l	5.15	5.15	5.15	1 : 2	280	No
TMW4	91-20-3	Naphthalene	ug/l	3.53	3.53	3.53	1 : 1	1500	No
TMW4	7439-97-6	Mercury	ug/l	0.0358	0.0358	0.0358	1 : 1	2	No
TMW4	71-43-2	BENZENE	ug/l	7.8	7.8	7.8	1 : 2	5	Yes
TMW4	1330-20-7	XYLENES	ug/l	2.6	2.6	2.6	1 : 1	280	No
TMW4	1330-20-7	Total Xylenes	ug/l	2.6	2.6	2.6	1 : 1	280	No
TMW4	100-41-4	ETHYLBENZENE	ug/l	34.2	34.2	34.2	1 : 2	74	No
TMW4	7440-66-6	Zinc	ug/l	14100	14100	14100	1 : 1	5000	Yes
TMW4	1330-20-7	XYLENES	ug/l	2.6	2.6	2.6	1 : 1	280	No
TMW4	7440-50-8	Copper	ug/l	2	2	2	1 : 1	1000	No
TMW4	1330-20-7	Total Xylenes	ug/l	2.6	2.6	2.6	1 : 1	280	No
WHI2-2S	7440-43-9	CADMIUM	ug/L	8	8	8	1 : 1	5	Yes
WHI2-2S	7440-62-2	VANADIUM	ug/L	77	77	77	1 : 1	62	Yes
WHI2-2S	7439-89-6	IRON	ug/L	144000	144000	144000	1 : 1	300	Yes
WHI2-2S	7440-66-6	ZINC	ug/L	666	666	666	1 : 1	5000	No

TABLE D-2
SELECTION OF GROUNDWATER COI FOR REDEVELOPMENT SCENARIO
BASF NORTH WORKS FACILITY

Well	CAS No.	Chemical	units	Min	Max	Mean	FOD	Drinking Water Criterion (a)	Exceeds?
WHI2-2S	7439-97-6	MERCURY	ug/L	33.4	33.4	33.4	1 : 1	2	Yes
WHI2-2S	TDS	TOTAL DISSOLVED SOLIDS	ug/L	11800000	11800000	11800000	1 : 1	NA	No
WHI2-2S	7439-95-4	MAGNESIUM	ug/L	207000	207000	207000	1 : 1	1100000	No
WHI2-2S	98-86-2	ACETOPHENONE	ug/l	1.13	1.13	1.13	1 : 1	4400	No
WHI2-2S	7440-02-0	NICKEL	ug/L	40	40	40	1 : 1	100	No
WHI2-2S	84-66-2	DIETHYL PHTHALATE	ug/l	4.35	4.35	4.35	1 : 1	16000	No
WHI2-2S	117-81-7	BIS(2-ETHYLHEXYL) PHTHALATE	ug/l	8.4	8.4	8.4	1 : 1	6	Yes
WHI2-2S	7440-39-3	BARIUM	ug/L	432	432	432	1 : 1	2000	No
WHI2-2S	7440-38-2	ARSENIC	ug/L	38	38	38	1 : 1	10	Yes
WHI2-2S	7439-92-1	LEAD	ug/L	239	239	239	1 : 1	4	Yes
WHI2-2S	7440-47-3	CHROMIUM	ug/L	62	62	62	1 : 1	100	No
WHI2-2S	7440-50-8	COPPER	ug/L	118	118	118	1 : 1	1000	No
WHI6-5F	100-41-4	Ethylbenzene	ug/l	1	1	1	2 : 2	74	No
WHI6-5F	111-44-4	Bis(2-chloroethyl)ether	ug/l	3.12	3.52	3.32	2 : 2	8.3	No
WHI6-5F	7440-38-2	Arsenic	ug/l	86	91	88.5	2 : 2	10	Yes
WHI6-5S	100-41-4	Ethylbenzene	ug/l	1	1	1	2 : 2	74	No
WHI6-5S	7440-50-8	Copper	ug/l	1	1	1	1 : 2	1000	No
WHI6-5S	7439-97-6	Mercury	ug/l	0.00067	0.000907	0.000789	2 : 2	2	No

Notes:
(a) - Michigan DEQ Part 201 drinking water criteria for commercial/industrial scenario. USEPA Region 3 tap water RBC used if no Part 201 criterion available.

TABLE D-3
CONSTITUENTS OF INTEREST - REDEVELOPMENT SCENARIO
BASF NORTH WORKS FACILITY
WYANDOTTE, MICHIGAN
TIER 2 RISK ASSESSMENT

Chemical	CAS	Soil	Groundwater
1,2-DICHLOROETHANE	107-06-2	X	X
1,2-DICHLOROPROPANE	78-87-5	X	X
ACETONE	67-64-1		X
2-PICOLINE	109-06-8		X
ARSENIC	7440-38-2	X	X
BENZENE	71-43-2	X	X
BENZO(A)ANTHRACENE	56-55-3	X	
BENZO(A)PYRENE	50-32-8	X	
BENZO(B)FLUORANTHENE	205-99-2	X	
BIS(2-ETHYLHEXYL)PHTHALATE	117-81-7		X
BIS(2-CHLOROETHYL)ETHER	111-44-4	X	X
BIS(2-CHLOROISOPROPYL)ETHER	108-60-1	X	X
CADMIUM	7440-43-9		X
CHLOROFORM	67-66-3		X
CHROMIUM	7440-47-3	X	X
COBALT	7440-48-4		X
CYANIDE	57-12-5		X
DIBENZ(AH)ANTHRACENE	53-70-3	X	
ETHYLBENZENE	100-41-4		X
LEAD	7439-92-1		X
MERCURY	7439-97-6	X	X
METHYLENE CHLORIDE	75-09-2		X
NAPHTHALENE	91-20-3	X	
NICKEL	7440-02-0		X
PENTACHLOROPHENOL	87-86-5		X
PHENANTHRENE	85-01-8	X	
THALLIUM	7440-28-0		X
TOLUENE	108-88-3		X
VANADIUM	7440-62-2		X
XYLENES (TOTAL)	1330-20-7		X
ZINC	7440-66-6		X

Notes:
CAS - Chemical Abstracts Service.

APPENDIX D-2

DOCUMENTATION AND WORKSHEETS FOR CALCULATION OF AMBIENT AIR CONCENTRATIONS FROM VOLATILIZATION AND PARTICULATE EMISSIONS FROM SOIL

APPENDIX D-2

CALCULATION OF AMBIENT AIR CONCENTRATIONS FROM VOLATILIZATION AND PARTICULATE EMISSIONS FROM SOIL

The calculation of air concentrations of volatile and non-volatile COI in soil followed USEPA's *Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites* (USEPA, 2002).

Volatile COI

The calculation of concentrations of volatile COI in outdoor air resulting from volatilization from soil involves dividing the soil concentration by a constituent-specific volatilization factor (VF), as follows:

> COI concentration in ambient air (mg/m^3) = Soil EPC (mg/kg soil) ÷ Volatilization Factor (m^3 air/kg soil)

The USEPA guidance (USEPA, 2002) was followed in calculating site- and constituent-specific volatilization factors, using the following equations:

$$VF\,(m^3/kg) = (Q/C)\frac{(3.14 D_a T)^{1/2}}{(2 P_b D_a)} 10^{-4}\,(m^2/cm^2) x \frac{1}{F_D}$$

And:

$$D_a = \frac{[(O_a{}^{10/3} D_i H' + O_w{}^{10/3} D_w)/n^2]}{P_b K_d + O_w + O_a H'}$$

Where:

Q/C = Inverse of mean concentration at the center of a 0.5 acre square source (g/m^2-s per kg/m^3)
F_D = Dispersion correction factor (unitless)
O_a = Air filled soil porosity (Lair/Lsoil)
O_w = Water filled soil porosity (Lwater/Lsoil)
D_i = Diffusivity in air (cm^2/s)
D_w = Diffusivity in water (cm^2/s)
D_a = Apparent diffusivity (cm^2/s)
n = Total soil porosity (Lpore/Lsoil)
P_b = Dry soil bulk density (g/cm^3)
K_d = Soil-water partition coefficient (cm^3/g) = K_{oc} * F_{oc}
K_{oc} = Soil-organic carbon partition coefficient (cm^3/g)
F_{oc} = Fraction organic carbon content of soil (g/g)
H' = Henry's law constant (dimensionless)
T = Exposure Interval (seconds)

Default soil parameters and constituent-specific parameters from USEPA (1996 and 2002) and MDEQ (1998) were used in the calculation of a volatilization factor for volatiles in soil. The soil parameters used in calculating the volatilization factors are presented in Table D-5. The constituent-specific parameters used in the calculation of the volatilization factors are presented in

Table D-6. The volatilization factors derived for each constituent are presented in Table D-7. Because the selection of the Q/C value is dependent on the size of the source area, the VF was calculated accounting for the size of each of the four SWMU/AOCs with volatile COI (provided in Table D-4). The VFs were used to calculate ambient air concentrations to evaluate inhalation exposure to volatile COI by the utility/redevelopment worker.

Non-Volatile COI

The calculation of concentrations of non-volatile COI bound to soil in fugitive dust involves multiplying the soil exposure point concentrations by the concentration of dust in air as follows:

COI concentration in ambient air (mg/m^3) = Soil EPC (mg/kg soil) x Dust concentration (kg soil/m^3)

The dust concentration in air used in the evaluation of ambient outdoor air pathway for the utility/redevelopment worker is the inverse of the particulate emission factor (PEF) derived in accordance with Equation 5-5 of USEPA guidance (USEPA, 2002):

$$PEF_{sc} = Q/C_{sr} \times \frac{1}{F_D} \times \left[\frac{T \times A_R}{556 \times (W/3)^{0.4} \times \frac{(365d/yr - p)}{365d/yr} \times \sum VKT} \right]$$

Where,

PEF_{SC}	=	Subchronic particulate emission factor (m^3/kg)
Q/C	=	inverse of the ratio of the 1-hr geometric mean air concentration to the emission flux along a straight road segment bisecting a square site (g/m^2-s per kg/m^3)
F_D	=	dispersion correction factor (unitless)
T	=	total time over which construction occurs (s)
A_R	=	surface area of contaminated road segment (m^2)(assuming a site-specific length and width of contaminated road segment
W	=	mean vehicle weight (tons)
p	=	number of days with at least 0.01 inches of precipitation (days/yr) (taken from Figure 5-2 of USEPA (2002)
v	=	number of vehicles
∑VKT	=	sum of fleet vehicle kilometers traveled during the exposure duration (km)

Tables D-8 and D-9 present the site-specific parameters used to calculate PEFs. Because the PEF is dependent on the size of the area, two separate PEFs were calculated, based on the size of the exposure areas with COIs in soil. A PEF based on a 0.5 acre source area was calculated for use with the small SWMU/AOCs (AOC 6, AOC 7A, AOC 7C, SWMU F, and SWMU H) and a PEF based on a 10 acre source area was calculated for the larger areas (AOC 2, AOC 5, and SWMU G), which range in size from 6.3 acres to 11.25 acres.

The concentrations of non-volatile COI in ambient air for a utility/redevelopment worker presented in Table 3-12 were calculated by multiplying the soil EPC presented in Table 3-10 by the 1/PEF values presented in Table D-9.

References

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TABLE D-4
DEVELOPMENT OF DISPERSION FACTORS FOR THE SOIL VOLATILIZATION TO OUTDOOR AIR PATHWAY
REDEVELOPMENT SCENARIO
BASF NORTH WORKS FACILITY
WYANDOTTE, MICHIGAN
TIER 2 RISK ASSESSMENT

Area (b)	A_c (acres)	Dispersion Factors (g/m^2-s per kg/m^3) Q/C_{sa} (a)
AOC 5	11.25	8.26
AOC 6	1.4	11.80
SWMU F	0.95	12.67
SWMU H	1.08	12.37
		Constants
		A 2.4538
		B 17.566
		C 189.0426

Notes:
(a) - Calculated using Equation 5-15 of USEPA, 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites.
(b) - Only AOCs/SWMUs with volatile COPCs in soil are shown (potentially carcinogenic PAH, which have very low volatility, are excluded from VF calculations).

TABLE D-5
SOIL AND EXPOSURE PARAMETERS USED IN THE DEVELOPMENT OF VOLATILIZATION FACTORS
REDEVELOPMENT SCENARIO
BASF NORTH WORKS FACILITY
WYANDOTTE, MICHIGAN
TIER 2 RISK ASSESSMENT

Parameter	Symbol	Units	Value	
Air-filled soil porosity	Oa	Lair/Lsoil	0.28	(a)
Water-filled soil porosity	Ow	Lwater/Lsoil	0.15	(a)
Total soil porosity	n	Lpore/Lsoil	0.43	(a)
Soil particle density	Ps	g/cm3	2.65	(a)
Dry soil bulk density	Pb	g/cm3	1.5	(a)
Organic carbon content	Foc	g/g	0.002	(c)
Exposure interval - Utility/Redevelopment Worker	T	seconds	3.15E+07	(b)
Dispersion Factor Correction for Utility/Redevelopment Worker	Fd	unitless	1.85E-01	(a)

Notes:
(a) USEPA, 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites.
(b) Exposure duration converted to seconds.
(c) MDEQ default fraction of organic carbon in soil (MDEQ, 1998).

TABLE D-6
CONSTITUENT PARAMETERS USED IN THE DEVELOPMENT OF VOLATILIZATION FACTORS
REDEVELOPMENT SCENARIO
BASF NORTH WORKS FACILITY
WYANDOTTE, MICHIGAN
TIER 2 RISK ASSESSMENT

Constituent	CAS	Solubility (mg/L)	Soil-Water Partition Coefficient (L/kg)	Soil Organic Carbon-Water Partition Coefficient (L/kg)	Henry's Law Constant (dimensionless)	Diffusivity in Air (cm^2/s)	Diffusivity in Water (cm^2/s)	Apparent Diffusivity (c) (cm^2/s)	Soil Saturation (mg/kg)
1,2-DICHLOROETHANE	107-06-2	8.52E+03 (b)	3.48E-02 (a)	1.74E+01 (b)	4.01E-02 (b)	1.04E-01 (b)	9.90E-06 (b)	1.52E-03	1.21E+03
1,2-DICHLOROPROPANE	78-87-5	2.80E+03 (b)	8.74E-02 (a)	4.37E+01 (b)	1.15E-01 (b)	7.82E-02 (b)	8.73E-06 (b)	2.23E-03	5.85E+02
BENZENE	71-43-2	1.75E+03 (b)	1.18E-01 (a)	5.89E+01 (b)	2.28E-01 (b)	8.80E-02 (b)	9.80E-06 (b)	3.99E-03	4.56E+02
BIS(2-CHLOROETHYL)ETHER	111-44-4	1.72E+04 (b)	3.10E-02 (a)	1.55E+01 (b)	7.38E-04 (b)	6.92E-02 (b)	7.53E-06 (b)	2.05E-05	2.26E+03
BIS(2-CHLOROISOPROPYL)ETHER	108-60-1	1.70E+03 (d)	7.84E-02 (a)	3.92E+01 (d)	4.62E-03 (d)	3.50E-02 (d)	7.36E-06 (d)	4.70E-05	3.05E+02
NAPHTHALENE	91-20-3	3.10E+01 (b)	4.00E+00 (a)	2.00E+03 (b)	1.98E-02 (b)	5.90E-02 (b)	7.50E-06 (b)	1.48E-05	1.27E+02
XYLENES (TOTAL)	1330-20-7	1.85E+02 (b,e)	7.78E-01 (a)	3.89E+02 (b,e)	3.14E-01 (b,e)	7.69E-02 (b,e)	8.44E-06 (b,e)	1.33E-03	1.73E+02

Notes:
foc fraction organic carbon.
(a) Kd = Koc*foc, where foc = 0.002, per (b).
(b) USEPA, 1996. Soil Screening Guidance. Technical Background Document. EPA/540/R-95/128.
(c) Equation 4-8 from USEPA, 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites.
(d) Risk Assessment Information System (RAIS). Toxicity and Chemical-Specific Factors Data Base. URL: [http://risk.lsd.ornl.gov/index.shtml].
(e) Parameters for p-xylene.

TABLE D-7
DEVELOPMENT OF VOLATILIZATION FACTORS FOR THE UTILITY/REDEVELOPMENT WORKER - INTRUSIVE ACTIVITIES (a)
REDEVELOPMENT SCENARIO
BASF NORTH WORKS FACILITY
WYANDOTTE, MICHIGAN
TIER 2 RISK ASSESSMENT

Constituent	**CAS**	**AOC 5 (m^3/kg)**	**AOC 6 (m^3/kg)**	**SWMU F (m^3/kg)**	**SWMU H (m^3/kg)**
Q/C Value (g/m^2-s per kg/m^3):		8.26	11.80	12.67	12.37
1,2-DICHLOROETHANE	107-06-2	3.80E+02	5.43E+02	5.83E+02	5.69E+02
1,2-DICHLOROPROPANE	78-87-5	3.14E+02	4.48E+02	4.81E+02	4.70E+02
BENZENE	71-43-2	2.34E+02	3.35E+02	3.60E+02	3.51E+02
BIS(2-CHLOROETHYL)ETHER	111-44-4	3.27E+03	4.67E+03	5.01E+03	4.90E+03
BIS(2-CHLOROISOPROPYL)ETHER	108-60-1	2.16E+03	3.09E+03	3.32E+03	3.24E+03
NAPHTHALENE	91-20-3	3.85E+03	5.51E+03	5.92E+03	5.78E+03
XYLENES (TOTAL)	1330-20-7	4.05E+02	5.79E+02	6.22E+02	6.07E+02

Notes:
(a) Equation 5-14 from USEPA, 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. Soil parameters presented in Table D-5, chemical parameters presented in Table D-6, Q/C calculated in Table D-4.

TABLE D-8
DEVELOPMENT OF PARTICULATE EMISSION FACTOR FOR THE UTILITY/REDEVELOPMENT WORKER
REDEVELOPMENT SCENARIO
BASF NORTH WORKS FACILITY
WYANDOTTE, MICHIGAN
TIER 2 RISK ASSESSMENT

Parameter	Definition	Units	Values	Notes
A	constant	unitless	12.9351	USEPA (2002) default
A_{s1}	areal extent of site surface soil contamination	acres	0.5	USEPA (2002) example (b)
A_{s2}	areal extent of site surface soil contamination	acres	10	(c)
B	constant	unitless	5.7383	USEPA (2002) default
C	constant	unitless	71.7711	USEPA (2002) default
$Q/C_{sr\ (0.5\ acre)}$	**inverse of the ratio of the 1-hr geometric mean air concentration to the emission flux along a straight road segment bisecting a square site**	**(g/m^2 -s per kg/m^3)**	**23.01785**	**(a)**
$Q/C_{sr\ (10\ acre)}$	**inverse of the ratio of the 1-hr geometric mean air concentration to the emission flux along a straight road segment bisecting a square site**	**(g/m^2 -s per kg/m^3)**	**15.24747**	**(a)**

Notes:
(a) USEPA, 2002 (Equation 5-6):

$$Q / C_{sr} = A \times \exp\left[\frac{(\ln A_s - B)^2}{C}\right]$$

(b) It is assumed that the areal extent of site surface soil that is subject to particulate emissions at any one time is 0.5 acres, which represents a road segment of 45 m long by 6 m wide (example provided by USEPA in Supplemental SSL guidance (2002)).
(c) Alternate source size of 10 acres is also evaluated.

TABLE D-9
DEVELOPMENT OF PARTICULATE EMISSION FACTOR FOR THE UTILITY/REDEVELOPMENT WORKER
REDEVELOPMENT SCENARIO
BASF NORTH WORKS FACILITY
WYANDOTTE, MICHIGAN
TIER 2 RISK ASSESSMENT

Parameter	Definition	Units	Values (0.5 acre)		Values (10 acres)	
				Notes		Notes
Q/C_{sr}	inverse of the ratio of the 1-hr geometric mean air concentration to the emission flux along a straight road segment bisecting a square site	g/m^2-s per kg/m^3	23.01785	(b)	15.24747	(b)
F_D	dispersion correction factor	unitless	0.185	USEPA (2002) default	0.185	USEPA (2002) default
T	total time over which construction occurs	weeks	4	(c)	4	
T	total time over which construction occurs	days	28.0	4 weeks x 7 days/week	28.0	4 weeks x 7 days/week
T	total time over which construction occurs	sec	2,419,200	28 days x 24 hr/day x 3600 sec/hr	2,419,200	28 days x 24 hr/day x 3600 sec/hr
A_s	areal extent of site surface soil contamination	acres	0.5	USEPA (2002) example	10.0	Approximate area of largest SWMU/AOC
A_s	areal extent of site surface soil contamination	m^2	2,023	Acres x 4046.86 m2	40,469	Acres x 4046.86 m2
L_R	length of contaminated segment	m	45	USEPA (2002) example (road segment)	100	Approximate footprint of SWMU F where redevelopment occurring
W_R	width of contaminated segment	m	6	USEPA (2002) example (road segment)	100	
A_R	surface area of contaminated road segment	m^2	270	L_R x W_R	10000	L_R x W_R
W	mean vehicle weight	tons	8	USEPA (2002) example	8	USEPA (2002) example
p	number of days with at least 0.01 inches of precipitation	days/yr	140	(e)	140	(e)
v	number of vehicles	number	30	USEPA (2002) example	100	Estimated truck traffic
∑VKT	sum of fleet vehicle kilometers traveled during the exposure duration	km	27	v x square root of As x T (weeks) x 5 days/week	402	v x square root of As x T (weeks) x 5 days/week
PEF_{SC}	**subchronic road particulate emission factor**	**m^3/kg**	**5.93E+06**	**(a)**	**9.77E+06**	**(a)**
1/PEF	**Calculated dust concentration**	**ug/m^3**	**169**	**(f)**	**102**	**(f)**

Notes:

(a) USEPA, 2002 (Equation 5-5):

$$PEF_{sc} = Q/C_{sr} \times \frac{1}{F_D} \times \left[\frac{T \times A_R}{556 \times (W/3)^{0.4} \times \frac{(365d/yr - p)}{365d/yr} \times \sum VKT} \right]$$

(b) Calculated from Equation 5-6 (USEPA, 2002), see Table D-8.

(c) Construction activities are assumed to occur over a 1-month (4 week) period.

(d) Example provided by USEPA (2002): daily unpaved road traffic consists of 20 two-ton cars and 10 twenty-ton trucks and the mean vehicle weght is [(20 cars x 2 tons/car) + (10 trucks x 20 tons/truck)]/30 vehicles = 8 tons

(e) USEPA, 2002 (Exhibit 5-2)

(f) In order to convert PEFsc (m^3/kg) to 1/PEF (ug/m^3), 1/PEF was multiplied by 10^9

APPENDIX D-3

DOCUMENTATION AND WORKSHEETS FOR CALCULATION OF EXCAVATION TRENCH AIR CONCENTRATIONS FROM STANDING WATER IN AN EXCAVATION TRENCH

APPENDIX D-3

CALCULATION OF EXCAVATION TRENCH AIR CONCENTRATIONS FROM STANDING WATER IN AN EXCAVATION TRENCH

Excavation trench air concentrations of a COI resulting from volatilization from groundwater infiltrating an excavation trench can be predicted by use of the method recommended by USEPA (1987) for predicting volatilization from standing water.

Model to Predict Air Concentration

In this model, the air concentration of a COI is estimated at the downwind boundary of the water. For the purposes of calculating this concentration, a rectangular box with the base corresponding to the water surface is considered. The height of the box, Hb, is the height to which the chemical emissions from the water surface are uniformly mixed with the air. Lb is the dimension of the box parallel to the direction of the wind. Wb is the width of the box perpendicular to the airflow. If U is the wind speed, then, by conservation of mass, the air concentration, Ca, of chemical within the box is given by:

$$C_a = \frac{Q}{H_b W_b U} \quad \textbf{(1)}$$

The diffusion height, H_b, above the water surface is approximately equal to 0.05 L_b (Jackson, 1976). With this substitution, the equation for the air concentration becomes:

$$C_a = \frac{Q}{0.05AU} \quad \textbf{(2)}$$

Where:

Q = chemical emission rate (g/s)

A = water surface area (m^2) (270 m^2; best professional judgement estimate of utility repair/installation trench, and equal to a trench approximately 6 m wide and 45 m long)

U = wind speed (m/s) (2.25 m/s; default value USEPA, 1991)

The chemical emission rate, Q, can be expressed as follows:

$$Q = KAC_L \quad \textbf{(3)}$$

Where:

Q = chemical emission rate (g/s)

K = overall mass transfer coefficient (m/s)

A = water surface area (m^2) (270 m^2; best professional judgement estimate of utility repair/installation trench, and equal to a trench approximately 6 m wide and 45 m long)

C_L = chemical concentration in water (g/m^3)

With the substitution of equation (3) into equation (2), the equation for air concentration becomes:

$$Ca = \frac{KC_L}{0.05u} \quad (4)$$

As wind speed, u, and the chemical concentration in water, C_L, are known or can be measured, the chemical concentration in air is then a function of the overall mass transfer coefficient.

Mass Transfer Coefficient

The overall mass transfer coefficient, K, is given by:

$$\frac{1}{K} = \frac{1}{K_L} + \frac{1}{K_G K_{eq}} \quad \textbf{(5)}$$

Where:

K_L = Liquid phase mass transfer coefficient (m/s)

K_G = Gas phase mass transfer coefficient (m/s)

K_{eq}= Equilibrium mass transfer coefficient (unitless)

The equilibrium mass transfer coefficient is given by the following:

$$K_{eq} = \frac{H}{RT} \quad \textbf{(6)}$$

Where:

H = Henry's Law constant for the chemical (atm m^3/g-mol)

R = Universal Gas Constant (8.21 x 10^{-5} atm m^3/g-mol/^oK)

T = Water Temperature (°K)

The Henry's Law constants are chemical-specific and were obtained from the USEPA Soil Screening Guidance (USEPA, 1996), the USEPA Handbook of RCRA Ground-water Monitoring Constituents (USEPA, 1992), the Risk Assessment Information System (RAIS) Toxicity and Chemical-Specific Factors Data Base (http://risk.lsd.ornl.gov/index.shtml), and the Syracuse Research Corporation Interactive PhysProp Database (http://esc.syrres.com/interkow/physdemo.htm).

The liquid phase mass transfer coefficient is given by:

$$K_L = 2.78 \times 10^{-6} \left(\frac{D_w}{D_{ether}} \right)^{2/3} \quad \textbf{(7)}$$

Where:

D_w = Diffusivity of the compound in water (cm^2/s)

D_{ether} = Diffusivity of ether in water (8.5 x 10^{-6} cm^2/s; USEPA, 1987).

The diffusivity of each chemical in water was obtained from the USEPA Soil Screening Guidance (USEPA, 1996), the Risk Assessment Information System (RAIS) Toxicity and Chemical-Specific Factors Data Base (http://risk.lsd.ornl.gov/index.shtml), or was calculated by ENSR.

The gas phase mass transfer coefficient is given by:

$$K_G = 4.82 \times 10^{-3} U^{0.78} Sc_G^{-0.67} d_e^{-0.11} \quad \textbf{(8)}$$

Where:

U = wind speed (m/s)

Sc_G = Schmidt number = $\mu_G/(\rho_G D_a)$

μ_G = viscosity of air (1.81 x 10^{-4} g/cm-s)

ρ_G = density of air (1.2 x 10^{-3} g/cm^3)

D_a = diffusivity of the chemical in air (cm^2/s)

d_e = effective diameter (m) = $(4A/\pi)^{0.5}$

For each of the compounds the molecular diffusivity in air was obtained from the USEPA Soil Screening Guidance (USEPA, 1996), the Risk Assessment Information System (RAIS) Toxicity and Chemical-Specific Factors Data Base (http://risk.lsd.ornl.gov/index.shtml), or was calculated by ENSR.

Attenuation Factor

For the purpose of calculating the concentration in air from a given concentration in water, it is convenient to define an attenuation factor, α, which is given as the ratio of the ambient air concentration given in equation (4) to the concentration in water:

$$\alpha = \frac{C_a}{C_L} = \frac{K}{0.05U} \quad \textbf{(9)}$$

If the concentration in the water is given per liter and the air concentration is given per cubic meter, then the attenuation factor becomes:

$$\alpha(L/m^3) = \frac{20000K}{U} \quad \textbf{(10)}$$

where the mass transfer coefficient, K, is defined as above.

Model Application and Results

Table D-10 summarizes model inputs and intermediate steps in the modeling process, and presents the calculated groundwater to air attenuation factor. The attenuation factor is multiplied by the groundwater EPCs provided in Table 3-11 to calculate trench air concentrations provided in Table 3-13 of the report.

Uncertainty Analysis

It should be noted that the volatilization model described above does not consider the effect of one chemical in solution upon the volatilization of another. The extent of this effect is uncertain, and may result in over or underestimation of air concentrations. The assumption of a water temperature of 25°C is conservative considering the increase of the Henry's Law parameter with temperature.

References

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TABLE D-10
ESTIMATION OF TRENCH AIR CONCENTRATIONS FROM UNIT GROUNDWATER CONCENTRATIONS - REDEVELOPMENT SCENARIO
BASF NORTH WORKS FACILITY
WYANDOTTE, MICHIGAN
TIER 2 RISK ASSESSMENT

*** Input Parameters ***

Water temperature (degK)	298.15	
Viscosity of water (cp)	0.8904	
Wetted area (m**2)	270	(Best professional judgement - trench approximately 6 m wide (~20 feet) by 45 m long (~150 feet)
Wind speed (m/s)	2.25	

*** Constants ***

Gas const. (atm m**3/(mol degK))	8.21E-05
Diff. of ether in H2O (cm**2/s)	8.50E-06
Viscosity of air (g/(cm s))	1.81E-04
Density of air (g/cm**3)	1.20E-03

*** Calculated Parameter ***

Effective diameter of source (m)	18.541

*** Chemical-Specific Parameters ***

Constituent	CAS Number	Groundwater Concentration (mg/L)	Molecular Weight (g/mol)		Henry's Law Coefficient (atm*m**3/g-mole)		Diffusivity In Air (cm**2/s)		Diffusivity In Water (cm**2/s)		Keq	Kl (m/s)	SCg	Kg (m/s)	K (m/s)	Q **(m3/s)**	Groundwater-to-Air Attenuation Factor **(L/m3)**
1,2-DICHLOROETHANE	107-06-2	1	98.96	(a)	1.18E-03	(a)	1.40E-01	(b)	9.90E-06	(b)	4.81E-02	3.08E-06	1.08E+00	6.26E-03	3.05E-06	8.23E-04	2.71E-02
1,2-DICHLOROPROPANE	78-87-5	1	112.99	(a)	2.68E-03	(a)	7.80E-02	(b)	8.80E-06	(b)	1.09E-01	2.85E-06	1.93E+00	4.23E-03	2.83E-06	7.63E-04	2.51E-02
ACETONE	67-64-1	1	58.08	(a)	3.88E-05	(b)	1.24E-01	(b)	1.14E-05	(b)	1.59E-03	3.38E-06	1.22E+00	5.77E-03	2.47E-06	6.67E-04	2.19E-02
BENZENE	71-43-2	1	78.11	(a)	5.55E-03	(b)	8.80E-02	(b)	9.80E-06	(b)	2.27E-01	3.06E-06	1.71E+00	4.59E-03	3.05E-06	8.23E-04	2.71E-02
BIS(2-CHLOROETHYL)ETHER	111-44-4	1	143.01	(a)	1.30E-05	(a)	6.92E-02	(b)	7.53E-06	(b)	5.31E-04	2.56E-06	2.18E+00	3.90E-03	1.15E-06	3.10E-04	1.02E-02
BIS(2-CHLOROISOPROPYL)ETHER	108-60-1	1	171	(d)	4.62E-03	(d)	3.50E-02	(d)	7.36E-06	(d)	1.89E-01	2.53E-06	4.31E+00	2.47E-03	2.51E-06	6.78E-04	2.23E-02
CHLOROFORM	67-66-3	1	119.38	(a)	3.67E-03	(b)	1.04E-01	(b)	1.00E-05	(b)	1.50E-01	3.10E-06	1.45E+00	5.13E-03	3.09E-06	8.33E-04	2.74E-02
ETHYLBENZENE	100-41-4	1	106.17	(a)	8.04E-03	(a)	7.50E-02	(b)	7.80E-06	(b)	3.29E-01	2.63E-06	2.01E+00	4.12E-03	2.62E-06	7.07E-04	2.33E-02
METHYLENE CHLORIDE	75-09-2	1	84.93	(a)	2.19E-03	(b)	1.01E-01	(b)	1.17E-05	(b)	8.95E-02	3.44E-06	1.49E+00	5.03E-03	3.41E-06	9.22E-04	3.03E-02
TOLUENE	108-88-3	1	92.14	(a)	6.64E-03	(b)	8.70E-02	(b)	8.60E-06	(b)	2.71E-01	2.80E-06	1.73E+00	4.55E-03	2.80E-06	7.55E-04	2.48E-02
XYLENES (TOTAL)	1330-20-7	1	106.17	(a)	7.66E-03	(b,e)	7.69E-02	(b,e)	8.44E-06	(b,e)	3.13E-01	2.77E-06	1.96E+00	4.19E-03	2.76E-06	7.45E-04	2.45E-02
2-PICOLINE	109-06-8	1	93.13	(a)	1.10E-05	(a,f)	9.10E-02	(d,f)	7.60E-06	(d,f)	4.49E-04	2.58E-06	1.66E+00	4.69E-03	1.16E-06	3.13E-04	1.03E-02
BIS(2-ETHYLHEXYL)PHTHALAT	117-81-7	1	390.54	(a)	1.02E-07	(b)	3.51E-02	(b)	3.66E-06	(b)	4.17E-06	1.59E-06	4.30E+00	2.48E-03	1.03E-08	2.77E-06	9.12E-05
PENTACHLOROPHENOL	87-86-5	1	266.34	(a)	2.44E-08	(b)	5.60E-02	(b)	6.10E-06	(b)	9.97E-07	2.23E-06	2.69E+00	3.39E-03	3.37E-09	9.10E-07	3.00E-05

Notes:
CAS - Chemical Abstract Service.
References for physical constants:
(a) USEPA, 1992. Handbook of RCRA Ground-water Monitoring Constituents. PB92-233287.
(b) USEPA. 1996a. Soil Screening Guidance. PB96-963502.
(c) Syracuse Research Corporation. Interactive PhysProp Database. http://esc.syrres.com/interkow/physdemo.htm.
(d) Risk Assessment Information System (RAIS). Toxicity and Chemical-Specific Factors Data Base. URL: [http://risk.lsd.ornl.gov/index.shtml].
(e) p-xylenes used as surrogate based on structural similarities.
(f) Pyridine used as surrogate based on structural similarities.

APPENDIX D-4

RISK CALCULATION SPREADSHEETS FOR THE UTILITY/REDEVELOPMENT WORKER

TABLE D-11A
BASF NORTH WORKS FACILITY
WYANDOTTE, MICHIGAN
TIER 2 RISK ASSESSMENT

Receptors Evaluated:	
Receptor 1:	Utility/Redevelopment Worker

CARCINOGENIC AND NONCARCINOGENIC ASSUMPTIONS FOR UTILITY/REDEVELOPMENT WORKER DERMAL CONTACT AND INGESTION OF SOIL		Assumed Value	Units	Calculated Value
Soil Ingestion Rate	Utility/Redevelopment Worker	330	(mg soil/day)	
Adherence Factor	Utility/Redevelopment Worker	0.19	(mg/cm^2)	
Skin Surface Area Exposed	Utility/Redevelopment Worker	3339	(cm^2)	
Body Weight	Utility/Redevelopment Worker	70	(kg)	
Exposure Frequency	Utility/Redevelopment Worker	20	(days)/365(days) =	5.48E-02
Exposure Duration (cancer)	Utility/Redevelopment Worker	1	(years)/70(years) =	1.43E-02
Exposure Duration (noncancer)	Utility/Redevelopment Worker	1	(years)/1(years) =	1.00E+00
Lifetime		70	(years)	
Unit Conversion Factor		1.00E-06	(kg/mg)	

TABLE D-11B
BASF NORTH WORKS FACILITY
WYANDOTTE, MICHIGAN
TIER 2 RISK ASSESSMENT
CARCINOGENIC ASSESSMENT
DERMAL CONTACT
AND INGESTION OF SOIL
FOR UTILITY/REDEVELOPMENT WORKER

Chemical	Unit Concentration In Soil (mg/kg-soil)	Dermal Absorption Factor	Oral Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Dermal Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	ADDing (mg/kg-day)	Lifetime Average Daily Dose-Ing. (mg/kg-day)	ADDder (mg/kg-day)	Lifetime Average Daily Dose-Der. (mg/kg-day)	Potential Excess Lifetime Cancer Risk per Unit Concentration		
									Ingestion	Dermal Contact	Total
1,2-DICHLOROETHANE	1.00E+00	1.00E-02	9.10E-02	9.10E-02	3.69E-09	3.69E-09	7.09E-11	7.09E-11	3.36E-10	6.46E-12	3.42E-10
1,2-DICHLOROPROPANE	1.00E+00	1.00E-02	NA	NA	3.69E-09	3.69E-09	7.09E-11	7.09E-11	NA	NA	NC
ACETONE	1.00E+00	1.00E-02	NA	NA	3.69E-09	3.69E-09	7.09E-11	7.09E-11	NA	NA	NC
2-PICOLINE	1.00E+00	1.00E-02	NA	NA	3.69E-09	3.69E-09	7.09E-11	7.09E-11	NA	NA	NC
ARSENIC	1.00E+00	3.00E-02	1.50E+00	1.50E+00	3.69E-09	3.69E-09	2.13E-10	2.13E-10	5.54E-09	3.19E-10	5.85E-09
BENZENE	1.00E+00	1.00E-02	5.50E-02	5.50E-02	3.69E-09	3.69E-09	7.09E-11	7.09E-11	2.03E-10	3.90E-12	2.07E-10
BENZO(A)ANTHRACENE	1.00E+00	1.30E-01	7.30E-01	7.30E-01	3.69E-09	3.69E-09	9.22E-10	9.22E-10	2.69E-09	6.73E-10	3.37E-09
BENZO(A)PYRENE	1.00E+00	1.30E-01	7.30E+00	7.30E+00	3.69E-09	3.69E-09	9.22E-10	9.22E-10	2.69E-08	6.73E-09	3.37E-08
BENZO(B)FLUORANTHENE	1.00E+00	1.30E-01	7.30E-01	7.30E-01	3.69E-09	3.69E-09	9.22E-10	9.22E-10	2.69E-09	6.73E-10	3.37E-09
BIS(2-ETHYLHEXYL)PHTHALATE	1.00E+00	1.00E-02	1.40E-02	1.40E-02	3.69E-09	3.69E-09	7.09E-11	7.09E-11	5.17E-11	9.93E-13	5.27E-11
BIS(2-CHLOROETHYL)ETHER	1.00E+00	1.00E-02	1.10E+00	1.10E+00	3.69E-09	3.69E-09	7.09E-11	7.09E-11	4.06E-09	7.80E-11	4.14E-09
BIS(2-CHLOROISOPROPYL)ETH	1.00E+00	1.00E-02	7.00E-02	7.00E-02	3.69E-09	3.69E-09	7.09E-11	7.09E-11	2.58E-10	4.97E-12	2.63E-10
CADMIUM	1.00E+00	1.00E-03	NA	NA	3.69E-09	3.69E-09	7.09E-12	7.09E-12	NA	NA	NC
CHLOROFORM	1.00E+00	1.00E-02	NA	NA	3.69E-09	3.69E-09	7.09E-11	7.09E-11	NA	NA	NC
CHROMIUM	1.00E+00	1.00E-03	NA	NA	3.69E-09	3.69E-09	7.09E-12	7.09E-12	NA	NA	NC
COBALT	1.00E+00	1.00E-03	NA	NA	3.69E-09	3.69E-09	7.09E-12	7.09E-12	NA	NA	NC
CYANIDE	1.00E+00	1.00E-03	NA	NA	3.69E-09	3.69E-09	7.09E-12	7.09E-12	NA	NA	NC
DIBENZ(AH)ANTHRACENE	1.00E+00	1.30E-01	7.30E+00	7.30E+00	3.69E-09	3.69E-09	9.22E-10	9.22E-10	2.69E-08	6.73E-09	3.37E-08
ETHYLBENZENE	1.00E+00	1.00E-02	NA	NA	3.69E-09	3.69E-09	7.09E-11	7.09E-11	NA	NA	NC
LEAD	1.00E+00	1.00E-03	NA	NA	3.69E-09	3.69E-09	7.09E-12	7.09E-12	NA	NA	NC
MERCURY	1.00E+00	1.00E-03	NA	NA	3.69E-09	3.69E-09	7.09E-12	7.09E-12	NA	NA	NC
METHYLENE CHLORIDE	1.00E+00	1.00E-02	7.50E-03	7.50E-03	3.69E-09	3.69E-09	7.09E-11	7.09E-11	2.77E-11	5.32E-13	2.82E-11
NAPHTHALENE	1.00E+00	1.30E-01	NA	NA	3.69E-09	3.69E-09	9.22E-10	9.22E-10	NA	NA	NC
NICKEL	1.00E+00	1.00E-03	NA	NA	3.69E-09	3.69E-09	7.09E-12	7.09E-12	NA	NA	NC
PENTACHLOROPHENOL	1.00E+00	2.50E-01	1.20E-01	1.20E-01	3.69E-09	3.69E-09	1.77E-09	1.77E-09	4.43E-10	2.13E-10	6.56E-10
PHENANTHRENE	1.00E+00	1.30E-01	NA	NA	3.69E-09	3.69E-09	9.22E-10	9.22E-10	NA	NA	NC
THALLIUM	1.00E+00	1.00E-03	NA	NA	3.69E-09	3.69E-09	7.09E-12	7.09E-12	NA	NA	NC
TOLUENE	1.00E+00	1.00E-02	NA	NA	3.69E-09	3.69E-09	7.09E-11	7.09E-11	NA	NA	NC
VANADIUM	1.00E+00	1.00E-03	NA	NA	3.69E-09	3.69E-09	7.09E-12	7.09E-12	NA	NA	NC
XYLENES (TOTAL)	1.00E+00	1.00E-02	NA	NA	3.69E-09	3.69E-09	7.09E-11	7.09E-11	NA	NA	NC
ZINC	1.00E+00	1.00E-03	NA	NA	3.69E-09	3.69E-09	7.09E-12	7.09E-12	NA	NA	NC

TABLE D-11C
POTENTIAL CARCINOGENIC RISK
RISK BY DERMAL CONTACT WITH
AND INGESTION OF SOIL
FOR UTILITY/REDEVELOPMENT WORKER
BASF NORTH WORKS FACILITY
WYANDOTTE, MICHIGAN
TIER 2 RISK ASSESSMENT

Chemical	Reference Risk (per mg/kg)	AOC 2		AOC 5		AOC 6		AOC 7A		AOC 7C		SWMU F		SWMU G		SWMU H	
		EPC (mg/kg)	PELCR	EPC (mg/kg)	PELCR	EPC (mg/kg)	PELCR	EPC (mg/kg)	PELCR	EPC (mg/kg)	PELCR	EPC (mg/kg)	PELCR	EPC (mg/kg)	PELCR	EPC (mg/kg)	PELCR
1,2-DICHLOROETHANE	3.42E-10	NCOPC	NCOPC	1.00E+02	3.42E-08	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
1,2-DICHLOROPROPANE	NC	NCOPC	NCOPC	2.90E+03	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	1.09E+01	NC	NCOPC	NCOPC	2.62E+04	NC
ACETONE	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
2-PICOLINE	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
ARSENIC	5.85E-09	2.54E+01	1.49E-07	NCOPC	NCOPC	4.10E+01	2.40E-07	2.84E+01	1.66E-07	2.37E+01	1.39E-07	4.22E+01	2.47E-07	5.21E+01	3.05E-07	2.73E+01	1.60E-07
BENZENE	2.07E-10	NCOPC	NCOPC	NCOPC	NCOPC	8.43E+02	1.74E-07	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
BENZO(A)ANTHRACENE	3.37E-09	NCOPC	NCOPC	NCOPC	NCOPC	3.93E+01	1.32E-07	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
BENZO(A)PYRENE	3.37E-08	NCOPC	NCOPC	NCOPC	NCOPC	2.96E+01	9.98E-07	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
BENZO(B)FLUORANTHENE	3.37E-09	NCOPC	NCOPC	NCOPC	NCOPC	3.36E+01	1.13E-07	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
BIS(2-ETHYLHEXYL)PHTHAL	5.27E-11	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
BIS(2-CHLOROETHYL)ETHE	4.14E-09	NCOPC	NCOPC	6.40E+00	2.65E-08	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
BIS(2-CHLOROISOPROPYL)E	2.63E-10	NCOPC	NCOPC	4.00E+01	1.05E-08	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	5.91E+00	1.56E-09	NCOPC	NCOPC	7.60E+02	2.00E-07
CADMIUM	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
CHLOROFORM	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
CHROMIUM	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	5.33E+01	NC
COBALT	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
CYANIDE	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
DIBENZ(AH)ANTHRACENE	3.37E-08	NCOPC	NCOPC	NCOPC	NCOPC	2.99E+00	1.01E-07	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
ETHYLBENZENE	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
LEAD	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
MERCURY	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	2.81E+01	NC
METHYLENE CHLORIDE	2.82E-11	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
NAPHTHALENE	NC	NCOPC	NCOPC	NCOPC	NCOPC	1.37E+03	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
NICKEL	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
PENTACHLOROPHENOL	6.56E-10	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
PHENANTHRENE	NC	NCOPC	NCOPC	NCOPC	NCOPC	2.49E+02	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
THALLIUM	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
TOLUENE	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
VANADIUM	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
XYLENES (TOTAL)	NC	NCOPC	NCOPC	NCOPC	NCOPC	1.04E+02	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
ZINC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
Total:			**1.49E-07**		**7.12E-08**		**1.76E-06**		**1.66E-07**		**1.39E-07**		**2.49E-07**		**3.05E-07**		**3.60E-07**

Notes:
AOC - Area of Concern.
EPC - Exposure Point Concentration.
NC - Not calculated, no dose-response value available.
NCOPC - Not a chemical of potential concern in this area/medium.
PELCR - Potential Excess Lifetime Cancer Risk.
SWMU - Solid Waste Management Unit.

TABLE D-11D
BASF NORTH WORKS FACILITY
WYANDOTTE, MICHIGAN
TIER 2 RISK ASSESSMENT
NONCARCINOGENIC ASSESSMENT
DERMAL CONTACT
AND INGESTION OF SOIL
FOR UTILITY/REDEVELOPMENT WORKER

Chemical	Unit Concentration In Soil (mg/kg-soil)	Dermal Absorption Factor	Oral Reference Dose (mg/kg-day)	Dermal Reference Dose (mg/kg-day)	ADDing (mg/kg-day)	Chronic Average Daily Dose-Ing. (mg/kg-day)	ADDder (mg/kg-day)	Chronic Average Daily Dose-Der. (mg/kg-day)	Potential Hazard Quotient per Unit Concentration		
									Ingestion	Dermal Contact	Total
1,2-DICHLOROETHANE	1.00E+00	1.00E-02	2.00E-02	2.00E-02	2.58E-07	2.58E-07	4.97E-09	4.97E-09	1.29E-05	2.48E-07	1.32E-05
1,2-DICHLOROPROPANE	1.00E+00	1.00E-02	4.40E-01	4.40E-01	2.58E-07	2.58E-07	4.97E-09	4.97E-09	5.87E-07	1.13E-08	5.98E-07
ACETONE	1.00E+00	1.00E-02	9.00E-01	9.00E-01	2.58E-07	2.58E-07	4.97E-09	4.97E-09	2.87E-07	5.52E-09	2.93E-07
2-PICOLINE	1.00E+00	1.00E-02	1.00E-03	1.00E-03	2.58E-07	2.58E-07	4.97E-09	4.97E-09	2.58E-04	4.97E-06	2.63E-04
ARSENIC	1.00E+00	3.00E-02	3.00E-04	3.00E-04	2.58E-07	2.58E-07	1.49E-08	1.49E-08	8.61E-04	4.97E-05	9.11E-04
BENZENE	1.00E+00	1.00E-02	1.20E-02	1.20E-02	2.58E-07	2.58E-07	4.97E-09	4.97E-09	2.15E-05	4.14E-07	2.19E-05
BENZO(A)ANTHRACENE	1.00E+00	1.30E-01	3.00E-01	3.00E-01	2.58E-07	2.58E-07	6.46E-08	6.46E-08	8.61E-07	2.15E-07	1.08E-06
BENZO(A)PYRENE	1.00E+00	1.30E-01	3.00E-01	3.00E-01	2.58E-07	2.58E-07	6.46E-08	6.46E-08	8.61E-07	2.15E-07	1.08E-06
BENZO(B)FLUORANTHENE	1.00E+00	1.30E-01	3.00E-01	3.00E-01	2.58E-07	2.58E-07	6.46E-08	6.46E-08	8.61E-07	2.15E-07	1.08E-06
BIS(2-ETHYLHEXYL)PHTHALATE	1.00E+00	1.00E-02	2.00E-02	2.00E-02	2.58E-07	2.58E-07	4.97E-09	4.97E-09	1.29E-05	2.48E-07	1.32E-05
BIS(2-CHLOROETHYL)ETHER	1.00E+00	1.00E-02	4.00E-02	4.00E-02	2.58E-07	2.58E-07	4.97E-09	4.97E-09	6.46E-06	1.24E-07	6.58E-06
BIS(2-CHLOROISOPROPYL)ETHER	1.00E+00	1.00E-02	4.00E-02	4.00E-02	2.58E-07	2.58E-07	4.97E-09	4.97E-09	6.46E-06	1.24E-07	6.58E-06
CADMIUM	1.00E+00	1.00E-03	5.00E-04	2.50E-05	2.58E-07	2.58E-07	4.97E-10	4.97E-10	5.17E-04	1.99E-05	5.36E-04
CHLOROFORM	1.00E+00	1.00E-02	1.00E-02	1.00E-02	2.58E-07	2.58E-07	4.97E-09	4.97E-09	2.58E-05	4.97E-07	2.63E-05
CHROMIUM	1.00E+00	1.00E-03	1.50E+00	1.95E-02	2.58E-07	2.58E-07	4.97E-10	4.97E-10	1.72E-07	2.55E-08	1.98E-07
COBALT	1.00E+00	1.00E-03	2.00E-02	2.00E-02	2.58E-07	2.58E-07	4.97E-10	4.97E-10	1.29E-05	2.48E-08	1.29E-05
CYANIDE	1.00E+00	1.00E-03	2.00E-02	2.00E-02	2.58E-07	2.58E-07	4.97E-10	4.97E-10	1.29E-05	2.48E-08	1.29E-05
DIBENZ(AH)ANTHRACENE	1.00E+00	1.30E-01	3.00E-01	3.00E-01	2.58E-07	2.58E-07	6.46E-08	6.46E-08	8.61E-07	2.15E-07	1.08E-06
ETHYLBENZENE	1.00E+00	1.00E-02	1.00E-01	1.00E-01	2.58E-07	2.58E-07	4.97E-09	4.97E-09	2.58E-06	4.97E-08	2.63E-06
LEAD	1.00E+00	1.00E-03	NA	NA	2.58E-07	2.58E-07	4.97E-10	4.97E-10	NA	NA	NC
MERCURY	1.00E+00	1.00E-03	3.00E-03	2.10E-04	2.58E-07	2.58E-07	4.97E-10	4.97E-10	8.61E-05	2.36E-06	8.85E-05
METHYLENE CHLORIDE	1.00E+00	1.00E-02	6.00E-02	6.00E-02	2.58E-07	2.58E-07	4.97E-09	4.97E-09	4.31E-06	8.28E-08	4.39E-06
NAPHTHALENE	1.00E+00	1.30E-01	2.00E-01	2.00E-01	2.58E-07	2.58E-07	6.46E-08	6.46E-08	1.29E-06	3.23E-07	1.61E-06
NICKEL	1.00E+00	1.00E-03	2.00E-02	8.00E-04	2.58E-07	2.58E-07	4.97E-10	4.97E-10	1.29E-05	6.21E-07	1.35E-05
PENTACHLOROPHENOL	1.00E+00	2.50E-01	3.00E-02	3.00E-02	2.58E-07	2.58E-07	1.24E-07	1.24E-07	8.61E-06	4.14E-06	1.27E-05
PHENANTHRENE	1.00E+00	1.30E-01	3.00E-01	3.00E-01	2.58E-07	2.58E-07	6.46E-08	6.46E-08	8.61E-07	2.15E-07	1.08E-06
THALLIUM	1.00E+00	1.00E-03	6.67E-04	6.67E-04	2.58E-07	2.58E-07	4.97E-10	4.97E-10	3.87E-04	7.45E-07	3.88E-04
TOLUENE	1.00E+00	1.00E-02	8.00E-01	8.00E-01	2.58E-07	2.58E-07	4.97E-09	4.97E-09	3.23E-07	6.21E-09	3.29E-07
VANADIUM	1.00E+00	1.00E-03	1.00E-03	2.60E-05	2.58E-07	2.58E-07	4.97E-10	4.97E-10	2.58E-04	1.91E-05	2.77E-04
XYLENES (TOTAL)	1.00E+00	1.00E-02	2.00E-01	2.00E-01	2.58E-07	2.58E-07	4.97E-09	4.97E-09	1.29E-06	2.48E-08	1.32E-06
ZINC	1.00E+00	1.00E-03	3.00E-01	3.00E-01	2.58E-07	2.58E-07	4.97E-10	4.97E-10	8.61E-07	1.66E-09	8.63E-07

TABLE D-11E
POTENTIAL NONCARCINOGENIC HAZARD
RISK BY DERMAL CONTACT WITH
AND INGESTION OF SOIL
FOR UTILITY/REDEVELOPMENT WORKER
BASF NORTH WORKS FACILITY
WYANDOTTE, MICHIGAN
TIER 2 RISK ASSESSMENT

	Reference	AOC 2		AOC 5		AOC 6		AOC 7A		AOC 7C		SWMU F		SWMU G		SWMU H	
Chemical	HQ (per mg/kg)	EPC (mg/kg)	HQ	EPC (mg/kg)	HQ	EPC (mg/kg)	HQ	EPC (mg/kg)	HQ	EPC (mg/kg)	HQ	EPC (mg/kg)	HQ	EPC (mg/kg)	HQ	EPC (mg/kg)	HQ
1,2-DICHLOROETHANE	1.32E-05	NCOPC	NCOPC	1.00E+02	1.32E-03	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
1,2-DICHLOROPROPANE	5.98E-07	NCOPC	NCOPC	2.90E+03	1.74E-03	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	1.09E+01	6.49E-06	NCOPC	NCOPC	2.62E+04	1.57E-02
ACETONE	2.93E-07	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
2-PICOLINE	2.63E-04	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
ARSENIC	9.11E-04	2.54E+01	2.31E-02	NCOPC	NCOPC	4.10E+01	3.74E-02	2.84E+01	2.59E-02	2.37E+01	2.15E-02	4.22E+01	3.85E-02	5.21E+01	4.74E-02	2.73E+01	2.49E-02
BENZENE	2.19E-05	NCOPC	NCOPC	NCOPC	NCOPC	8.43E+02	1.85E-02	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
BENZO(A)ANTHRACENE	1.08E-06	NCOPC	NCOPC	NCOPC	NCOPC	3.93E+01	4.23E-05	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
BENZO(A)PYRENE	1.08E-06	NCOPC	NCOPC	NCOPC	NCOPC	2.96E+01	3.19E-05	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
BENZO(B)FLUORANTHENE	1.08E-06	NCOPC	NCOPC	NCOPC	NCOPC	3.36E+01	3.62E-05	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
BIS(2-ETHYLHEXYL)PHTHAL	1.32E-05	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
BIS(2-CHLOROETHYL)ETHEI	6.58E-06	NCOPC	NCOPC	6.40E+00	4.21E-05	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
BIS(2-CHLOROISOPROPYL)E	6.58E-06	NCOPC	NCOPC	4.00E+01	2.63E-04	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	5.91E+00	3.89E-05	NCOPC	NCOPC	7.60E+02	5.00E-03
CADMIUM	5.36E-04	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
CHLOROFORM	2.63E-05	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
CHROMIUM	1.98E-07	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	5.33E+01	1.05E-05
COBALT	1.29E-05	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
CYANIDE	1.29E-05	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
DIBENZ(AH)ANTHRACENE	1.08E-06	NCOPC	NCOPC	NCOPC	NCOPC	2.99E+00	3.22E-06	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
ETHYLBENZENE	2.63E-06	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
LEAD	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
MERCURY	8.85E-05	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	2.81E+01	2.48E-03
METHYLENE CHLORIDE	4.39E-06	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
NAPHTHALENE	1.61E-06	NCOPC	NCOPC	NCOPC	NCOPC	1.37E+03	2.21E-03	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
NICKEL	1.35E-05	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
PENTACHLOROPHENOL	1.27E-05	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
PHENANTHRENE	1.08E-06	NCOPC	NCOPC	NCOPC	NCOPC	2.49E+02	2.68E-04	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
THALLIUM	3.88E-04	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
TOLUENE	3.29E-07	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
VANADIUM	2.77E-04	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
XYLENES (TOTAL)	1.32E-06	NCOPC	NCOPC	NCOPC	NCOPC	1.04E+02	1.37E-04	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
ZINC	8.63E-07	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
Total Hazard Index:			**2.31E-02**		**3.36E-03**		**5.86E-02**		**2.59E-02**		**2.15E-02**		**3.85E-02**		**4.74E-02**		**4.80E-02**

Notes:
AOC - Area of Concern.
EPC - Exposure Point Concentration.
HQ - Hazard Quotient.
NC - Not calculated, no dose-response value available.
NCOPC - Not a chemical of potential concern in this area/medium.
SWMU - Solid Waste Management Unit.

TABLE D-12A
BASF NORTH WORKS FACILITY
WYANDOTTE, MICHIGAN
TIER 2 RISK ASSESSMENT

Receptors Evaluated:	
Receptor 1:	Utility/Redevelopment Worker
Receptor 2:	
Receptor 3:	

CARCINOGENIC AND NONCARCINOGENIC ASSUMPTIONS FOR UTILITY/REDEVELOPMENT WORKER INHALATION OF DUST AND VOLATILES FROM SOIL		Assumed Value	Units	Calculated Value
Inhalation Rate	Utility/Redevelopment Worker	2.5	(m^3 air/hour)	
Body Weight	Utility/Redevelopment Worker	70	(kg)	
Exposure Time	Utility/Redevelopment Worker	8	(hrs/day) =	8.00E+00
Exposure Frequency	Utility/Redevelopment Worker	20	(days)/365 (days) =	5.48E-02
Exposure Duration (cancer)	Utility/Redevelopment Worker	1	(yrs)/70(yrs) =	1.43E-02
Exposure Duration (noncancer)	Utility/Redevelopment Worker	1	(yrs)/1(yrs) =	1.00E+00
Lifetime		70	(years)	

TABLE D-12B
BASF NORTH WORKS FACILITY
WYANDOTTE, MICHIGAN
TIER 2 RISK ASSESSMENT
CARCINOGENIC ASSESSMENT
INHALATION OF
DUST AND VOLATILES FROM SOIL
FOR UTILITY/REDEVELOPMENT WORKER

Chemical	Unit Concentration In Air (mg/m^3 air)	Inhalation Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	ADDinh (mg/kg-day)	Lifetime Average Daily Dose - Inh. (mg/kg-day)	Potential Excess Lifetime Cancer Risk per Unit Concentration Inhalation
1,2-DICHLOROETHANE	1.00E+00	9.10E-02	2.24E-04	2.24E-04	2.04E-05
1,2-DICHLOROPROPANE	1.00E+00	NA	2.24E-04	2.24E-04	NC
ACETONE	1.00E+00	NA	2.24E-04	2.24E-04	NC
2-PICOLINE	1.00E+00	NA	2.24E-04	2.24E-04	NC
ARSENIC	1.00E+00	1.51E+01	2.24E-04	2.24E-04	3.38E-03
BENZENE	1.00E+00	2.73E-02	2.24E-04	2.24E-04	6.11E-06
BENZO(A)ANTHRACENE	1.00E+00	3.10E-01	2.24E-04	2.24E-04	6.93E-05
BENZO(A)PYRENE	1.00E+00	3.10E+00	2.24E-04	2.24E-04	6.93E-04
BENZO(B)FLUORANTHENE	1.00E+00	3.10E-01	2.24E-04	2.24E-04	6.93E-05
BIS(2-ETHYLHEXYL)PHTHALATE	1.00E+00	NA	2.24E-04	2.24E-04	NC
BIS(2-CHLOROETHYL)ETHER	1.00E+00	1.16E+00	2.24E-04	2.24E-04	2.58E-04
BIS(2-CHLOROISOPROPYL)ETH	1.00E+00	3.50E-02	2.24E-04	2.24E-04	7.83E-06
CADMIUM	1.00E+00	6.30E+00	2.24E-04	2.24E-04	1.41E-03
CHLOROFORM	1.00E+00	8.05E-02	2.24E-04	2.24E-04	1.80E-05
CHROMIUM	1.00E+00	NA	2.24E-04	2.24E-04	NC
COBALT	1.00E+00	NA	2.24E-04	2.24E-04	NC
CYANIDE	1.00E+00	NA	2.24E-04	2.24E-04	NC
DIBENZ(AH)ANTHRACENE	1.00E+00	3.10E+00	2.24E-04	2.24E-04	6.93E-04
ETHYLBENZENE	1.00E+00	NA	2.24E-04	2.24E-04	NC
LEAD	1.00E+00	NA	2.24E-04	2.24E-04	NC
MERCURY	1.00E+00	NA	2.24E-04	2.24E-04	NC
METHYLENE CHLORIDE	1.00E+00	1.65E-03	2.24E-04	2.24E-04	3.68E-07
NAPHTHALENE	1.00E+00	NA	2.24E-04	2.24E-04	NC
NICKEL	1.00E+00	8.40E-01	2.24E-04	2.24E-04	1.88E-04
PENTACHLOROPHENOL	1.00E+00	NA	2.24E-04	2.24E-04	NC
PHENANTHRENE	1.00E+00	NA	2.24E-04	2.24E-04	NC
THALLIUM	1.00E+00	NA	2.24E-04	2.24E-04	NC
TOLUENE	1.00E+00	NA	2.24E-04	2.24E-04	NC
VANADIUM	1.00E+00	NA	2.24E-04	2.24E-04	NC
XYLENES (TOTAL)	1.00E+00	NA	2.24E-04	2.24E-04	NC
ZINC	1.00E+00	NA	2.24E-04	2.24E-04	NC

TABLE D-12C
POTENTIAL CARCINOGENIC RISK
RISK BY INHALATION OF
DUST AND VOLATILES FROM SOIL
FOR UTILITY/REDEVELOPMENT WORKER
BASF NORTH WORKS FACILITY
WYANDOTTE, MICHIGAN
TIER 2 RISK ASSESSMENT

Chemical	Reference Risk (per mg/m³)	AOC 2		AOC 5		AOC 6		AOC 7A		AOC 7C		SWMU F		SWMU G		SWMU H	
		EPC (mg/m³)	PELCR	EPC (mg/m³)	PELCR	EPC (mg/m³)	PELCR	EPC (mg/m³)	PELCR	EPC (mg/m³)	PELCR	EPC (mg/m³)	PELCR	EPC (mg/m³)	PELCR	EPC (mg/m³)	PELCR
1,2-DICHLOROETHANE	2.04E-05	NCOPC	NCOPC	2.63E-01	5.36E-06	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
1,2-DICHLOROPROPANE	NC	NCOPC	NCOPC	9.25E+00	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	2.25E-02	NC	NCOPC	NCOPC	5.58E+01	NC
ACETONE	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
2-PICOLINE	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
ARSENIC	3.38E-03	2.60E-03	8.78E-06	NCOPC	NCOPC	6.92E-03	2.34E-05	4.79E-03	1.62E-05	3.99E-03	1.35E-05	7.12E-03	2.40E-05	5.33E-03	1.80E-05	4.60E-03	1.55E-05
BENZENE	6.11E-06	NCOPC	NCOPC	NCOPC	NCOPC	2.52E+00	1.54E-05	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
BENZO(A)ANTHRACENE	6.93E-05	NCOPC	NCOPC	NCOPC	NCOPC	6.63E-03	4.60E-07	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
BENZO(A)PYRENE	6.93E-04	NCOPC	NCOPC	NCOPC	NCOPC	4.99E-03	3.46E-06	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
BENZO(B)FLUORANTHENE	6.93E-05	NCOPC	NCOPC	NCOPC	NCOPC	5.67E-03	3.93E-07	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
BIS(2-ETHYLHEXYL)PHTHALATE	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
BIS(2-CHLOROETHYL)ETHER	2.58E-04	NCOPC	NCOPC	2.04E-02	5.27E-06	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
BIS(2-CHLOROISOPROPYL)ETHER	7.83E-06	NCOPC	NCOPC	1.28E-01	9.99E-07	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	1.78E-03	1.40E-08	NCOPC	NCOPC	2.35E-01	1.84E-06
CADMIUM	1.41E-03	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
CHLOROFORM	1.80E-05	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
CHROMIUM	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	8.98E-03	NC
COBALT	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
CYANIDE	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
DIBENZ(AH)ANTHRACENE	6.93E-04	NCOPC	NCOPC	NCOPC	NCOPC	5.04E-04	3.49E-07	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
ETHYLBENZENE	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
LEAD	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
MERCURY	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	4.73E-03	NC
METHYLENE CHLORIDE	3.68E-07	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
NAPHTHALENE	NC	NCOPC	NCOPC	NCOPC	NCOPC	2.48E-01	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
NICKEL	1.88E-04	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
PENTACHLOROPHENOL	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
PHENANTHRENE	NC	NCOPC	NCOPC	NCOPC	NCOPC	4.19E-02	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
THALLIUM	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
TOLUENE	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
VANADIUM	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
XYLENES (TOTAL)	NC	NCOPC	NCOPC	NCOPC	NCOPC	1.80E-01	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
ZINC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
Total:			**8.78E-06**		**1.16E-05**		**4.34E-05**		**1.62E-05**		**1.35E-05**		**2.41E-05**		**1.80E-05**		**1.74E-05**

Notes:
AOC - Area of Concern.
EPC - Exposure Point Concentration.
NC - Not calculated, no dose-response value available.
NCOPC - Not a chemical of potential concern in this area/medium.
PELCR - Potential Excess Lifetime Cancer Risk.
SWMU - Solid Waste Management Unit.

TABLE D-12D
BASF NORTH WORKS FACILITY
WYANDOTTE, MICHIGAN
TIER 2 RISK ASSESSMENT
NONCARCINOGENIC ASSESSMENT
INHALATION OF
DUST AND VOLATILES FROM SOIL
FOR UTILITY/REDEVELOPMENT WORKER

Chemical	Unit Concentration In Air (mg/m^3 air)	Inhalation Reference Dose (mg/kg-day)	ADDinh (mg/kg-day)	Chronic Average Daily Dose-inh (mg/kg-day)	Potential Hazard Quotient per Unit Concentration Inhalation
1,2-DICHLOROETHANE	1.00E+00	7.00E-01	1.57E-02	1.57E-02	2.24E-02
1,2-DICHLOROPROPANE	1.00E+00	3.43E-03	1.57E-02	1.57E-02	4.57E+00
ACETONE	1.00E+00	9.00E-01	1.57E-02	1.57E-02	1.74E-02
2-PICOLINE	1.00E+00	1.00E-03	1.57E-02	1.57E-02	1.57E+01
ARSENIC	1.00E+00	3.00E-04	1.57E-02	1.57E-02	5.22E+01
BENZENE	1.00E+00	2.57E-02	1.57E-02	1.57E-02	6.09E-01
BENZO(A)ANTHRACENE	1.00E+00	3.00E-01	1.57E-02	1.57E-02	5.22E-02
BENZO(A)PYRENE	1.00E+00	3.00E-01	1.57E-02	1.57E-02	5.22E-02
BENZO(B)FLUORANTHENE	1.00E+00	3.00E-01	1.57E-02	1.57E-02	5.22E-02
BIS(2-ETHYLHEXYL)PHTHALATE	1.00E+00	2.00E-02	1.57E-02	1.57E-02	7.83E-01
BIS(2-CHLOROETHYL)ETHER	1.00E+00	4.00E-02	1.57E-02	1.57E-02	3.91E-01
BIS(2-CHLOROISOPROPYL)ETHER	1.00E+00	4.00E-02	1.57E-02	1.57E-02	3.91E-01
CADMIUM	1.00E+00	5.70E-05	1.57E-02	1.57E-02	2.75E+02
CHLOROFORM	1.00E+00	1.43E-02	1.57E-02	1.57E-02	1.10E+00
CHROMIUM	1.00E+00	1.50E+00	1.57E-02	1.57E-02	1.04E-02
COBALT	1.00E+00	5.71E-06	1.57E-02	1.57E-02	2.74E+03
CYANIDE	1.00E+00	2.00E-02	1.57E-02	1.57E-02	7.83E-01
DIBENZ(AH)ANTHRACENE	1.00E+00	3.00E-01	1.57E-02	1.57E-02	5.22E-02
ETHYLBENZENE	1.00E+00	2.86E-01	1.57E-02	1.57E-02	5.48E-02
LEAD	1.00E+00	NA	1.57E-02	1.57E-02	NC
MERCURY	1.00E+00	8.57E-05	1.57E-02	1.57E-02	1.83E+02
METHYLENE CHLORIDE	1.00E+00	3.00E-01	1.57E-02	1.57E-02	5.22E-02
NAPHTHALENE	1.00E+00	2.57E-03	1.57E-02	1.57E-02	6.09E+00
NICKEL	1.00E+00	NA	1.57E-02	1.57E-02	NC
PENTACHLOROPHENOL	1.00E+00	3.00E-02	1.57E-02	1.57E-02	5.22E-01
PHENANTHRENE	1.00E+00	3.00E-01	1.57E-02	1.57E-02	5.22E-02
THALLIUM	1.00E+00	NA	1.57E-02	1.57E-02	NC
TOLUENE	1.00E+00	1.43E+00	1.57E-02	1.57E-02	1.10E-02
VANADIUM	1.00E+00	NA	1.57E-02	1.57E-02	NC
XYLENES (TOTAL)	1.00E+00	8.57E-02	1.57E-02	1.57E-02	1.83E-01
ZINC	1.00E+00	NA	1.57E-02	1.57E-02	NC

TABLE D-12E
POTENTIAL NONCARCINOGENIC HAZARD
RISK BY INHALATION OF
DUST AND VOLATILES FROM SOIL
FOR UTILITY/REDEVELOPMENT WORKER
BASF NORTH WORKS FACILITY
WYANDOTTE, MICHIGAN
TIER 2 RISK ASSESSMENT

Chemical	Reference HQ (per mg/m³)	AOC 2		AOC 5		AOC 6		AOC 7A		AOC 7C		SWMU F		SWMU G		SWMU H	
		EPC (mg/m³)	HQ	EPC (mg/m³)	HQ	EPC (mg/m³)	HQ	EPC (mg/m³)	HQ	EPC (mg/m³)	HQ	EPC (mg/m³)	HQ	EPC (mg/m³)	HQ	EPC (mg/m³)	HQ
1,2-DICHLOROETHANE	2.24E-02	NCOPC	NCOPC	2.63E-01	5.89E-03	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
1,2-DICHLOROPROPANE	4.57E+00	NCOPC	NCOPC	9.25E+00	4.22E+01	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	2.25E-02	1.03E-01	NCOPC	NCOPC	5.58E+01	2.55E+02
ACETONE	1.74E-02	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
2-PICOLINE	1.57E+01	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
ARSENIC	5.22E+01	2.60E-03	1.36E-01	NCOPC	NCOPC	6.92E-03	3.61E-01	4.79E-03	2.50E-01	3.99E-03	2.08E-01	7.12E-03	3.71E-01	5.33E-03	2.78E-01	4.60E-03	2.40E-01
BENZENE	6.09E-01	NCOPC	NCOPC	NCOPC	NCOPC	2.52E+00	1.53E+00	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
BENZO(A)ANTHRACENE	5.22E-02	NCOPC	NCOPC	NCOPC	NCOPC	6.63E-03	3.46E-04	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
BENZO(A)PYRENE	5.22E-02	NCOPC	NCOPC	NCOPC	NCOPC	4.99E-03	2.61E-04	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
BENZO(B)FLUORANTHENE	5.22E-02	NCOPC	NCOPC	NCOPC	NCOPC	5.67E-03	2.96E-04	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
BIS(2-ETHYLHEXYL)PHTHALATE	7.83E-01	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
BIS(2-CHLOROETHYL)ETHER	3.91E-01	NCOPC	NCOPC	2.04E-02	7.99E-03	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
BIS(2-CHLOROISOPROPYL)ETHER	3.91E-01	NCOPC	NCOPC	1.28E-01	4.99E-02	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	1.78E-03	6.98E-04	NCOPC	NCOPC	2.35E-01	9.19E-02
CADMIUM	2.75E+02	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
CHLOROFORM	1.10E+00	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
CHROMIUM	1.04E-02	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	8.98E-03	9.37E-05
COBALT	2.74E+03	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
CYANIDE	7.83E-01	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
DIBENZ(AH)ANTHRACENE	5.22E-02	NCOPC	NCOPC	NCOPC	NCOPC	5.04E-04	2.63E-05	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
ETHYLBENZENE	5.48E-02	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
LEAD	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
MERCURY	1.83E+02	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	4.73E-03	8.63E-01
METHYLENE CHLORIDE	5.22E-02	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
NAPHTHALENE	6.09E+00	NCOPC	NCOPC	NCOPC	NCOPC	2.48E-01	1.51E+00	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
NICKEL	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
PENTACHLOROPHENOL	5.22E-01	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
PHENANTHRENE	5.22E-02	NCOPC	NCOPC	NCOPC	NCOPC	4.19E-02	2.19E-03	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
THALLIUM	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
TOLUENE	1.10E-02	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
VANADIUM	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
XYLENES (TOTAL)	1.83E-01	NCOPC	NCOPC	NCOPC	NCOPC	1.80E-01	3.29E-02	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
ZINC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
Total Hazard Index:			**1.36E-01**		**4.23E+01**		**3.44E+00**		**2.50E-01**		**2.08E-01**		**4.75E-01**		**2.78E-01**		**2.56E+02**

Notes:
AOC - Area of Concern.
EPC - Exposure Point Concentration.
HQ - Hazard Quotient.
NC - Not calculated, no dose-response value available.
NCOPC - Not a chemical of potential concern in this area/medium.
SWMU - Solid Waste Management Unit.

TABLE D-13A
BASF NORTH WORKS FACILITY
WYANDOTTE, MICHIGAN
TIER 2 RISK ASSESSMENT

Receptors Evaluated:	
Receptor 1:	Utility/Redevelopment Worker

CARCINOGENIC AND NONCARCINOGENIC ASSUMPTIONS FOR UTILITY/REDEVELOPMENT WORKER DERMAL CONTACT AND INCIDENTAL INGESTION OF GROUNDWATER		Assumed Value	Units	Calculated Value
Water Ingestion Rate	Utility/Redevelopment Worker	0.005	(l/day)	
Skin Exposed	Utility/Redevelopment Worker	3339	(cm^2)	
Body Weight	Utility/Redevelopment Worker	70	(kg)	
Exposure Time (dermal only)	Utility/Redevelopment Worker	2	(hr/day)	
Event Frequency (dermal only)	Utility/Redevelopment Worker	1	(event/day)	
Exposure Frequency	Utility/Redevelopment Worker	20	(days)/365 (days) =	5.48E-02
Exposure Duration (cancer)	Utility/Redevelopment Worker	1	(yrs)/ 70(yrs) =	1.43E-02
Exposure Duration (noncancer)	Utility/Redevelopment Worker	1	(yrs)/ 1(yrs) =	1.00E+00
Lifetime		70		
Unit Conversion Factor (dermal only)		0.001	(l/cm^3)	

TABLE D-13B
BASF NORTH WORKS FACILITY
WYANDOTTE, MICHIGAN
CARCINOGENIC ASSESSMENT - UNIT RISK CALCULATION
UTILITY/REDEVELOPMENT WORKER
DERMAL CONTACT AND INCIDENTAL INGESTION
OF GROUNDWATER

Chemical	Unit Concentration In Groundwater (mg/l)	Oral Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Dermal Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Dermal Permeability Constant (cm/hr)	B (unitless)	Lag Time (τ) (hr/event)	Time to steady state t^* (hr)	Fraction Absorbed	Exposure Time (hr)		DA event Dose Absorbed (mg/cm^2-event)	ADDing (mg/kg-day)	Lifetime Average Daily Dose - ing. (mg/kg-day)	DAD (mg/kg-day)	Lifetime Average Daily Dose - Derm. (mg/kg-day)	Potential Lifetime Cancer Risk Per Unit Concentration		
																Ingestion	Dermal Contact	Total
Inorganics																		
ARSENIC	1.00E+00	1.50E+00	1.50E+00	1.00E-03	--	--	--	--	2.00E+00		2.00E-06	5.59E-08	5.59E-08	7.47E-08	7.47E-08	8.39E-08	1.12E-07	1.96E-07
CADMIUM	1.00E+00	NA	NA	1.00E-03	--	--	--	--	2.00E+00		2.00E-06	5.59E-08	5.59E-08	7.47E-08	7.47E-08	NA	NA	NC
CHROMIUM	1.00E+00	NA	NA	1.00E-03	--	--	--	--	2.00E+00		2.00E-06	5.59E-08	5.59E-08	7.47E-08	7.47E-08	NA	NA	NC
COBALT	1.00E+00	NA	NA	1.50E-04	--	--	--	--	2.00E+00		3.00E-07	5.59E-08	5.59E-08	1.12E-08	1.12E-08	NA	NA	NC
CYANIDE	1.00E+00	NA	NA	1.00E-03	--	--	--	--	2.00E+00		2.00E-06	5.59E-08	5.59E-08	7.47E-08	7.47E-08	NA	NA	NC
LEAD	1.00E+00	NA	NA	1.50E-04	--	--	--	--	2.00E+00		3.00E-07	5.59E-08	5.59E-08	1.12E-08	1.12E-08	NA	NA	NC
MERCURY	1.00E+00	NA	NA	1.00E-03	--	--	--	--	2.00E+00		2.00E-06	5.59E-08	5.59E-08	7.47E-08	7.47E-08	NA	NA	NC
NICKEL	1.00E+00	NA	NA	2.00E-04	--	--	--	--	2.00E+00		4.00E-07	5.59E-08	5.59E-08	1.49E-08	1.49E-08	NA	NA	NC
THALLIUM	1.00E+00	NA	NA	1.00E-03	--	--	--	--	2.00E+00		2.00E-06	5.59E-08	5.59E-08	7.47E-08	7.47E-08	NA	NA	NC
VANADIUM	1.00E+00	NA	NA	1.00E-03	--	--	--	--	2.00E+00		2.00E-06	5.59E-08	5.59E-08	7.47E-08	7.47E-08	NA	NA	NC
ZINC	1.00E+00	NA	NA	6.00E-04	--	--	--	--	2.00E+00		1.20E-06	5.59E-08	5.59E-08	4.48E-08	4.48E-08	NA	NA	NC
Organics																		
1,2-DICHLOROETHANE	1.00E+00	9.10E-02	9.10E-02	4.20E-03	1.61E-02	3.80E-01	9.20E-01	1.00E+00	2.00E+00	ET>t*	1.15E-05	5.59E-08	5.59E-08	4.30E-07	4.30E-07	5.09E-09	3.91E-08	4.42E-08
1,2-DICHLOROPROPANE	1.00E+00	NA	NA	7.80E-03	3.17E-02	4.60E-01	1.10E+00	1.00E+00	2.00E+00	ET>t*	2.25E-05	5.59E-08	5.59E-08	8.41E-07	8.41E-07	NA	NA	NC
ACETONE	1.00E+00	NA	NA	5.20E-04	1.53E-03	2.22E-01	5.34E-01	1.00E+00	2.00E+00	ET>t*	1.27E-06	5.59E-08	5.59E-08	4.75E-08	4.75E-08	NA	NA	NC
BENZENE	1.00E+00	5.50E-02	5.50E-02	1.50E-02	1.00E-01	2.90E-01	7.00E-01	1.00E+00	2.00E+00	ET>t*	3.68E-05	5.59E-08	5.59E-08	1.38E-06	1.38E-06	3.08E-09	7.56E-08	7.87E-08
BENZO(A)ANTHRACENE	1.00E+00	7.30E-01	7.30E-01	4.70E-01	2.80E+00	2.03E+00	8.53E+00	1.00E+00	2.00E+00	ET<t*	2.62E-03	5.59E-08	5.59E-08	9.77E-05	9.77E-05	4.08E-08	7.13E-05	7.14E-05
BENZO(A)PYRENE	1.00E+00	7.30E+00	7.30E+00	7.00E-01	4.30E+00	2.69E+00	1.17E+01	1.00E+00	2.00E+00	ET<t*	4.49E-03	5.59E-08	5.59E-08	1.68E-04	1.68E-04	4.08E-07	1.22E-03	1.22E-03
BENZO(B)FLUORANTHENE	1.00E+00	7.30E-01	7.30E-01	7.00E-01	4.30E+00	2.77E+00	1.20E+01	1.00E+00	2.00E+00	ET<t*	4.55E-03	5.59E-08	5.59E-08	1.70E-04	1.70E-04	4.08E-08	1.24E-04	1.24E-04
BIS(2-CHLOROETHYL)ETHER	1.00E+00	1.10E+00	1.10E+00	1.80E-03	8.17E-03	6.80E-01	1.62E+00	1.00E+00	2.00E+00	ET>t*	6.04E-06	5.59E-08	5.59E-08	2.25E-07	2.25E-07	6.15E-08	2.48E-07	3.10E-07
BIS(2-CHLOROISOPROPYL)ETHE	1.00E+00	7.00E-02	7.00E-02	9.08E-03	4.57E-02	9.55E-01	2.29E+00	1.00E+00	2.00E+00	ET<t*	3.47E-05	5.59E-08	5.59E-08	1.29E-06	1.29E-06	3.91E-09	9.06E-08	9.45E-08
CHLOROFORM	1.00E+00	NA	NA	6.80E-03	2.87E-02	5.00E-01	1.19E+00	1.00E+00	2.00E+00	ET>t*	2.02E-05	5.59E-08	5.59E-08	7.55E-07	7.55E-07	NA	NA	NC
DIBENZ(AH)ANTHRACENE	1.00E+00	7.30E+00	7.30E+00	1.50E+00	9.70E+00	3.88E+00	1.76E+01	6.00E-01	2.00E+00	ET<t*	6.93E-03	5.59E-08	5.59E-08	2.59E-04	2.59E-04	4.08E-07	1.89E-03	1.89E-03
ETHYLBENZENE	1.00E+00	NA	NA	4.90E-02	2.00E-01	4.20E-01	1.01E+00	1.00E+00	2.00E+00	ET>t*	1.31E-04	5.59E-08	5.59E-08	4.89E-06	4.89E-06	NA	NA	NC
METHYLENE CHLORIDE	1.00E+00	7.50E-03	7.50E-03	3.50E-03	1.26E-02	3.20E-01	7.60E-01	1.00E+00	2.00E+00	ET>t*	9.18E-06	5.59E-08	5.59E-08	3.43E-07	3.43E-07	4.19E-10	2.57E-09	2.99E-09
NAPHTHALENE	1.00E+00	NA	NA	4.70E-02	2.00E-01	5.60E-01	1.34E+00	1.00E+00	2.00E+00	ET>t*	1.41E-04	5.59E-08	5.59E-08	5.27E-06	5.27E-06	NA	NA	NC
PHENANTHRENE	1.00E+00	NA	NA	1.40E-01	7.00E-01	1.06E+00	4.11E+00	1.00E+00	2.00E+00	ET<t*	5.63E-04	5.59E-08	5.59E-08	2.10E-05	2.10E-05	NA	NA	NC
TOLUENE	1.00E+00	NA	NA	3.10E-02	1.00E-01	3.50E-01	8.40E-01	1.00E+00	2.00E+00	ET>t*	8.02E-05	5.59E-08	5.59E-08	3.00E-06	3.00E-06	NA	NA	NC
XYLENES (TOTAL)	1.00E+00	NA	NA	5.30E-02	2.00E-01	4.20E-01	1.01E+00	1.00E+00	2.00E+00	ET>t*	1.42E-04	5.59E-08	5.59E-08	5.28E-06	5.28E-06	NA	NA	NC
2-PICOLINE	1.00E+00	NA	NA	1.58E-03	8.86E-03	3.49E-01	8.39E-01	1.00E+00	2.00E+00	ET>t*	4.26E-06	5.59E-08	5.59E-08	1.59E-07	1.59E-07	NA	NA	NC
BIS(2-ETHYLHEXYL)PHTHALATE	1.00E+00	1.40E-02	1.40E-02	2.50E-02	2.00E-01	1.66E+01	3.99E+01	8.00E-01	2.00E+00	ET<t*	3.19E-04	5.59E-08	5.59E-08	1.19E-05	1.19E-05	7.83E-10	1.67E-07	1.67E-07
PENTACHLOROPHENOL	1.00E+00	1.20E-01	1.20E-01	3.90E-01	2.50E+00	3.33E+00	1.38E+01	9.00E-01	2.00E+00	ET<t*	2.50E-03	5.59E-08	5.59E-08	9.35E-05	9.35E-05	6.71E-09	1.12E-05	1.12E-05

TABLE D-13C
POTENTIAL CARCINOGENIC RISK
RISK BY DERMAL CONTACT WITH
AND INGESTION OF GROUNDWATER
UTILITY/REDEVELOPMENT WORKER
BASF NORTH WORKS FACILITY
WYANDOTTE, MICHIGAN
TIER 2 RISK ASSESSMENT

Chemical	Reference Risk (per mg/L)	AOC 1		AOC 2		AOC 5		AOC 6		AOC 7A		AOC 7B		AOC 7C	
		EPC (mg/L)	PELCR	EPC (mg/L)	PELCR	EPC (mg/L)	PELCR	EPC (mg/L)	PELCR	EPC (mg/L)	PELCR	EPC (mg/L)	PELCR	EPC (mg/L)	PELCR
1,2-DICHLOROETHANE	4.42E-08	NCOPC	NCOPC	NCOPC	NCOPC	2.00E+02	8.84E-06	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	2.00E+02	8.84E-06
1,2-DICHLOROPROPANE	NC	NCOPC	NCOPC	NCOPC	NCOPC	2.40E+03	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	2.40E+03	NC
ACETONE	NC	NCOPC	NCOPC	NCOPC	NCOPC	6.80E+01	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	6.80E+01	NC
2-PICOLINE	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	2.90E-02	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
ARSENIC	1.96E-07	3.60E-02	7.05E-09	2.73E-01	5.35E-08	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	3.80E-02	7.44E-09	NCOPC	NCOPC
BENZENE	7.87E-08	4.06E+00	3.20E-07	2.10E-02	1.65E-09	NCOPC	NCOPC	6.60E-02	5.20E-09	NCOPC	NCOPC	7.80E-03	6.14E-10	NCOPC	NCOPC
BENZO(A)ANTHRACENE	7.14E-05	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
BENZO(A)PYRENE	1.22E-03	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
BENZO(B)FLUORANTHENE	1.24E-04	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
BIS(2-ETHYLHEXYL)PHTHAL	1.67E-07	NCOPC	NCOPC	NCOPC	NCOPC	1.60E+01	2.68E-06	NCOPC	NCOPC	NCOPC	NCOPC	8.40E-03	1.41E-09	1.60E+01	2.68E-06
BIS(2-CHLOROETHYL)ETHEI	3.10E-07	4.69E-02	1.45E-08	NCOPC	NCOPC	1.45E+02	4.49E-05	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	1.45E+02	4.49E-05
BIS(2-CHLOROISOPROPYL)E	9.45E-08	NCOPC	NCOPC	NCOPC	NCOPC	4.85E+02	4.58E-05	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	4.85E+02	4.58E-05
CADMIUM	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	8.00E-03	NC	NCOPC	NCOPC
CHLOROFORM	NC	NCOPC	NCOPC	NCOPC	NCOPC	1.50E+01	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	1.50E+01	NC
CHROMIUM	NC	NCOPC	NCOPC	2.50E-01	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
COBALT	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
CYANIDE	NC	NCOPC	NCOPC	9.80E-01	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
DIBENZ(AH)ANTHRACENE	1.89E-03	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
ETHYLBENZENE	NC	1.71E+01	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
LEAD	NC	NCOPC	NCOPC	4.30E-03	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	2.39E-01	NC	NCOPC	NCOPC
MERCURY	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	3.34E-02	NC	NCOPC	NCOPC
METHYLENE CHLORIDE	2.99E-09	NCOPC	NCOPC	NCOPC	NCOPC	5.30E+01	1.58E-07	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	5.30E+01	1.58E-07
NAPHTHALENE	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
NICKEL	NC	NCOPC	NCOPC	1.50E+00	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
PENTACHLOROPHENOL	1.12E-05	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
PHENANTHRENE	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
THALLIUM	NC	NCOPC	NCOPC	9.60E-03	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
TOLUENE	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	2.18E+00	NC	NCOPC	NCOPC
VANADIUM	NC	NCOPC	NCOPC	1.90E-01	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	7.70E-02	NC	NCOPC	NCOPC
XYLENES (TOTAL)	NC	8.72E+00	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
ZINC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	1.41E+01	NC	NCOPC	NCOPC
Total:			**3.41E-07**		**5.51E-08**		**1.02E-04**		**5.20E-09**		**NC**		**9.46E-09**		**1.02E-04**

Notes:
AOC - Area of Concern.
EPC - Exposure Point Concentration.
NC - Not calculated, no dose-response value available.
NCOPC - Not a chemical of potential concern in this area/medium.
PELCR - Potential Excess Lifetime Cancer Risk.
SWMU - Solid Waste Management Unit.

TABLE D-13C
POTENTIAL CARCINOGENIC
RISK BY DERMAL CONTACT
AND INGESTION OF GROUNI
UTILITY/REDEVELOPMENT W
BASF NORTH WORKS FACILI
WYANDOTTE, MICHIGAN
TIER 2 RISK ASSESSMENT

Chemical	SWMU F		SWMU G		SWMU H (west end)		SWMU H (central)		SWMU H (east end)	
	EPC (mg/L)	PELCR	EPC (mg/L)	PELCR	EPC (mg/L)	PELCR	EPC (mg/L)	PELCR	EPC (mg/L)	PELCR
1,2-DICHLOROETHANE	NCOPC	NCOPC	NCOPC	NCOPC	2.00E+02	8.84E-06	NCOPC	NCOPC	NCOPC	NCOPC
1,2-DICHLOROPROPANE	1.30E-02	NC	NCOPC	NCOPC	2.40E+03	NC	NCOPC	NCOPC	NCOPC	NCOPC
ACETONE	NCOPC	NCOPC	NCOPC	NCOPC	6.80E+01	NC	NCOPC	NCOPC	NCOPC	NCOPC
2-PICOLINE	NCOPC	NCOPC	2.90E-02	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
ARSENIC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
BENZENE	NCOPC	NCOPC	6.60E-02	5.20E-09	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
BENZO(A)ANTHRACENE	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
BENZO(A)PYRENE	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
BENZO(B)FLUORANTHENE	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
BIS(2-ETHYLHEXYL)PHTHAL	NCOPC	NCOPC	NCOPC	NCOPC	1.60E+01	2.68E-06	NCOPC	NCOPC	NCOPC	NCOPC
BIS(2-CHLOROETHYL)ETHE	NCOPC	NCOPC	NCOPC	NCOPC	1.45E+02	4.49E-05	NCOPC	NCOPC	NCOPC	NCOPC
BIS(2-CHLOROISOPROPYL)E	9.40E-03	8.89E-10	NCOPC	NCOPC	4.85E+02	4.58E-05	NCOPC	NCOPC	NCOPC	NCOPC
CADMIUM	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
CHLOROFORM	NCOPC	NCOPC	NCOPC	NCOPC	1.50E+01	NC	NCOPC	NCOPC	NCOPC	NCOPC
CHROMIUM	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
COBALT	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
CYANIDE	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
DIBENZ(AH)ANTHRACENE	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
ETHYLBENZENE	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
LEAD	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
MERCURY	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
METHYLENE CHLORIDE	NCOPC	NCOPC	NCOPC	NCOPC	5.30E+01	1.58E-07	NCOPC	NCOPC	NCOPC	NCOPC
NAPHTHALENE	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
NICKEL	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
PENTACHLOROPHENOL	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	3.00E-03	3.37E-08
PHENANTHRENE	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
THALLIUM	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	6.20E-03	NC
TOLUENE	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
VANADIUM	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
XYLENES (TOTAL)	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
ZINC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
		8.89E-10		**5.20E-09**		**1.02E-04**		**NC**		**3.37E-08**

Notes:
AOC - Area of Concern.
EPC - Exposure Point Concentr
NC - Not calculated, no dose-re
NCOPC - Not a chemical of pot
PELCR - Potential Excess Lifeti
SWMU - Solid Waste Managem

TABLE D-13D
BASF NORTH WORKS FACILITY
WYANDOTTE, MICHIGAN
NONCARCINOGENIC ASSESSMENT - HAZARD INDEX CALCULATION
UTILITY/REDEVELOPMENT WORKER
DERMAL CONTACT AND INCIDENTAL INGESTION
OF GROUNDWATER

Chemical	Unit Concentration In Groundwater (mg/l)	Oral Reference Dose (mg/kg-day)	Dermal Reference Dose (mg/kg-day)	Dermal Permeability Constant (cm/hr)	B (unitless)	Lag Time (τ) (hr/event)	Time to steady state t* (hr)	Fraction Absorbed	Exposure Time (hr)		DA event Dose Absorbed (mg/cm^2-event)	ADDing (mg/kg-day)	Chronic Average Daily Dose-ing (mg/kg-day)	DAD (mg/kg-day)	Chronic Average Daily Dose-derm (mg/kg-day)	Unit Hazard Quotient Per Unit Concentration		
																Ingestion	Dermal Contact	Total
Inorganics																		
ARSENIC	1.00E+00	3.00E-04	3.00E-04	1.00E-03	--	--	--	--	2.00E+00		2.00E-06	3.91E-06	3.91E-06	5.23E-06	5.23E-06	1.30E-02	1.74E-02	3.05E-02
CADMIUM	1.00E+00	5.00E-04	2.50E-05	1.00E-03	--	--	--	--	2.00E+00		2.00E-06	3.91E-06	3.91E-06	5.23E-06	5.23E-06	7.83E-03	2.09E-01	2.17E-01
CHROMIUM	1.00E+00	1.50E+00	1.95E-02	1.00E-03	--	--	--	--	2.00E+00		2.00E-06	3.91E-06	3.91E-06	5.23E-06	5.23E-06	2.61E-06	2.68E-04	2.71E-04
COBALT	1.00E+00	2.00E-02	2.00E-02	1.50E-04	--	--	--	--	2.00E+00		3.00E-07	3.91E-06	3.91E-06	7.84E-07	7.84E-07	1.96E-04	3.92E-05	2.35E-04
CYANIDE	1.00E+00	2.00E-02	2.00E-02	1.00E-03	--	--	--	--	2.00E+00		2.00E-06	3.91E-06	3.91E-06	5.23E-06	5.23E-06	1.96E-04	2.61E-04	4.57E-04
LEAD	1.00E+00	NA	NA	1.50E-04	--	--	--	--	2.00E+00		3.00E-07	3.91E-06	3.91E-06	7.84E-07	7.84E-07	NA	NA	NC
MERCURY	1.00E+00	3.00E-03	2.10E-04	1.00E-03	--	--	--	--	2.00E+00		2.00E-06	3.91E-06	3.91E-06	5.23E-06	5.23E-06	1.30E-03	2.49E-02	2.62E-02
NICKEL	1.00E+00	2.00E-02	8.00E-04	2.00E-04	--	--	--	--	2.00E+00		4.00E-07	3.91E-06	3.91E-06	1.05E-06	1.05E-06	1.96E-04	1.31E-03	1.50E-03
THALLIUM	1.00E+00	6.67E-04	6.67E-04	1.00E-03	--	--	--	--	2.00E+00		2.00E-06	3.91E-06	3.91E-06	5.23E-06	5.23E-06	5.87E-03	7.84E-03	1.37E-02
VANADIUM	1.00E+00	1.00E-03	2.60E-05	1.00E-03	--	--	--	--	2.00E+00		2.00E-06	3.91E-06	3.91E-06	5.23E-06	5.23E-06	3.91E-03	2.01E-01	2.05E-01
ZINC	1.00E+00	3.00E-01	3.00E-01	6.00E-04	--	--	--	--	2.00E+00		1.20E-06	3.91E-06	3.91E-06	3.14E-06	3.14E-06	1.30E-05	1.05E-05	2.35E-05
Organics	1.00E+00																	
1,2-DICHLOROETHANE	1.00E+00	2.00E-02	2.00E-02	4.20E-03	1.61E-02	3.80E-01	9.20E-01	1.00E+00	2.00E+00	ET>t*	1.15E-05	3.91E-06	3.91E-06	3.01E-05	3.01E-05	1.96E-04	1.50E-03	1.70E-03
1,2-DICHLOROPROPANE	1.00E+00	4.40E-01	4.40E-01	7.80E-03	3.17E-02	4.60E-01	1.10E+00	1.00E+00	2.00E+00	ET>t*	2.25E-05	3.91E-06	3.91E-06	5.89E-05	5.89E-05	8.90E-06	1.34E-04	1.43E-04
ACETONE	1.00E+00	9.00E-01	9.00E-01	5.20E-04	1.53E-03	2.22E-01	5.34E-01	1.00E+00	2.00E+00	ET>t*	1.27E-06	3.91E-06	3.91E-06	3.32E-06	3.32E-06	4.35E-06	3.69E-06	8.04E-06
BENZENE	1.00E+00	1.20E-02	1.20E-02	1.50E-02	1.00E-01	2.90E-01	7.00E-01	1.00E+00	2.00E+00	ET>t*	3.68E-05	3.91E-06	3.91E-06	9.63E-05	9.63E-05	3.26E-04	8.02E-03	8.35E-03
BENZO(A)ANTHRACENE	1.00E+00	3.00E-01	3.00E-01	4.70E-01	2.80E+00	2.03E+00	8.53E+00	1.00E+00	2.00E+00	ET<t*	2.62E-03	3.91E-06	3.91E-06	6.84E-03	6.84E-03	1.30E-05	2.28E-02	2.28E-02
BENZO(A)PYRENE	1.00E+00	3.00E-01	3.00E-01	7.00E-01	4.30E+00	2.69E+00	1.17E+01	1.00E+00	2.00E+00	ET<t*	4.49E-03	3.91E-06	3.91E-06	1.17E-02	1.17E-02	1.30E-05	3.91E-02	3.91E-02
BENZO(B)FLUORANTHENE	1.00E+00	3.00E-01	3.00E-01	7.00E-01	4.30E+00	2.77E+00	1.20E+01	1.00E+00	2.00E+00	ET<t*	4.55E-03	3.91E-06	3.91E-06	1.19E-02	1.19E-02	1.30E-05	3.97E-02	3.97E-02
BIS(2-CHLOROETHYL)ETHER	1.00E+00	4.00E-02	4.00E-02	1.80E-03	8.17E-03	6.80E-01	1.62E+00	1.00E+00	2.00E+00	ET>t*	6.04E-06	3.91E-06	3.91E-06	1.58E-05	1.58E-05	9.78E-05	3.95E-04	4.92E-04
BIS(2-CHLOROISOPROPYL)ETHER	1.00E+00	4.00E-02	4.00E-02	9.08E-03	4.57E-02	9.55E-01	2.29E+00	1.00E+00	2.00E+00	ET<t*	3.47E-05	3.91E-06	3.91E-06	9.06E-05	9.06E-05	9.78E-05	2.27E-03	2.36E-03
CHLOROFORM	1.00E+00	1.00E-02	1.00E-02	6.80E-03	2.87E-02	5.00E-01	1.19E+00	1.00E+00	2.00E+00	ET>t*	2.02E-05	3.91E-06	3.91E-06	5.28E-05	5.28E-05	3.91E-04	5.28E-03	5.68E-03
DIBENZ(AH)ANTHRACENE	1.00E+00	3.00E-01	3.00E-01	1.50E+00	9.70E+00	3.88E+00	1.76E+01	6.00E-01	2.00E+00	ET<t*	6.93E-03	3.91E-06	3.91E-06	1.81E-02	1.81E-02	1.30E-05	6.04E-02	6.04E-02
ETHYLBENZENE	1.00E+00	1.00E-01	1.00E-01	4.90E-02	2.00E-01	4.20E-01	1.01E+00	1.00E+00	2.00E+00	ET>t*	1.31E-04	3.91E-06	3.91E-06	3.42E-04	3.42E-04	3.91E-05	3.42E-03	3.46E-03
METHYLENE CHLORIDE	1.00E+00	6.00E-02	6.00E-02	3.50E-03	1.26E-02	3.20E-01	7.60E-01	1.00E+00	2.00E+00	ET>t*	9.18E-06	3.91E-06	3.91E-06	2.40E-05	2.40E-05	6.52E-05	4.00E-04	4.65E-04
NAPHTHALENE	1.00E+00	2.00E-01	2.00E-01	4.70E-02	2.00E-01	5.60E-01	1.34E+00	1.00E+00	2.00E+00	ET>t*	1.41E-04	3.91E-06	3.91E-06	3.69E-04	3.69E-04	1.96E-05	1.85E-03	1.86E-03
PHENANTHRENE	1.00E+00	3.00E-01	3.00E-01	1.40E-01	7.00E-01	1.06E+00	4.11E+00	1.00E+00	2.00E+00	ET<t*	5.63E-04	3.91E-06	3.91E-06	1.47E-03	1.47E-03	1.30E-05	4.91E-03	4.92E-03
TOLUENE	1.00E+00	8.00E-01	8.00E-01	3.10E-02	1.00E-01	3.50E-01	8.40E-01	1.00E+00	2.00E+00	ET>t*	8.02E-05	3.91E-06	3.91E-06	2.10E-04	2.10E-04	4.89E-06	2.62E-04	2.67E-04
XYLENES (TOTAL)	1.00E+00	2.00E-01	2.00E-01	5.30E-02	2.00E-01	4.20E-01	1.01E+00	1.00E+00	2.00E+00	ET>t*	1.42E-04	3.91E-06	3.91E-06	3.70E-04	3.70E-04	1.96E-05	1.85E-03	1.87E-03
2-PICOLINE	1.00E+00	1.00E-03	1.00E-03	1.58E-03	8.86E-03	3.49E-01	8.39E-01	1.00E+00	2.00E+00	ET>t*	4.26E-06	3.91E-06	3.91E-06	1.11E-05	1.11E-05	3.91E-03	1.11E-02	1.50E-02
BIS(2-ETHYLHEXYL)PHTHALATE	1.00E+00	2.00E-02	2.00E-02	2.50E-02	2.00E-01	1.66E+01	3.99E+01	8.00E-01	2.00E+00	ET<t*	3.19E-04	3.91E-06	3.91E-06	8.34E-04	8.34E-04	1.96E-04	4.17E-02	4.19E-02
PENTACHLOROPHENOL	1.00E+00	3.00E-02	3.00E-02	3.90E-01	2.50E+00	3.33E+00	1.38E+01	9.00E-01	2.00E+00	ET<t*	2.50E-03	3.91E-06	3.91E-06	6.54E-03	6.54E-03	1.30E-04	2.18E-01	2.18E-01

TABLE D-13E
POTENTIAL NONCARCINOGENIC HAZARD
RISK BY DERMAL CONTACT WITH
AND INGESTION OF GROUNDWATER
UTILITY/REDEVELOPMENT WORKER
BASF NORTH WORKS FACILITY
WYANDOTTE, MICHIGAN
TIER 2 RISK ASSESSMENT

Chemical	Reference HQ (per mg/L)	AOC 1		AOC 2		AOC 5		AOC 6		AOC 7A		AOC 7B		AOC 7C	
		EPC (mg/L)	HQ	EPC (mg/L)	HQ	EPC (mg/L)	HQ	EPC (mg/L)	HQ	EPC (mg/L)	HQ	EPC (mg/L)	HQ	EPC (mg/L)	HQ
1,2-DICHLOROETHANE	1.70E-03	NCOPC	NCOPC	NCOPC	NCOPC	2.00E+02	3.40E-01	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	2.00E+02	3.40E-01
1,2-DICHLOROPROPANE	1.43E-04	NCOPC	NCOPC	NCOPC	NCOPC	2.40E+03	3.42E-01	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	2.40E+03	3.42E-01
ACETONE	8.04E-06	NCOPC	NCOPC	NCOPC	NCOPC	6.80E+01	5.47E-04	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	6.80E+01	5.47E-04
2-PICOLINE	1.50E-02	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	2.90E-02	4.36E-04	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
ARSENIC	3.05E-02	3.60E-02	1.10E-03	2.73E-01	8.32E-03	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	3.80E-02	1.16E-03	NCOPC	NCOPC
BENZENE	8.35E-03	4.06E+00	3.39E-02	2.10E-02	1.75E-04	NCOPC	NCOPC	6.60E-02	5.51E-04	NCOPC	NCOPC	7.80E-03	6.51E-05	NCOPC	NCOPC
BENZO(A)ANTHRACENE	2.28E-02	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
BENZO(A)PYRENE	3.91E-02	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
BENZO(B)FLUORANTHENE	3.97E-02	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
BIS(2-ETHYLHEXYL)PHTHALATE	4.19E-02	NCOPC	NCOPC	NCOPC	NCOPC	1.60E+01	6.70E-01	NCOPC	NCOPC	NCOPC	NCOPC	8.40E-03	3.52E-04	1.60E+01	6.70E-01
BIS(2-CHLOROETHYL)ETHER	4.92E-04	4.69E-02	2.31E-05	NCOPC	NCOPC	1.45E+02	7.14E-02	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	1.45E+02	7.14E-02
BIS(2-CHLOROISOPROPYL)ETHER	2.36E-03	NCOPC	NCOPC	NCOPC	NCOPC	4.85E+02	1.15E+00	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	4.85E+02	1.15E+00
CADMIUM	2.17E-01	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	8.00E-03	1.74E-03	NCOPC	NCOPC
CHLOROFORM	5.68E-03	NCOPC	NCOPC	NCOPC	NCOPC	1.50E+01	8.51E-02	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	1.50E+01	8.51E-02
CHROMIUM	2.71E-04	NCOPC	NCOPC	2.50E-01	6.77E-05	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
COBALT	2.35E-04	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
CYANIDE	4.57E-04	NCOPC	NCOPC	9.80E-01	4.48E-04	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
DIBENZ(AH)ANTHRACENE	6.04E-02	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
ETHYLBENZENE	3.46E-03	1.71E+01	5.91E-02	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
LEAD	NC	NCOPC	NCOPC	4.30E-03	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	2.39E-01	NC	NCOPC	NCOPC
MERCURY	2.62E-02	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	3.34E-02	8.75E-04	NCOPC	NCOPC
METHYLENE CHLORIDE	4.65E-04	NCOPC	NCOPC	NCOPC	NCOPC	5.30E+01	2.47E-02	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	5.30E+01	2.47E-02
NAPHTHALENE	1.86E-03	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
NICKEL	1.50E-03	NCOPC	NCOPC	1.50E+00	2.25E-03	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
PENTACHLOROPHENOL	2.18E-01	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
PHENANTHRENE	4.92E-03	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
THALLIUM	1.37E-02	NCOPC	NCOPC	9.60E-03	1.32E-04	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
TOLUENE	2.67E-04	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	2.18E+00	5.82E-04	NCOPC	NCOPC
VANADIUM	2.05E-01	NCOPC	NCOPC	1.90E-01	3.89E-02	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	7.70E-02	1.58E-02	NCOPC	NCOPC
XYLENES (TOTAL)	1.87E-03	8.72E+00	1.63E-02	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
ZINC	2.35E-05	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	1.41E+01	3.31E-04	NCOPC	NCOPC
Total Hazard Index:			**1.10E-01**		**5.03E-02**		**2.68E+00**		**9.87E-04**		**NC**		**2.09E-02**		**2.68E+00**

Notes:
AOC - Area of Concern.
EPC - Exposure Point Concentration.
HQ - Hazard Quotient.
NC - Not calculated, no dose-response value available.
NCOPC - Not a chemical of potential concern in this area/medium.
SWMU - Solid Waste Management Unit.

TABLE D-13E
POTENTIAL NONCARCINOGENIC HAZ
RISK BY DERMAL CONTACT WITH
AND INGESTION OF GROUNDWATER
UTILITY/REDEVELOPMENT WORKER
BASF NORTH WORKS FACILITY
WYANDOTTE, MICHIGAN
TIER 2 RISK ASSESSMENT

Chemical	SWMU F		SWMU G		SWMU H (west end)		SWMU H (central)		SWMU H (east end)	
	EPC (mg/L)	HQ	EPC (mg/L)	HQ	EPC (mg/L)	HQ	EPC (mg/L)	HQ	EPC (mg/L)	HQ
1,2-DICHLOROETHANE	NCOPC	NCOPC	NCOPC	NCOPC	2.00E+02	3.40E-01	NCOPC	NCOPC	NCOPC	NCOPC
1,2-DICHLOROPROPANE	1.30E-02	1.85E-06	NCOPC	NCOPC	2.40E+03	3.42E-01	NCOPC	NCOPC	NCOPC	NCOPC
ACETONE	NCOPC	NCOPC	NCOPC	NCOPC	6.80E+01	5.47E-04	NCOPC	NCOPC	NCOPC	NCOPC
2-PICOLINE	NCOPC	NCOPC	2.90E-02	4.36E-04	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
ARSENIC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
BENZENE	NCOPC	NCOPC	6.60E-02	5.51E-04	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
BENZO(A)ANTHRACENE	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
BENZO(A)PYRENE	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
BENZO(B)FLUORANTHENE	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
BIS(2-ETHYLHEXYL)PHTHALATE	NCOPC	NCOPC	NCOPC	NCOPC	1.60E+01	6.70E-01	NCOPC	NCOPC	NCOPC	NCOPC
BIS(2-CHLOROETHYL)ETHER	NCOPC	NCOPC	NCOPC	NCOPC	1.45E+02	7.14E-02	NCOPC	NCOPC	NCOPC	NCOPC
BIS(2-CHLOROISOPROPYL)ETHER	9.40E-03	2.22E-05	NCOPC	NCOPC	4.85E+02	1.15E+00	NCOPC	NCOPC	NCOPC	NCOPC
CADMIUM	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
CHLOROFORM	NCOPC	NCOPC	NCOPC	NCOPC	1.50E+01	8.51E-02	NCOPC	NCOPC	NCOPC	NCOPC
CHROMIUM	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
COBALT	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
CYANIDE	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
DIBENZ(AH)ANTHRACENE	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
ETHYLBENZENE	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
LEAD	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
MERCURY	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
METHYLENE CHLORIDE	NCOPC	NCOPC	NCOPC	NCOPC	5.30E+01	2.47E-02	NCOPC	NCOPC	NCOPC	NCOPC
NAPHTHALENE	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
NICKEL	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
PENTACHLOROPHENOL	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	3.00E-03	6.55E-04
PHENANTHRENE	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
THALLIUM	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	6.20E-03	8.50E-05
TOLUENE	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
VANADIUM	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
XYLENES (TOTAL)	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
ZINC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
		2.41E-05		9.87E-04		2.68E+00		NC		7.40E-04

Notes:
AOC - Area of Concern.
EPC - Exposure Point Concentration.
HQ - Hazard Quotient.
NC - Not calculated, no dose-response v
NCOPC - Not a chemical of potential cor
SWMU - Solid Waste Management Unit.

TABLE D-14A
BASF NORTH WORKS FACILITY
WYANDOTTE, MICHIGAN
TIER 2 RISK ASSESSMENT

Receptors Evaluated:	
Receptor 1:	Utility/Redevelopment Worker

CARCINOGENIC AND NONCARCINOGENIC ASSUMPTIONS FOR UTILITY/REDEVELOPMENT WORKER INHALATION OF VOLATILES FROM GROUNDWATER		Assumed Value	Units	Calculated Value
Inhalation Rate	Utility/Redevelopment Worker	2.5	(m^3 air/hour)	
Body Weight	Utility/Redevelopment Worker	70	(kg)	
Exposure Time	Utility/Redevelopment Worker	2	(hrs/day) =	2.00E+00
Exposure Frequency	Utility/Redevelopment Worker	20	(days)/365 (days) =	5.48E-02
Exposure Duration (cancer)	Utility/Redevelopment Worker	1	(yrs)/70(yrs) =	1.43E-02
Exposure Duration (noncancer)	Utility/Redevelopment Worker	1	(yrs)/1(yrs) =	1.00E+00
Lifetime		70	(years)	

TABLE D-14B
BASF NORTH WORKS FACILITY
WYANDOTTE, MICHIGAN
TIER 2 RISK ASSESSMENT
CARCINOGENIC ASSESSMENT
INHALATION OF
VOLATILES FROM GROUNDWATER
FOR UTILITY/REDEVELOPMENT WORKER

Chemical	Unit Concentration In Air (mg/m^3 air)	Inhalation Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	ADDinh (mg/kg-day)	Lifetime Average Daily Dose - Inh. (mg/kg-day)	Potential Excess Lifetime Cancer Risk per Unit Concentration Inhalation
1,2-DICHLOROETHANE	1.00E+00	9.10E-02	5.59E-05	5.59E-05	5.09E-06
1,2-DICHLOROPROPANE	1.00E+00	NA	5.59E-05	5.59E-05	NC
ACETONE	1.00E+00	NA	5.59E-05	5.59E-05	NC
2-PICOLINE	1.00E+00	NA	5.59E-05	5.59E-05	NC
ARSENIC	1.00E+00	1.51E+01	5.59E-05	5.59E-05	8.44E-04
BENZENE	1.00E+00	2.73E-02	5.59E-05	5.59E-05	1.53E-06
BENZO(A)ANTHRACENE	1.00E+00	3.10E-01	5.59E-05	5.59E-05	1.73E-05
BENZO(A)PYRENE	1.00E+00	3.10E+00	5.59E-05	5.59E-05	1.73E-04
BENZO(B)FLUORANTHENE	1.00E+00	3.10E-01	5.59E-05	5.59E-05	1.73E-05
BIS(2-ETHYLHEXYL)PHTHALATE	1.00E+00	NA	5.59E-05	5.59E-05	NC
BIS(2-CHLOROETHYL)ETHER	1.00E+00	1.16E+00	5.59E-05	5.59E-05	6.46E-05
BIS(2-CHLOROISOPROPYL)ETH	1.00E+00	3.50E-02	5.59E-05	5.59E-05	1.96E-06
CADMIUM	1.00E+00	6.30E+00	5.59E-05	5.59E-05	3.52E-04
CHLOROFORM	1.00E+00	8.05E-02	5.59E-05	5.59E-05	4.50E-06
CHROMIUM	1.00E+00	NA	5.59E-05	5.59E-05	NC
COBALT	1.00E+00	NA	5.59E-05	5.59E-05	NC
CYANIDE	1.00E+00	NA	5.59E-05	5.59E-05	NC
DIBENZ(AH)ANTHRACENE	1.00E+00	3.10E+00	5.59E-05	5.59E-05	1.73E-04
ETHYLBENZENE	1.00E+00	NA	5.59E-05	5.59E-05	NC
LEAD	1.00E+00	NA	5.59E-05	5.59E-05	NC
MERCURY	1.00E+00	NA	5.59E-05	5.59E-05	NC
METHYLENE CHLORIDE	1.00E+00	1.65E-03	5.59E-05	5.59E-05	9.20E-08
NAPHTHALENE	1.00E+00	NA	5.59E-05	5.59E-05	NC
NICKEL	1.00E+00	8.40E-01	5.59E-05	5.59E-05	4.70E-05
PENTACHLOROPHENOL	1.00E+00	NA	5.59E-05	5.59E-05	NC
PHENANTHRENE	1.00E+00	NA	5.59E-05	5.59E-05	NC
THALLIUM	1.00E+00	NA	5.59E-05	5.59E-05	NC
TOLUENE	1.00E+00	NA	5.59E-05	5.59E-05	NC
VANADIUM	1.00E+00	NA	5.59E-05	5.59E-05	NC
XYLENES (TOTAL)	1.00E+00	NA	5.59E-05	5.59E-05	NC
ZINC	1.00E+00	NA	5.59E-05	5.59E-05	NC

TABLE D-14C
POTENTIAL CARCINOGENIC RISK
RISK BY INHALATION OF
VOLATILES FROM GROUNDWATER
FOR UTILITY/REDEVELOPMENT WORKER
BASF NORTH WORKS FACILITY
WYANDOTTE, MICHIGAN
TIER 2 RISK ASSESSMENT

	Reference	AOC 1		AOC 2		AOC 5		AOC 6		AOC 7A		AOC 7B		AOC 7C	
Chemical	Risk (per mg/m^3)	EPC (mg/m^3)	PELCR	EPC (mg/m^3)	PELCR	EPC (mg/m^3)	PELCR	EPC (mg/m^3)	PELCR	EPC (mg/m^3)	PELCR	EPC (mg/m^3)	PELCR	EPC (mg/m^3)	PELCR
1,2-DICHLOROETHANE	5.09E-06	NCOPC	NCOPC	NCOPC	NCOPC	5.42E+00	2.76E-05	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	5.42E+00	2.76E-05
1,2-DICHLOROPROPANE	NC	NCOPC	NCOPC	NCOPC	NCOPC	6.03E+01	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	6.03E+01	NC
ACETONE	NC	NCOPC	NCOPC	NCOPC	NCOPC	1.49E+00	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	1.49E+00	NC
2-PICOLINE	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	2.99E-04	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
ARSENIC	8.44E-04	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
BENZENE	1.53E-06	1.10E-01	1.68E-07	5.69E-04	8.68E-10	NCOPC	NCOPC	1.79E-03	2.73E-09	NCOPC	NCOPC	2.11E-04	3.23E-10	NCOPC	NCOPC
BENZO(A)ANTHRACENE	1.73E-05	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
BENZO(A)PYRENE	1.73E-04	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
BENZO(B)FLUORANTHENE	1.73E-05	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
BIS(2-ETHYLHEXYL)PHTHALATE	NC	NCOPC	NCOPC	NCOPC	NCOPC	1.46E-03	NC	NCOPC	NCOPC	NCOPC	NCOPC	7.66E-07	NC	1.46E-03	NC
BIS(2-CHLOROETHYL)ETHER	6.46E-05	4.78E-04	3.09E-08	NCOPC	NCOPC	1.48E+00	9.54E-05	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	1.48E+00	9.54E-05
BIS(2-CHLOROISOPROPYL)ETHER	1.96E-06	NCOPC	NCOPC	NCOPC	NCOPC	1.08E+01	2.12E-05	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	1.08E+01	2.12E-05
CADMIUM	3.52E-04	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
CHLOROFORM	4.50E-06	NCOPC	NCOPC	NCOPC	NCOPC	4.11E-01	1.85E-06	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	4.11E-01	1.85E-06
CHROMIUM	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
COBALT	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
CYANIDE	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
DIBENZ(AH)ANTHRACENE	1.73E-04	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
ETHYLBENZENE	NC	3.98E-01	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
LEAD	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
MERCURY	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
METHYLENE CHLORIDE	9.20E-08	NCOPC	NCOPC	NCOPC	NCOPC	1.61E+00	1.48E-07	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	1.61E+00	1.48E-07
NAPHTHALENE	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
NICKEL	4.70E-05	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
PENTACHLOROPHENOL	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
PHENANTHRENE	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
THALLIUM	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
TOLUENE	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	5.42E-02	NC	NCOPC	NCOPC
VANADIUM	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
XYLENES (TOTAL)	NC	2.14E-01	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
ZINC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
	Total:		1.99E-07		8.68E-10		1.46E-04		2.73E-09		NC		3.23E-10		1.46E-04

Notes:
AOC - Area of Concern.
EPC - Exposure Point Concentration.
NC - Not calculated, no dose-response value available.
NCOPC - Not a chemical of potential concern in this area/medium.
PELCR - Potential Excess Lifetime Cancer Risk.
SWMU - Solid Waste Management Unit.

TABLE D-14C
POTENTIAL CARCINOGENIC RISK
RISK BY INHALATION OF
VOLATILES FROM GROUNDWATER
FOR UTILITY/REDEVELOPMENT WC
BASF NORTH WORKS FACILITY
WYANDOTTE, MICHIGAN
TIER 2 RISK ASSESSMENT

	SWMU F		SWMU G		SWMU H (west end)		SWMU H (central)		SWMU H (east end)	
Chemical	EPC (mg/m^3)	PELCR	EPC (mg/m^3)	PELCR	EPC (mg/m^3)	PELCR	EPC (mg/m^3)	PELCR	EPC (mg/m^3)	PELCR
1,2-DICHLOROETHANE	NCOPC	NCOPC	NCOPC	NCOPC	5.42E+00	2.76E-05	NCOPC	NCOPC	NCOPC	NCOPC
1,2-DICHLOROPROPANE	3.27E-04	NC	NCOPC	NCOPC	6.03E+01	NC	NCOPC	NCOPC	NCOPC	NCOPC
ACETONE	NCOPC	NCOPC	NCOPC	NCOPC	1.49E+00	NC	NCOPC	NCOPC	NCOPC	NCOPC
2-PICOLINE	NCOPC	NCOPC	2.99E-04	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
ARSENIC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
BENZENE	NCOPC	NCOPC	1.79E-03	2.73E-09	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
BENZO(A)ANTHRACENE	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
BENZO(A)PYRENE	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
BENZO(B)FLUORANTHENE	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
BIS(2-ETHYLHEXYL)PHTHALATE	NCOPC	NCOPC	NCOPC	NCOPC	1.46E-03	NC	NCOPC	NCOPC	NCOPC	NCOPC
BIS(2-CHLOROETHYL)ETHER	NCOPC	NCOPC	NCOPC	NCOPC	1.48E+00	9.54E-05	NCOPC	NCOPC	NCOPC	NCOPC
BIS(2-CHLOROISOPROPYL)ETHER	2.10E-04	4.11E-10	NCOPC	NCOPC	1.08E+01	2.12E-05	NCOPC	NCOPC	NCOPC	NCOPC
CADMIUM	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
CHLOROFORM	NCOPC	NCOPC	NCOPC	NCOPC	4.11E-01	1.85E-06	NCOPC	NCOPC	NCOPC	NCOPC
CHROMIUM	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
COBALT	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
CYANIDE	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
DIBENZ(AH)ANTHRACENE	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
ETHYLBENZENE	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
LEAD	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
MERCURY	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
METHYLENE CHLORIDE	NCOPC	NCOPC	NCOPC	NCOPC	1.61E+00	1.48E-07	NCOPC	NCOPC	NCOPC	NCOPC
NAPHTHALENE	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
NICKEL	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
PENTACHLOROPHENOL	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	8.99E-08	NC
PHENANTHRENE	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
THALLIUM	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
TOLUENE	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
VANADIUM	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
XYLENES (TOTAL)	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
ZINC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
		4.11E-10		**2.73E-09**		**1.46E-04**		**NC**		**NC**

Notes:
AOC - Area of Concern.
EPC - Exposure Point Concentration.
NC - Not calculated, no dose-response
NCOPC - Not a chemical of potential c
PELCR - Potential Excess Lifetime Car
SWMU - Solid Waste Management Un

TABLE D-14D
BASF NORTH WORKS FACILITY
WYANDOTTE, MICHIGAN
TIER 2 RISK ASSESSMENT
NONCARCINOGENIC ASSESSMENT
INHALATION OF
VOLATILES FROM GROUNDWATER
FOR UTILITY/REDEVELOPMENT WORKER

Chemical	Unit Concentration In Air (mg/m^3 air)	Inhalation Reference Dose (mg/kg-day)	ADDinh (mg/kg-day)	Chronic Average Daily Dose-inh (mg/kg-day)	Potential Hazard Quotient per Unit Concentration Inhalation
1,2-DICHLOROETHANE	1.00E+00	7.00E-01	3.91E-03	3.91E-03	5.59E-03
1,2-DICHLOROPROPANE	1.00E+00	3.43E-03	3.91E-03	3.91E-03	1.14E+00
ACETONE	1.00E+00	9.00E-01	3.91E-03	3.91E-03	4.35E-03
2-PICOLINE	1.00E+00	1.00E-03	3.91E-03	3.91E-03	3.91E+00
ARSENIC	1.00E+00	3.00E-04	3.91E-03	3.91E-03	1.30E+01
BENZENE	1.00E+00	2.57E-02	3.91E-03	3.91E-03	1.52E-01
BENZO(A)ANTHRACENE	1.00E+00	3.00E-01	3.91E-03	3.91E-03	1.30E-02
BENZO(A)PYRENE	1.00E+00	3.00E-01	3.91E-03	3.91E-03	1.30E-02
BENZO(B)FLUORANTHENE	1.00E+00	3.00E-01	3.91E-03	3.91E-03	1.30E-02
BIS(2-ETHYLHEXYL)PHTHALATE	1.00E+00	2.00E-02	3.91E-03	3.91E-03	1.96E-01
BIS(2-CHLOROETHYL)ETHER	1.00E+00	4.00E-02	3.91E-03	3.91E-03	9.78E-02
BIS(2-CHLOROISOPROPYL)ETHER	1.00E+00	4.00E-02	3.91E-03	3.91E-03	9.78E-02
CADMIUM	1.00E+00	5.70E-05	3.91E-03	3.91E-03	6.87E+01
CHLOROFORM	1.00E+00	1.43E-02	3.91E-03	3.91E-03	2.74E-01
CHROMIUM	1.00E+00	1.50E+00	3.91E-03	3.91E-03	2.61E-03
COBALT	1.00E+00	5.71E-06	3.91E-03	3.91E-03	6.85E+02
CYANIDE	1.00E+00	2.00E-02	3.91E-03	3.91E-03	1.96E-01
DIBENZ(AH)ANTHRACENE	1.00E+00	3.00E-01	3.91E-03	3.91E-03	1.30E-02
ETHYLBENZENE	1.00E+00	2.86E-01	3.91E-03	3.91E-03	1.37E-02
LEAD	1.00E+00	NA	3.91E-03	3.91E-03	NC
MERCURY	1.00E+00	8.57E-05	3.91E-03	3.91E-03	4.57E+01
METHYLENE CHLORIDE	1.00E+00	3.00E-01	3.91E-03	3.91E-03	1.30E-02
NAPHTHALENE	1.00E+00	2.57E-03	3.91E-03	3.91E-03	1.52E+00
NICKEL	1.00E+00	NA	3.91E-03	3.91E-03	NC
PENTACHLOROPHENOL	1.00E+00	3.00E-02	3.91E-03	3.91E-03	1.30E-01
PHENANTHRENE	1.00E+00	3.00E-01	3.91E-03	3.91E-03	1.30E-02
THALLIUM	1.00E+00	NA	3.91E-03	3.91E-03	NC
TOLUENE	1.00E+00	1.43E+00	3.91E-03	3.91E-03	2.74E-03
VANADIUM	1.00E+00	NA	3.91E-03	3.91E-03	NC
XYLENES (TOTAL)	1.00E+00	8.57E-02	3.91E-03	3.91E-03	4.57E-02
ZINC	1.00E+00	NA	3.91E-03	3.91E-03	NC

TABLE D-14E
POTENTIAL NONCARCINOGENIC HAZARD
RISK BY INHALATION OF
VOLATILES FROM GROUNDWATER
FOR UTILITY/REDEVELOPMENT WORKER
BASF NORTH WORKS FACILITY
WYANDOTTE, MICHIGAN
TIER 2 RISK ASSESSMENT

Chemical	Reference HQ (per mg/m³)	AOC 1		AOC 2		AOC 5		AOC 6		AOC 7A		AOC 7B		AOC 7C	
		EPC (mg/m³)	HQ	EPC (mg/m³)	HQ	EPC (mg/m³)	HQ	EPC (mg/m³)	HQ	EPC (mg/m³)	HQ	EPC (mg/m³)	HQ	EPC (mg/m³)	HQ
1,2-DICHLOROETHANE	5.59E-03	NCOPC	NCOPC	NCOPC	NCOPC	5.42E+00	3.03E-02	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	5.42E+00	3.03E-02
1,2-DICHLOROPROPANE	1.14E+00	NCOPC	NCOPC	NCOPC	NCOPC	6.03E+01	6.89E+01	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	6.03E+01	6.89E+01
ACETONE	4.35E-03	NCOPC	NCOPC	NCOPC	NCOPC	1.49E+00	6.49E-03	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	1.49E+00	6.49E-03
2-PICOLINE	3.91E+00	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	2.99E-04	1.17E-03	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
ARSENIC	1.30E+01	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
BENZENE	1.52E-01	1.10E-01	1.67E-02	5.69E-04	8.66E-05	NCOPC	NCOPC	1.79E-03	2.72E-04	NCOPC	NCOPC	2.11E-04	3.22E-05	NCOPC	NCOPC
BENZO(A)ANTHRACENE	1.30E-02	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
BENZO(A)PYRENE	1.30E-02	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
BENZO(B)FLUORANTHENE	1.30E-02	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
BIS(2-ETHYLHEXYL)PHTHALATE	1.96E-01	NCOPC	NCOPC	NCOPC	NCOPC	1.46E-03	2.85E-04	NCOPC	NCOPC	NCOPC	NCOPC	7.66E-07	1.50E-07	1.46E-03	2.85E-04
BIS(2-CHLOROETHYL)ETHER	9.78E-02	4.78E-04	4.68E-05	NCOPC	NCOPC	1.48E+00	1.45E-01	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	1.48E+00	1.45E-01
BIS(2-CHLOROISOPROPYL)ETHER	9.78E-02	NCOPC	NCOPC	NCOPC	NCOPC	1.08E+01	1.06E+00	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	1.08E+01	1.06E+00
CADMIUM	6.87E+01	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
CHLOROFORM	2.74E-01	NCOPC	NCOPC	NCOPC	NCOPC	4.11E-01	1.13E-01	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	4.11E-01	1.13E-01
CHROMIUM	2.61E-03	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
COBALT	6.85E+02	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
CYANIDE	1.96E-01	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
DIBENZ(AH)ANTHRACENE	1.30E-02	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
ETHYLBENZENE	1.37E-02	3.98E-01	5.46E-03	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
LEAD	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
MERCURY	4.57E+01	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
METHYLENE CHLORIDE	1.30E-02	NCOPC	NCOPC	NCOPC	NCOPC	1.61E+00	2.10E-02	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	1.61E+00	2.10E-02
NAPHTHALENE	1.52E+00	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
NICKEL	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
PENTACHLOROPHENOL	1.30E-01	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
PHENANTHRENE	1.30E-02	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
THALLIUM	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
TOLUENE	2.74E-03	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	5.42E-02	1.48E-04	NCOPC	NCOPC
VANADIUM	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
XYLENES (TOTAL)	4.57E-02	2.14E-01	9.77E-03	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
ZINC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
Total Hazard Index:			**3.20E-02**		**8.66E-05**		**7.02E+01**		**1.44E-03**		**NC**		**1.81E-04**		**7.02E+01**

Notes:
AOC - Area of Concern.
EPC - Exposure Point Concentration.
HQ - Hazard Quotient.
NC - Not calculated, no dose-response value available.
NCOPC - Not a chemical of potential concern in this area/medium.
SWMU - Solid Waste Management Unit.

TABLE D-14E
POTENTIAL NONCARCINOGENIC H
RISK BY INHALATION OF
VOLATILES FROM GROUNDWATER
FOR UTILITY/REDEVELOPMENT W(
BASF NORTH WORKS FACILITY
WYANDOTTE, MICHIGAN
TIER 2 RISK ASSESSMENT

Chemical	SWMU F		SWMU G		SWMU H (west end)		SWMU H (central)		SWMU H (east end)	
	EPC (mg/m^3)	HQ	EPC (mg/m^3)	HQ	EPC (mg/m^3)	HQ	EPC (mg/m^3)	HQ	EPC (mg/m^3)	HQ
1,2-DICHLOROETHANE	NCOPC	NCOPC	NCOPC	NCOPC	5.42E+00	3.03E-02	NCOPC	NCOPC	NCOPC	NCOPC
1,2-DICHLOROPROPANE	3.27E-04	3.73E-04	NCOPC	NCOPC	6.03E+01	6.89E+01	NCOPC	NCOPC	NCOPC	NCOPC
ACETONE	NCOPC	NCOPC	NCOPC	NCOPC	1.49E+00	6.49E-03	NCOPC	NCOPC	NCOPC	NCOPC
2-PICOLINE	NCOPC	NCOPC	2.99E-04	1.17E-03	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
ARSENIC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
BENZENE	NCOPC	NCOPC	1.79E-03	2.72E-04	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
BENZO(A)ANTHRACENE	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
BENZO(A)PYRENE	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
BENZO(B)FLUORANTHENE	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
BIS(2-ETHYLHEXYL)PHTHALATE	NCOPC	NCOPC	NCOPC	NCOPC	1.46E-03	2.85E-04	NCOPC	NCOPC	NCOPC	NCOPC
BIS(2-CHLOROETHYL)ETHER	NCOPC	NCOPC	NCOPC	NCOPC	1.48E+00	1.45E-01	NCOPC	NCOPC	NCOPC	NCOPC
BIS(2-CHLOROISOPROPYL)ETHER	2.10E-04	2.05E-05	NCOPC	NCOPC	1.08E+01	1.06E+00	NCOPC	NCOPC	NCOPC	NCOPC
CADMIUM	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
CHLOROFORM	NCOPC	NCOPC	NCOPC	NCOPC	4.11E-01	1.13E-01	NCOPC	NCOPC	NCOPC	NCOPC
CHROMIUM	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
COBALT	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
CYANIDE	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
DIBENZ(AH)ANTHRACENE	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
ETHYLBENZENE	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
LEAD	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
MERCURY	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
METHYLENE CHLORIDE	NCOPC	NCOPC	NCOPC	NCOPC	1.61E+00	2.10E-02	NCOPC	NCOPC	NCOPC	NCOPC
NAPHTHALENE	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
NICKEL	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
PENTACHLOROPHENOL	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	8.99E-08	1.17E-08
PHENANTHRENE	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
THALLIUM	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
TOLUENE	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
VANADIUM	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
XYLENES (TOTAL)	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
ZINC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC
		3.94E-04		**1.44E-03**		**7.02E+01**		**NC**		**1.17E-08**

Notes:
AOC - Area of Concern.
EPC - Exposure Point Concentration.
HQ - Hazard Quotient.
NC - Not calculated, no dose-response
NCOPC - Not a chemical of potential c
SWMU - Solid Waste Management Ur

APPENDIX D-5

SPREADSHEETS FOR CALCULATION OF PRELIMINARY REMEDIATION GOALS FOR UTILITY/REDEVELOPMENT WORKER

TABLE D-15
CALCULATION OF REMEDIAL GOALS FOR CARCINOGENIC COCs
UTILITY/REDEVELOPMENT WORKER - REDEVELOPMENT SCENARIO
BASF NORTH WORKS
WYANDOTTE, MICHIGAN
TIER 2 HUMAN HEALTH RISK ASSESSMENT

Chemical	Remedial Goals for AOC 5 (a)						
	Soil PELCR		Groundwater PELCR		Total Risk	Soil RG (mg/kg)	GW RG (mg/L)
	Ing/Derm.	Inhalation	Ing/Derm.	Inhalation			
1,2-DICHLOROETHANE	3.42E-08	5.36E-06	8.84E-06	2.76E-05	4.18E-05	3.66E+02	1.08E+02
1,2-DICHLOROPROPANE	NC	NC	NC	NC	0.00E+00		
ACETONE	NCOPC	NCOPC	NC	NC	0.00E+00		
2-PICOLINE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00		
ARSENIC	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00		
BENZENE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00		
BENZO(A)ANTHRACENE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00		
BENZO(A)PYRENE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00		
BENZO(B)FLUORANTHENE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00		
BIS(2-ETHYLHEXYL)PHTHALATE	NCOPC	NCOPC	2.68E-06	NC	2.68E-06		1.18E+02
BIS(2-CHLOROETHYL)ETHER	2.65E-08	5.27E-06	4.49E-05	9.54E-05	1.46E-04	2.38E+01	2.04E+01
BIS(2-CHLOROISOPROPYL)ETHER	1.05E-08	9.99E-07	4.58E-05	2.12E-05	6.81E-05		1.43E+02
CADMIUM	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00		
CHLOROFORM	NCOPC	NCOPC	NC	1.85E-06	1.85E-06		1.60E+02
CHROMIUM	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00		
COBALT	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00		
CYANIDE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00		
DIBENZ(AH)ANTHRACENE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00		
ETHYLBENZENE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00		
LEAD	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00		
MERCURY	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00		
METHYLENE CHLORIDE	NCOPC	NCOPC	1.58E-07	1.48E-07	3.06E-07		
NAPHTHALENE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00		
NICKEL	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00		
PENTACHLOROPHENOL	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00		
PHENANTHRENE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00		
THALLIUM	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00		
TOLUENE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00		
VANADIUM	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00		
XYLENES (TOTAL)	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00		
ZINC	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00		
Total Risk:	7.12E-08	1.16E-05	1.02E-04	1.46E-04	**2.60E-04**		
				Total PELCR of non-COCs	**1.32E-06**		

Notes:
(a) RGs calculated so that total risk does not exced target risk of 1E-04 (and accounting for total PELCR of non-COCs). RGs calculated for each shaded chemical and medium (PELCR > 1E-06).
RG = (Allowable Risk/HQ) * EPC ÷ (Calculated Risk/HQ).
Arsenic in SWMU H consistent with background.
Ing/Derm - Ingestion/Dermal Contact.
NC - Not Calculated or no dose-response value.
NCOPC - Not a chemical of potential concern in this area/medium.
PELCR - Potential Excess Lifetime Cancer Risk

TABLE D-15
CALCULATION OF REMEDIAL GOALS FOR CARCINOGENIC COCs
UTILITY/REDEVELOPMENT WORKER - REDEVELOPMENT SCENA
BASF NORTH WORKS
WYANDOTTE, MICHIGAN
TIER 2 HUMAN HEALTH RISK ASSESSMENT

Chemical	Remedial Goals for AOC 7C (a)						
	Soil PELCR		Groundwater PELCR		Total Risk	Soil RG (mg/kg)	GW RG (mg/L)
	Ing/Derm.	Inhalation	Ing/Derm.	Inhalation			
1,2-DICHLOROETHANE	NCOPC	NCOPC	8.84E-06	2.76E-05	3.64E-05		9.13E+01
1,2-DICHLOROPROPANE	NCOPC	NCOPC	NC	NC	0.00E+00		
ACETONE	NCOPC	NCOPC	NC	NC	0.00E+00		
2-PICOLINE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00		
ARSENIC	1.39E-07	1.35E-05	NCOPC	NCOPC	1.36E-05	2.89E+01	
BENZENE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00		
BENZO(A)ANTHRACENE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00		
BENZO(A)PYRENE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00		
BENZO(B)FLUORANTHENE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00		
BIS(2-ETHYLHEXYL)PHTHALATE	NCOPC	NCOPC	2.68E-06	NC	2.68E-06		9.92E+01
BIS(2-CHLOROETHYL)ETHER	NCOPC	NCOPC	4.49E-05	9.54E-05	1.40E-04		1.72E+01
BIS(2-CHLOROISOPROPYL)ETHER	NCOPC	NCOPC	4.58E-05	2.12E-05	6.70E-05		1.20E+02
CADMIUM	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00		
CHLOROFORM	NCOPC	NCOPC	NC	1.85E-06	1.85E-06		1.35E+02
CHROMIUM	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00		
COBALT	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00		
CYANIDE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00		
DIBENZ(AH)ANTHRACENE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00		
ETHYLBENZENE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00		
LEAD	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00		
MERCURY	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00		
METHYLENE CHLORIDE	NCOPC	NCOPC	1.58E-07	1.48E-07	3.06E-07		
NAPHTHALENE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00		
NICKEL	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00		
PENTACHLOROPHENOL	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00		
PHENANTHRENE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00		
THALLIUM	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00		
TOLUENE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00		
VANADIUM	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00		
XYLENES (TOTAL)	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00		
ZINC	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00		
Total Risk:	1.39E-07	1.35E-05	1.02E-04	1.46E-04	**2.62E-04**		
				Total PELCR of non-COCs	**3.06E-07**		

Notes:
(a) RGs calculated so that total risk does not exced target risk of 1E-04 (and accounting for total PELCR of non-COCs). RGs calculated for each shaded chemical and medium (PELCR > 1E-06).
RG = (Allowable Risk/HQ) * EPC ÷ (Calculated Risk/HQ).
Arsenic in SWMU H consistent with background.
Ing/Derm - Ingestion/Dermal Contact.
NC - Not Calculated or no dose-response value.
NCOPC - Not a chemical of potential concern in this area/medium.
PELCR - Potential Excess Lifetime Cancer Risk

TABLE D-15
CALCULATION OF REMEDIAL GOALS FOR CARCINOGENIC COCs
UTILITY/REDEVELOPMENT WORKER - REDEVELOPMENT SCENA
BASF NORTH WORKS
WYANDOTTE, MICHIGAN
TIER 2 HUMAN HEALTH RISK ASSESSMENT

Chemical	Remedial Goals for SWMU H (west end) (a)						
	Soil PELCR		Groundwater PELCR		Total Risk	Soil RG (mg/kg)	GW RG (mg/L)
	Ing/Derm.	Inhalation	Ing/Derm.	Inhalation			
1,2-DICHLOROETHANE	NCOPC	NCOPC	8.84E-06	2.76E-05	3.64E-05		9.13E+01
1,2-DICHLOROPROPANE	NC	NC	NC	NC	0.00E+00		
ACETONE	NCOPC	NCOPC	NC	NC	0.00E+00		
2-PICOLINE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00		
ARSENIC	1.60E-07	1.55E-05	NCOPC	NCOPC	1.57E-05	2.89E+01	
BENZENE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00		
BENZO(A)ANTHRACENE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00		
BENZO(A)PYRENE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00		
BENZO(B)FLUORANTHENE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00		
BIS(2-ETHYLHEXYL)PHTHALATE	NCOPC	NCOPC	2.68E-06	NC	2.68E-06		9.92E+01
BIS(2-CHLOROETHYL)ETHER	NCOPC	NCOPC	4.49E-05	9.54E-05	1.40E-04		1.72E+01
BIS(2-CHLOROISOPROPYL)ETHER	2.00E-07	1.84E-06	4.58E-05	2.12E-05	6.91E-05		1.20E+02
CADMIUM	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00		
CHLOROFORM	NCOPC	NCOPC	NC	1.85E-06	1.85E-06		1.35E+02
CHROMIUM	NC	NC	NCOPC	NCOPC	0.00E+00		
COBALT	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00		
CYANIDE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00		
DIBENZ(AH)ANTHRACENE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00		
ETHYLBENZENE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00		
LEAD	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00		
MERCURY	NC	NC	NCOPC	NCOPC	0.00E+00		
METHYLENE CHLORIDE	NCOPC	NCOPC	1.58E-07	1.48E-07	3.06E-07		
NAPHTHALENE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00		
NICKEL	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00		
PENTACHLOROPHENOL	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00		
PHENANTHRENE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00		
THALLIUM	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00		
TOLUENE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00		
VANADIUM	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00		
XYLENES (TOTAL)	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00		
ZINC	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00		
Total Risk:	3.60E-07	1.74E-05	1.02E-04	1.46E-04	**2.66E-04**		
				Total PELCR of non-COCs	**3.06E-07**		

Notes:
(a) RGs calculated so that total risk does not exced target risk of 1E-04 (and accounting for total PELCR of non-COCs). RGs calculated for each shaded chemical and medium (PELCR > 1E-06).
RG = (Allowable Risk/HQ) * EPC ÷ (Calculated Risk/HQ).
Arsenic in SWMU H consistent with background.
Ing/Derm - Ingestion/Dermal Contact.
NC - Not Calculated or no dose-response value.
NCOPC - Not a chemical of potential concern in this area/medium.
PELCR - Potential Excess Lifetime Cancer Risk

TABLE D-16
CALCULATION OF REMEDIAL GOALS FOR NONCARCINOGENIC COCs
UTILITY/REDEVELOPMENT WORKER - REDEVELOPMENT SCENARIO
BASF NORTH WORKS
WYANDOTTE, MICHIGAN
TIER 2 HUMAN HEALTH RISK ASSESSMENT

		Remedial Goals for AOC 5 (a)								
		Soil HQ		Groundwater HQ			Liver & Kidneys	Blood	Liver	Blood
Chemical	Target Organ	Ing/Derm.	Inhalation	Ing/Derm.	Inhalation	Total HQ	GW RG (mg/L)	GW RG (mg/L)	Soil RG (mg/kg)	Soil RG (mg/kg)
1,2-DICHLOROETHANE	liver, kidney	1.32E-03	5.89E-03	3.40E-01	3.03E-02	3.77E-01	9.53E+01			
1,2-DICHLOROPROPANE	blood, liver, repro	1.74E-03	4.22E+01	3.42E-01	6.89E+01	1.11E+02	6.12E+00	7.65E+00	1.21E+01	1.51E+01
ACETONE		NCOPC	NCOPC	5.47E-04	6.49E-03	7.04E-03				
2-PICOLINE		NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
ARSENIC	skin	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
BENZENE	blood	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
BENZO(A)ANTHRACENE		NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
BENZO(A)PYRENE		NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
BENZO(B)FLUORANTHENE		NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
BIS(2-ETHYLHEXYL)PHTHALATE	liver	NCOPC	NCOPC	6.70E-01	2.85E-04	6.70E-01	4.21E+00			
BIS(2-CHLOROETHYL)ETHER	blood	4.21E-05	7.99E-03	7.14E-02	1.45E-01	2.24E-01		1.48E+02		
BIS(2-CHLOROISOPROPYL)ETHER	blood	2.63E-04	4.99E-02	1.15E+00	1.06E+00	2.26E+00		4.85E+01		
CADMIUM		NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
CHLOROFORM	liver, kidney, CNS	NCOPC	NCOPC	8.51E-02	1.13E-01	1.98E-01	1.34E+01			
CHROMIUM		NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
COBALT		NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
CYANIDE		NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
DIBENZ(AH)ANTHRACENE		NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
ETHYLBENZENE		NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
LEAD		NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
MERCURY	CNS	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
METHYLENE CHLORIDE		NCOPC	NCOPC	2.47E-02	2.10E-02	4.56E-02				
NAPHTHALENE	nasal	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
NICKEL		NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
PENTACHLOROPHENOL		NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
PHENANTHRENE		NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
THALLIUM		NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
TOLUENE		NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
VANADIUM		NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
XYLENES (TOTAL)		NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
ZINC		NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
Total HI:		3.36E-03	4.23E+01	2.68E+00	7.02E+01	**1.15E+02**				
						Total HI of non-COCs	**1.18E-01**			

Notes:
(a) RGs calculated so that total HI does not exced target organ HI of 1 (and accounting for HI of non-COCs). RGs calculated for each shaded chemical and medium (HQ > 0.1).
RG = (Allowable Risk/HQ) * EPC ÷ (Calculated Risk/HQ).
Arsenic in SWMU H consistent with background.
HI - Hazard Index.
HQ - Hazard Quotient.
Ing/Derm - Ingestion/Dermal Contact.
NC - Not Calculated or no dose-response value.
NCOPC - Not a chemical of potential concern in this area/medium.

TABLE D-16
CALCULATION OF REMEDIAL GOALS FOR NONCARCINOGENIC COCs
UTILITY/REDEVELOPMENT WORKER - REDEVELOPMENT SCENARIO
BASF NORTH WORKS
WYANDOTTE, MICHIGAN
TIER 2 HUMAN HEALTH RISK ASSESSMENT

	Remedial Goals for AOC 6 (a)							
	Soil HQ		Groundwater HQ			Skin	Blood	Nasal
Chemical	Ing/Derm.	Inhalation	Ing/Derm.	Inhalation	Total HQ	Soil RG (mg/kg)	Soil RG (mg/kg)	Soil RG (mg/kg)
1,2-DICHLOROETHANE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00			
1,2-DICHLOROPROPANE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00			
ACETONE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00			
2-PICOLINE	NCOPC	NCOPC	4.36E-04	1.17E-03	1.61E-03			
ARSENIC	3.74E-02	3.61E-01	NCOPC	NCOPC	3.98E-01	9.90E+01		
BENZENE	1.85E-02	1.53E+00	5.51E-04	2.72E-04	1.55E+00		5.22E+02	
BENZO(A)ANTHRACENE	4.23E-05	3.46E-04	NCOPC	NCOPC	3.88E-04			
BENZO(A)PYRENE	3.19E-05	2.61E-04	NCOPC	NCOPC	2.92E-04			
BENZO(B)FLUORANTHENE	3.62E-05	2.96E-04	NCOPC	NCOPC	3.32E-04			
BIS(2-ETHYLHEXYL)PHTHALATE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00			
BIS(2-CHLOROETHYL)ETHER	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00			
BIS(2-CHLOROISOPROPYL)ETHER	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00			
CADMIUM	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00			
CHLOROFORM	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00			
CHROMIUM	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00			
COBALT	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00			
CYANIDE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00			
DIBENZ(AH)ANTHRACENE	3.22E-06	2.63E-05	NCOPC	NCOPC	2.95E-05			
ETHYLBENZENE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00			
LEAD	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00			
MERCURY	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00			
METHYLENE CHLORIDE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00			
NAPHTHALENE	2.21E-03	1.51E+00	NCOPC	NCOPC	1.51E+00			8.68E+02
NICKEL	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00			
PENTACHLOROPHENOL	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00			
PHENANTHRENE	2.68E-04	2.19E-03	NCOPC	NCOPC	2.46E-03			
THALLIUM	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00			
TOLUENE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00			
VANADIUM	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00			
XYLENES (TOTAL)	1.37E-04	3.29E-02	NCOPC	NCOPC	3.31E-02			
ZINC	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00			
Total HI:	5.86E-02	3.44E+00	9.87E-04	1.44E-03	**3.50E+00**			
					Total HI of non-COCs	**3.90E-02**		

Notes:
(a) RGs calculated so that total HI does not exced target organ HI of 1 (and accounting for HI of non-COCs). RGs calculated for each shaded chemical and medium (HQ > 0.1).
RG = (Allowable Risk/HQ) * EPC ÷ (Calculated Risk/HQ).
Arsenic in SWMU H consistent with background.
HI - Hazard Index.
HQ - Hazard Quotient.
Ing/Derm - Ingestion/Dermal Contact.
NC - Not Calculated or no dose-response value.
NCOPC - Not a chemical of potential concern in this area/medium.

TABLE D-16
CALCULATION OF REMEDIAL GOALS FOR NONCARCINOGENIC COCs
UTILITY/REDEVELOPMENT WORKER - REDEVELOPMENT SCENARIO
BASF NORTH WORKS
WYANDOTTE, MICHIGAN
TIER 2 HUMAN HEALTH RISK ASSESSMENT

	Remedial Goals for AOC 7C (a)								
	Soil HQ		Groundwater HQ			Liver & kidney	Skin	Blood	CNS
Chemical	Ing/Derm.	Inhalation	Ing/Derm.	Inhalation	Total HQ	GW RG (mg/L)	Soil RG (mg/kg)	GW RG (mg/L)	GW RG (mg/L)
1,2-DICHLOROETHANE	NCOPC	NCOPC	3.40E-01	3.03E-02	3.70E-01	1.28E+02			
1,2-DICHLOROPROPANE	NCOPC	NCOPC	3.42E-01	6.89E+01	6.92E+01	8.21E+00		1.10E+01	
ACETONE	NCOPC	NCOPC	5.47E-04	6.49E-03	7.04E-03				
2-PICOLINE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
ARSENIC	2.15E-02	2.08E-01	NCOPC	NCOPC	2.30E-01		1.74E+02		
BENZENE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
BENZO(A)ANTHRACENE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
BENZO(A)PYRENE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
BENZO(B)FLUORANTHENE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
BIS(2-ETHYLHEXYL)PHTHALATE	NCOPC	NCOPC	6.70E-01	2.85E-04	6.70E-01	5.65E+00			
BIS(2-CHLOROETHYL)ETHER	NCOPC	NCOPC	7.14E-02	1.45E-01	2.16E-01			2.12E+02	
BIS(2-CHLOROISOPROPYL)ETHER	NCOPC	NCOPC	1.15E+00	1.06E+00	2.21E+00			6.94E+01	
CADMIUM	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
CHLOROFORM	NCOPC	NCOPC	8.51E-02	1.13E-01	1.98E-01	1.80E+01			7.18E+01
CHROMIUM	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
COBALT	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
CYANIDE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
DIBENZ(AH)ANTHRACENE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
ETHYLBENZENE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
LEAD	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
MERCURY	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
METHYLENE CHLORIDE	NCOPC	NCOPC	2.47E-02	2.10E-02	4.56E-02				
NAPHTHALENE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
NICKEL	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
PENTACHLOROPHENOL	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
PHENANTHRENE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
THALLIUM	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
TOLUENE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
VANADIUM	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
XYLENES (TOTAL)	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
ZINC	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
Total HI:	2.15E-02	2.08E-01	2.68E+00	7.02E+01	**7.31E+01**				
					Total HI of non-COCs	**5.27E-02**			

Notes:
(a) RGs calculated so that total HI does not exced target organ HI of 1 (and accounting for HI of non-COCs). RGs calculated for each shaded chemical and medium (HQ > 0.1).
RG = (Allowable Risk/HQ) * EPC ÷ (Calculated Risk/HQ).
Arsenic in SWMU H consistent with background.
HI - Hazard Index.
HQ - Hazard Quotient.
Ing/Derm - Ingestion/Dermal Contact.
NC - Not Calculated or no dose-response value.
NCOPC - Not a chemical of potential concern in this area/medium.

TABLE D-16
CALCULATION OF REMEDIAL GOALS FOR NONCARCINOGENIC COCs
UTILITY/REDEVELOPMENT WORKER - REDEVELOPMENT SCENARIO
BASF NORTH WORKS
WYANDOTTE, MICHIGAN
TIER 2 HUMAN HEALTH RISK ASSESSMENT

	Remedial Goals for SWMU H (west end) (a)											
	Soil HQ		Groundwater HQ			Liver & kidney		Skin	Blood		CNS	
Chemical	Ing/Derm.	Inhalation	Ing/Derm.	Inhalation	Total HQ	GW RG (mg/L)	Soil RG (mg/kg)	Soil RG (mg/kg)	GW RG (mg/L)	Soil RG (mg/kg)	Soil RG (mg/kg)	GW RG (mg/L)
1,2-DICHLOROETHANE	NCOPC	NCOPC	3.40E-01	3.03E-02	3.70E-01	9.19E+01						
1,2-DICHLOROPROPANE	1.57E-02	2.55E+02	3.42E-01	6.89E+01	3.24E+02	5.90E+00	1.75E+01		7.37E+00	2.19E+01		
ACETONE	NCOPC	NCOPC	5.47E-04	6.49E-03	7.04E-03							
2-PICOLINE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00							
ARSENIC	2.49E-02	2.40E-01	NCOPC	NCOPC	2.65E-01			8.76E+01				
BENZENE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00							
BENZO(A)ANTHRACENE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00							
BENZO(A)PYRENE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00							
BENZO(B)FLUORANTHENE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00							
BIS(2-ETHYLHEXYL)PHTHALATE	NCOPC	NCOPC	6.70E-01	2.85E-04	6.70E-01	4.06E+00						
BIS(2-CHLOROETHYL)ETHER	NCOPC	NCOPC	7.14E-02	1.45E-01	2.16E-01				1.43E+02			
BIS(2-CHLOROISOPROPYL)ETHER	5.00E-03	9.19E-02	1.15E+00	1.06E+00	2.30E+00				4.67E+01			
CADMIUM	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00							
CHLOROFORM	NCOPC	NCOPC	8.51E-02	1.13E-01	1.98E-01	1.29E+01						3.22E+01
CHROMIUM	1.05E-05	9.37E-05	NCOPC	NCOPC	1.04E-04							
COBALT	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00							
CYANIDE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00							
DIBENZ(AH)ANTHRACENE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00							
ETHYLBENZENE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00							
LEAD	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00							
MERCURY	2.48E-03	8.63E-01	NCOPC	NCOPC	8.66E-01						1.38E+01	
METHYLENE CHLORIDE	NCOPC	NCOPC	2.47E-02	2.10E-02	4.56E-02							
NAPHTHALENE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00							
NICKEL	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00							
PENTACHLOROPHENOL	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00							
PHENANTHRENE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00							
THALLIUM	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00							
TOLUENE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00							
VANADIUM	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00							
XYLENES (TOTAL)	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00							
ZINC	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00							
Total HI:	4.80E-02	2.56E+02	2.68E+00	7.02E+01	**3.29E+02**							
				Total HI of non-COCs	**1.50E-01**							

Notes:
(a) RGs calculated so that total HI does not exced target organ HI of 1 (and accounting for HI of non-COCs). RGs calculated for each shaded chemical and medium (HQ > 0.1).
RG = (Allowable Risk/HQ) * EPC ÷ (Calculated Risk/HQ).
Arsenic in SWMU H consistent with background.
HI - Hazard Index.
HQ - Hazard Quotient.
Ing/Derm - Ingestion/Dermal Contact.
NC - Not Calculated or no dose-response value.
NCOPC - Not a chemical of potential concern in this area/medium.

TABLE D-16
CALCULATION OF REMEDIAL GOALS FOR NONCARCINOGENIC COCs
UTILITY/REDEVELOPMENT WORKER - REDEVELOPMENT SCENARIO
BASF NORTH WORKS
WYANDOTTE, MICHIGAN
TIER 2 HUMAN HEALTH RISK ASSESSMENT

	Remedial Goals for SWMU H (central) (a)								
	Soil HQ		Groundwater HQ			Liver	Blood	Skin	CNS
Chemical	Ing/Derm.	Inhalation	Ing/Derm.	Inhalation	Total HQ	Soil RG (mg/kg)	Soil RG (mg/kg)	Soil RG (mg/kg)	Soil RG (mg/kg)
1,2-DICHLOROETHANE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
1,2-DICHLOROPROPANE	1.57E-02	2.55E+02	NCOPC	NCOPC	2.55E+02	9.29E+01	9.29E+01		
ACETONE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
2-PICOLINE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
ARSENIC	2.49E-02	2.40E-01	NCOPC	NCOPC	2.65E-01			9.31E+01	
BENZENE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
BENZO(A)ANTHRACENE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
BENZO(A)PYRENE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
BENZO(B)FLUORANTHENE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
BIS(2-ETHYLHEXYL)PHTHALATE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
BIS(2-CHLOROETHYL)ETHER	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
BIS(2-CHLOROISOPROPYL)ETHER	5.00E-03	9.19E-02	NCOPC	NCOPC	9.69E-02				
CADMIUM	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
CHLOROFORM	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
CHROMIUM	1.05E-05	9.37E-05	NCOPC	NCOPC	1.04E-04				
COBALT	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
CYANIDE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
DIBENZ(AH)ANTHRACENE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
ETHYLBENZENE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
LEAD	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
MERCURY	2.48E-03	8.63E-01	NCOPC	NCOPC	8.66E-01				2.93E+01
METHYLENE CHLORIDE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
NAPHTHALENE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
NICKEL	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
PENTACHLOROPHENOL	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
PHENANTHRENE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
THALLIUM	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
TOLUENE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
VANADIUM	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
XYLENES (TOTAL)	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
ZINC	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
Total HI:	4.80E-02	2.56E+02	NCOPC	NCOPC	**2.56E+02**				
				Total HI of non-COCs	**9.70E-02**				

Notes:
(a) RGs calculated so that total HI does not exced target organ HI of 1 (and accounting for HI of non-COCs). RGs calculated for each shaded chemical and medium (HQ > 0.1).
RG = (Allowable Risk/HQ) * EPC ÷ (Calculated Risk/HQ).
Arsenic in SWMU H consistent with background.
HI - Hazard Index.
HQ - Hazard Quotient.
Ing/Derm - Ingestion/Dermal Contact.
NC - Not Calculated or no dose-response value.
NCOPC - Not a chemical of potential concern in this area/medium.

TABLE D-16
CALCULATION OF REMEDIAL GOALS FOR NONCARCINOGENIC COCs
UTILITY/REDEVELOPMENT WORKER - REDEVELOPMENT SCENARIO
BASF NORTH WORKS
WYANDOTTE, MICHIGAN
TIER 2 HUMAN HEALTH RISK ASSESSMENT

	Remedial Goals for SWMU H (east end) (a)								
	Soil HQ		Groundwater HQ			Liver	Blood	Skin	CNS
Chemical	Ing/Derm.	Inhalation	Ing/Derm.	Inhalation	Total HQ	Soil RG (mg/kg)	Soil RG (mg/kg)	Soil RG (mg/kg)	Soil RG (mg/kg)
1,2-DICHLOROETHANE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
1,2-DICHLOROPROPANE	1.57E-02	2.55E+02	NCOPC	NCOPC	2.55E+02	9.28E+01	9.28E+01		
ACETONE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
2-PICOLINE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
ARSENIC	2.49E-02	2.40E-01	NCOPC	NCOPC	2.65E-01			9.30E+01	
BENZENE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
BENZO(A)ANTHRACENE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
BENZO(A)PYRENE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
BENZO(B)FLUORANTHENE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
BIS(2-ETHYLHEXYL)PHTHALATE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
BIS(2-CHLOROETHYL)ETHER	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
BIS(2-CHLOROISOPROPYL)ETHER	5.00E-03	9.19E-02	NCOPC	NCOPC	9.69E-02				
CADMIUM	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
CHLOROFORM	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
CHROMIUM	1.05E-05	9.37E-05	NCOPC	NCOPC	1.04E-04				
COBALT	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
CYANIDE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
DIBENZ(AH)ANTHRACENE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
ETHYLBENZENE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
LEAD	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
MERCURY	2.48E-03	8.63E-01	NCOPC	NCOPC	8.66E-01				2.92E+01
METHYLENE CHLORIDE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
NAPHTHALENE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
NICKEL	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
PENTACHLOROPHENOL	NCOPC	NCOPC	6.55E-04	1.17E-08	6.55E-04				
PHENANTHRENE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
THALLIUM	NCOPC	NCOPC	8.50E-05	NCOPC	8.50E-05				
TOLUENE	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
VANADIUM	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
XYLENES (TOTAL)	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
ZINC	NCOPC	NCOPC	NCOPC	NCOPC	0.00E+00				
Total HI:	4.80E-02	2.56E+02	7.40E-04	1.17E-08	**2.56E+02**				
				Total HI of non-COCs	**9.77E-02**				

Notes:
(a) RGs calculated so that total HI does not exced target organ HI of 1 (and accounting for HI of non-COCs). RGs calculated for each shaded chemical and medium (HQ > 0.1).
RG = (Allowable Risk/HQ) * EPC ÷ (Calculated Risk/HQ).
Arsenic in SWMU H consistent with background.
HI - Hazard Index.
HQ - Hazard Quotient.
Ing/Derm - Ingestion/Dermal Contact.
NC - Not Calculated or no dose-response value.
NCOPC - Not a chemical of potential concern in this area/medium.

APPENDIX D-6

WORKSHEETS FOR CALCULATION OF BLOOD LEAD CONCENTRATIONS IN UTILITY/REDEVELOPMENT WORKER AND FETUS

Table D-17A

Calculation of Blood Lead Concentration (PbB) - Homogeneous Population

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 05/19/03

Exposure Variable	Description of Exposure Variable	Units	Values for Non-Residential Exposure Scenario Using Equation 1		
			Mean Conc	Max Conc	
PbS	Water lead concentration	ug/l or ppb		239	Well located in AOC 7B - site-wide maximum
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9	0.9	
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4	0.4	
GSD_i	Geometric standard deviation PbB	--	2.1	2.1	
PbB_0	Baseline PbB	ug/dL	1.5	1.5	
IRw	Water Ingestion Rate	l/day		0.005	Site-specific
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--	--	
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--	--	
K_{SD}	Mass fraction of soil in dust	--	--	--	
Afw	Absorption fraction (water ingestion)	--	0.20	0.20	
EFw	Exposure frequency (same for soil and dust)	days/yr		20	Site-specific
ATw	Averaging time (same for soil and dust)	days/yr	365	365	
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**1.50**	**1.51**	
$PbB_{fetal, 0.95}$	**95th percentile PbB among fetuses of adult workers**	**ug/dL**	**4.6**	**4.6**	
PbB_t	**Target PbB level of concern (e.g., 10 ug/dL)**	**ug/dL**	**10.0**	**10.0**	
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**0.3%**	**0.4%**	

[1] Equation 1 does not apportion exposure between soil and dust ingestion (excludes W_S, K_{SD}).
When $IR_S = IR_{S+D}$ and $W_S = 1.0$, the equations yield the same $PbB_{fetal0.95}$.

***Equation 1, based on Eq. 1, 2 in USEPA (1996).**

PbB_{adult} =
$PbB_{fetal, 0.95}$ =

****Equation 2, alternate approach based on Eq. 1, 2, and A-19 in USEPA (1996).**

PbB_{adult} =
$PbB_{fetal, 0.95}$ =

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Table D-17B

Calculation of Blood Lead Concentration (PbB) - Heterogeneous Population

U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 05/19/03

Exposure Variable	Description of Exposure Variable	Units	Values for Non-Residential Exposure Scenario Using Equation 1		
			Mean Conc	Max Conc	
PbS	Water lead concentration	ug/l or ppb		239	Well located in AOC 7B - site-wide maximum
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9	0.9	
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4	0.4	
GSD_i	Geometric standard deviation PbB	--	2.3	2.3	
PbB_0	Baseline PbB	ug/dL	1.7	1.7	
IRw	Water Ingestion Rate	l/day		0.005	Site-specific
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--	--	
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--	--	
K_{SD}	Mass fraction of soil in dust	--	--	--	
Afw	Absorption fraction (water ingestion)	--	0.20	0.20	
EFw	Exposure frequency (same for soil and dust)	days/yr		20	Site-specific
ATw	Averaging time (same for soil and dust)	days/yr	365	365	
PbB_{adult}	**PbB of adult worker, geometric mean**	**ug/dL**	**1.70**	**1.71**	
$PbB_{fetal, 0.95}$	**95th percentile PbB among fetuses of adult workers**	**ug/dL**	**6.0**	**6.0**	
PbB_t	**Target PbB level of concern (e.g., 10 ug/dL)**	**ug/dL**	**10.0**	**10.0**	
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**	**%**	**1.2%**	**1.2%**	

[1] Equation 1 does not apportion exposure between soil and dust ingestion (excludes W_S, K_{SD}).
When $IR_S = IR_{S+D}$ and $W_S = 1.0$, the equations yield the same $PbB_{fetal,0.95}$.

***Equation 1, based on Eq. 1, 2 in USEPA (1996).**

PbB_{adult} =
$PbB_{fetal, 0.95}$ =

****Equation 2, alternate approach based on Eq. 1, 2, and A-19 in USEPA (1996).**

PbB_{adult} =
$PbB_{fetal, 0.95}$ =

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Appendix E

Agency Correspondence for SERA

August 14, 2006

Lori Sargent
Wildlife Division Endangered Species Specialist
P.O. Box 30444
Lansing, MI 48909

Subject: Request for Environmental Review, Wayne County, Wyandotte, Michigan
ENSR Project Number 001760-180

Dear Lori Sargent

A Corrective Measure Study (CMS) is being conducted at the BASF North Works Facility owned by BASF Corporation (BASF) located at 1609 Biddle Avenue, Wayne County, Wyandotte, Michigan. The Facility covers approximately 230 acres, and 25 to 30 percent of this area is covered with buildings, paved streets, tank farms and parking lots. ENSR, working on behalf of BASF is checking for the known presence of any rare, threatened or endangered listed species, including species of special concern or critical habitat in the vicinity of the site. A topographic map and a street map identifying the location of the property is attached for your reference. Included with this letter is a list of species identified during our online research at the Michigan State University Extension (MSUE) website (http://web4.msue.msu.edu/mnfi/data/county.cfm). However, ENSR would like confirmation of the listed species as well as additional information not presented on your website.

We appreciate DNR's Wildlife Division efforts to provide ENSR with this information in a timely manner. A letter of request for information regarding federal-listed species has been sent to the US Fish and Wildlife office. Please contact Kristen Wandland at (919) 872-6600 if you have questions regarding this project.

Sincerely,

Kristen Wandland
Ecological Task Manager

attachments

cc: file

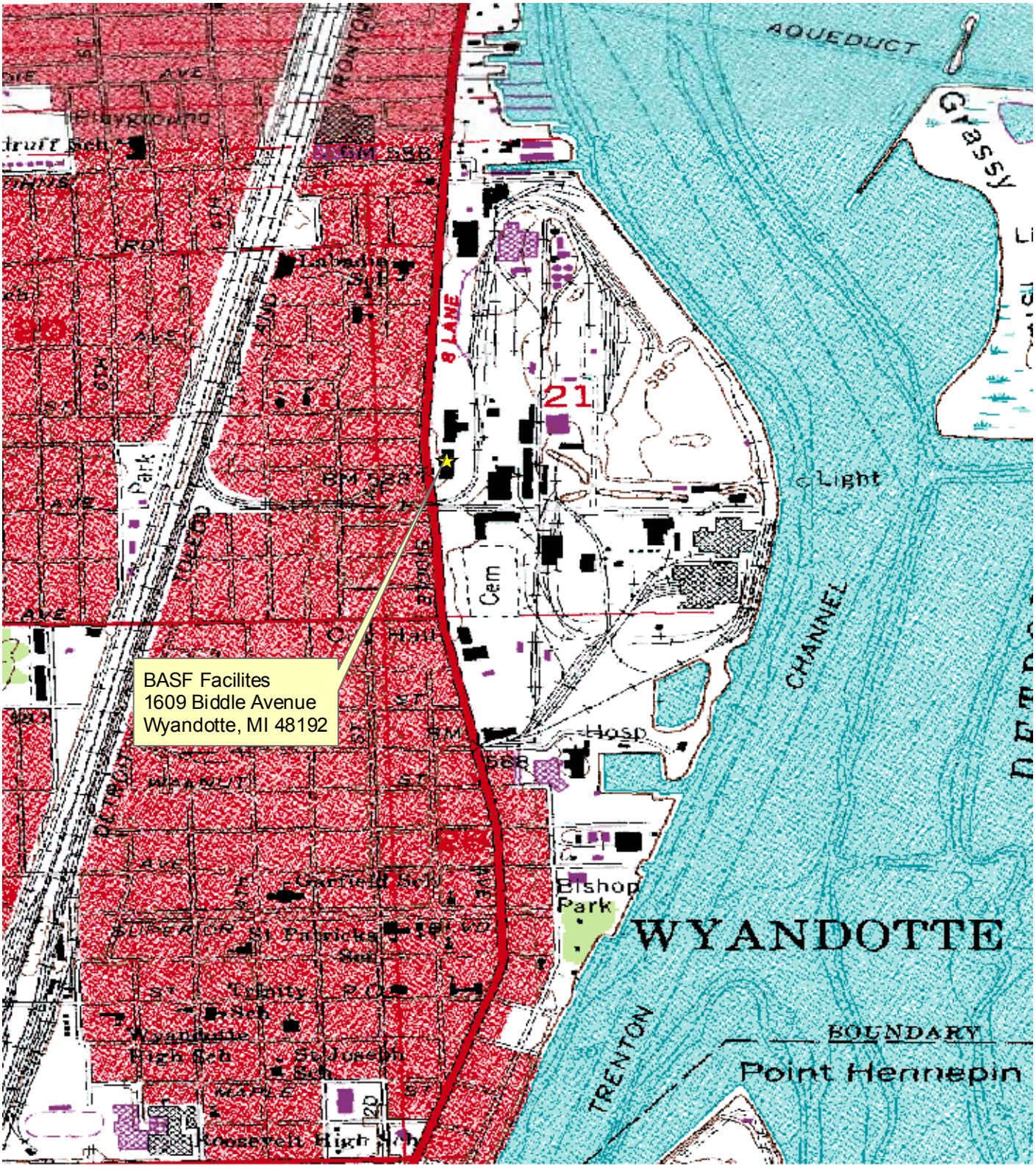
Wayne County

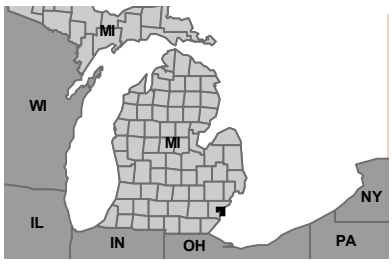
Current as of 5/25/2006

Scientific Name	Common Name	Federal Status	State Status
Acipenser fulvescens	Lake Sturgeon		T
Adlumia fungosa	Climbing Fumitory		SC
Ambystoma texanum	Smallmouth Salamander		E
Ammocrypta pellucida	Eastern Sand Darter		T
Ammodramus henslowii	Henslow's Sparrow		T
Ammodramus savannarum	Grasshopper Sparrow		SC
Angelica venenosa	Hairy Angelica		SC
Arabis missouriensis var. deamii	Missouri Rock-cress		SC
Aristida longespica	Three-awned Grass		T
Aristolochia serpentaria	Virginia Snakeroot		T
Asclepias hirtella	Tall Green Milkweed		T
Asclepias sullivantii	Sullivant's Milkweed		T
Calephelis mutica	Swamp Metalmark		SC
Camassia scilloides	Wild-hyacinth		T
Carex frankii	Frank's Sedge		SC
Carex squarrosa	Sedge		SC
Castanea dentata	American Chestnut		E
Clemmys guttata	Spotted Turtle		T
Clinostomus elongatus	Redside Dace		E
Cyclonaias tuberculata	Purple Wartyback		SC
Cyperus flavescens	Yellow Nut-grass		SC
Diarrhena americana	Beak Grass		T
Disporum maculatum	Nodding Mandarin		X
Dry-mesic southern forest			
Elaphe vulpina gloydi	Eastern Fox Snake		T
Eleocharis engelmannii	Engelmann's Spike-rush		SC
Epioblasma obliquata perobliqua	White Catspaw	LE	E
Epioblasma torulosa rangiana	Northern Riffleshell	LE	E
Epioblasma triquetra	Snuffbox		E
Eragrostis pilosa	Small Love Grass		SC
Euonymus atropurpurea	Wahoo		SC
Euphorbia commutata	Tinted Spurge		T
Euphyes dukesi	Dukes' Skipper		T
Falco peregrinus	Peregrine Falcon		E
Fraxinus profunda	Pumpkin Ash		T
Galearis spectabilis	Showy Orchis		T
Gentianella quinquefolia	Stiff Gentian		T
Geum virginianum	Pale Avens		SC
Great Blue Heron Rookery	Great Blue Heron Rookery		
Great lakes marsh			
Gymnocladus dioicus	Kentucky Coffee-tree		SC
Haliaeetus leucocephalus	Bald Eagle	LT,PDL	T
Hibiscus moscheutos	Swamp Rose-mallow		SC
Hybanthus concolor	Green Violet		SC

Hydrastis canadensis	Goldenseal		T
Hypericum gentianoides	Gentian-leaved St. John's-wort		SC
Ixobrychus exilis	Least Bittern		T
Jeffersonia diphylla	Twinleaf		SC
Juncus brachycarpus	Short-fruited Rush		T
Juncus vaseyi	Vasey's Rush		T
Justicia americana	Water-willow		T
Lactuca floridana	Woodland Lettuce		T
Lakeplain mesic prairie			
Lakeplain oak openings			
Lakeplain wet prairie	Alkaline Wet Prairie, Midwest Type		
Lakeplain wet-mesic prairie	Alkaline Tallgrass Prairie, Midwest Type		
Lampsilis fasciola	Wavy-rayed Lampmussel		T
Leucospora multifida	conobea		SC
Liatris squarrosa	Blazing-star		X
Liparis liliifolia	Purple Twayblade		SC
Ludwigia alternifolia	Seedbox		SC
Lycopodium appressum	Northern Prostrate Clubmoss		SC
Lycopus virginicus	Virginia Water-horehound		T
Lysimachia hybrida	Swamp Candles		SC
Macrhybopsis storeriana	Silver Chub		SC
mesic sand prairie	Moist Sand Prairie, Midwest Type		
Mesic southern forest	Rich Forest, Central Midwest Type		
Mimulus alatus	Wing-stemmed Monkey-flower		X
Morus rubra	Red Mulberry		T
Moxostoma carinatum	River Redhorse		T
Myotis sodalis	Indiana Bat or Indiana Myotis	LE	E
Nelumbo lutea	American Lotus		T
Notropis anogenus	Pugnose Shiner		SC
Noturus miurus	Brindled Madtom		SC
Noturus stigmosus	Northern Madtom		E
Nycticorax nycticorax	Black-crowned Night-heron		SC
Obovaria olivaria	Hickorynut		SC
Obovaria subrotunda	Round Hickorynut		E
Opsopoeodus emiliae	Pugnose Minnow		E
Panax quinquefolius	Ginseng		T
Penstemon pallidus	Pale Beard Tongue		SC
Percina copelandi	Channel Darter		E
Percina shumardi	River Darter		E
Phaseolus polystachios	Wild Bean		SC
Platanthera leucophaea	Prairie Fringed Orchid	LT	E
Pleurobema coccineum	Round Pigtoe		SC
Polygala cruciata	Cross-leaved Milkwort		SC
Pomatiopsis cincinnatiensis	Brown Walker		SC
Potentilla paradoxa	Sand Cinquefoil		T
Quercus shumardii	Shumard's oak		SC

Rallus elegans	King Rail		E
Rhexia virginica	Meadow-beauty		SC
Rotala ramosior	Tooth-cup		SC
Ruellia humilis	Hairy Ruellia		T
Sagittaria montevidensis	Arrowhead		T
Sanguisorba canadensis	Canadian Burnet		T
Scirpus clintonii	Clinton's Bulrush		SC
Scleria pauciflora	Few-flowered Nut-rush		E
Scleria triglomerata	Tall Nut-rush		SC
Silene virginica	Fire Pink		T
Silphium laciniatum	Compass-plant		T
Silphium perfoliatum	Cup-plant		T
Simpsonaias ambigua	Salamander Mussel		E
Sistrurus catenatus catenatus	Eastern Massasauga	C	SC
Sisyrinchium hastile	Blue-eyed-grass		X
Smilax herbacea	Smooth Carrion-flower		SC
Southern floodplain forest			
Speyeria idalia	Regal Fritillary		E
Spiza americana	Dickcissel		SC
Sterna forsteri	Forster's Tern		SC
Sterna hirundo	Common Tern		T
Stizostedion canadense	Sauger		T
Strophostyles helvula	Trailing Wild Bean		SC
Stylurus laurae	Laura's Snaketail		SC
Trillium recurvatum	Prairie Trillium		T
Villosa fabalis	Rayed Bean	C	E
Villosa iris	Rainbow		SC
Wisteria frutescens	Wisteria		T
Zizania aquatica var. aquatica	Wild-rice		T





ENSR | AECOM

BASF
North Works Facility
1609 Biddle Avenue
Wayne County
Wyandotte, MI 48192

SCALE	DWG DATE	PROJECT NO.
1:19755	08/14	00760-180

Figure Number

1

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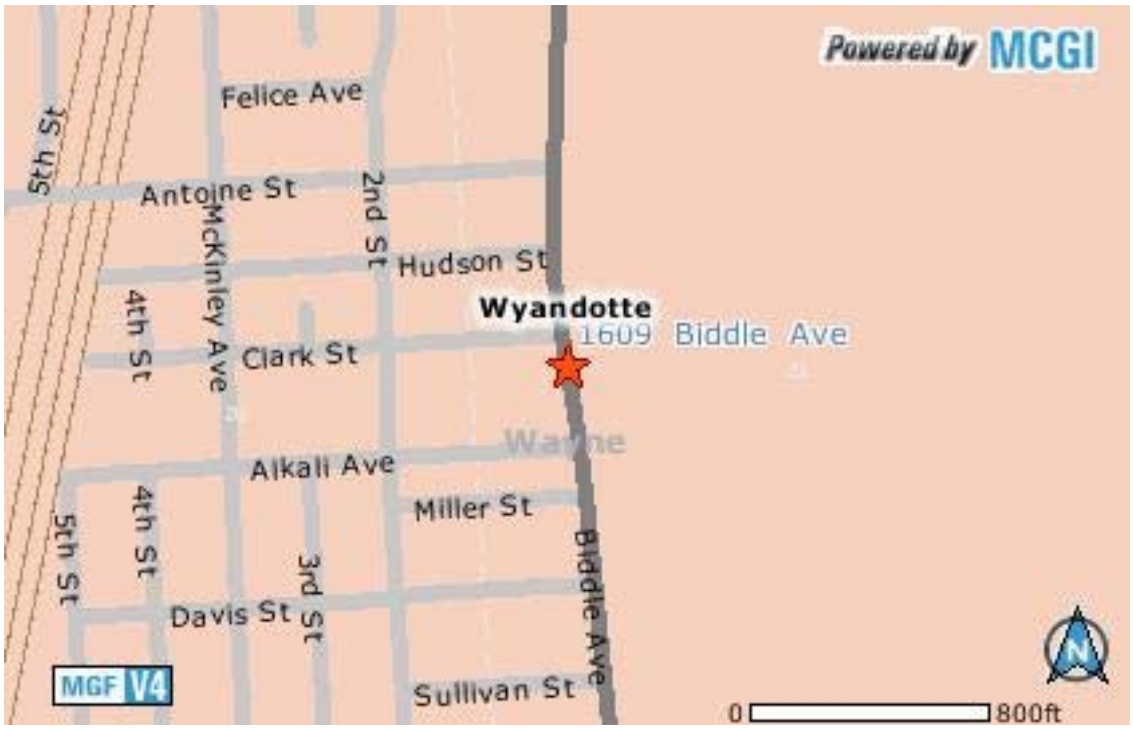
1609 Biddle Ave
Wyandotte, MI



August 2006

August 14, 2006

Field Supervisor
US Fish and Wildlife Service
2651 Coolidge Rd Suite 101
East Lancing, MI 48823

Subject: Request for Project Review, Wayne County, Wyandotte, Michigan ENSR Project Number 04020-099

To Whom It May Concern:

A Corrective Measure Study (CMS) is being conducted at the BASF North Works Facility owned by BASF Corporation (BASF) located at 1609 Biddle Avenue, Wayne County, Wyandotte, Michigan. The Facility covers approximately 230 acres, and 25 to 30 percent of this area is covered with buildings, paved streets, and parking lots. ENSR, working on behalf of BASF, is checking for the known presence of any rare, threatened or endangered listed species, including species of special concern or critical habitat in the vicinity of the site. A topographic map and a street map identifying the location of the property is attached for your reference. Included with this letter is a list of species identified during our online research at the US Fish and Wildlife Service (USFWS) Threatened and Endangered Species System website (http://ecos.fws.gov/tess_public/). ENSR would like confirmation of the listed species as well as additional information not presented on your website for Wayne County in the vicinity of the site.

We appreciate USFWS efforts to provide ENSR with this information in a timely manner. A letter of request for information regarding state-listed species has been sent to the DNR's Michigan Wildlife Division offices. Please contact Kristen Wandland at (919) 872-6600 if you have questions regarding this project.

Sincerely,

Kristen Wandland
Ecological Task Manager

attachments

cc: file

Notes:

- *This report shows the species listed in this state that also occur in this state.*
- *This list does not include experimental populations and similarity of appearance listings.*
- *This list includes non-nesting sea turtles and whales in State/Territory coastal waters.*
- *This list includes species or populations under the sole jurisdiction of the National Marine Fisheries Service.*
- *Click on the highlighted scientific names below to view a Species Profile for each listing.*

Species listed in this state and that occur in this state -- 22 listings

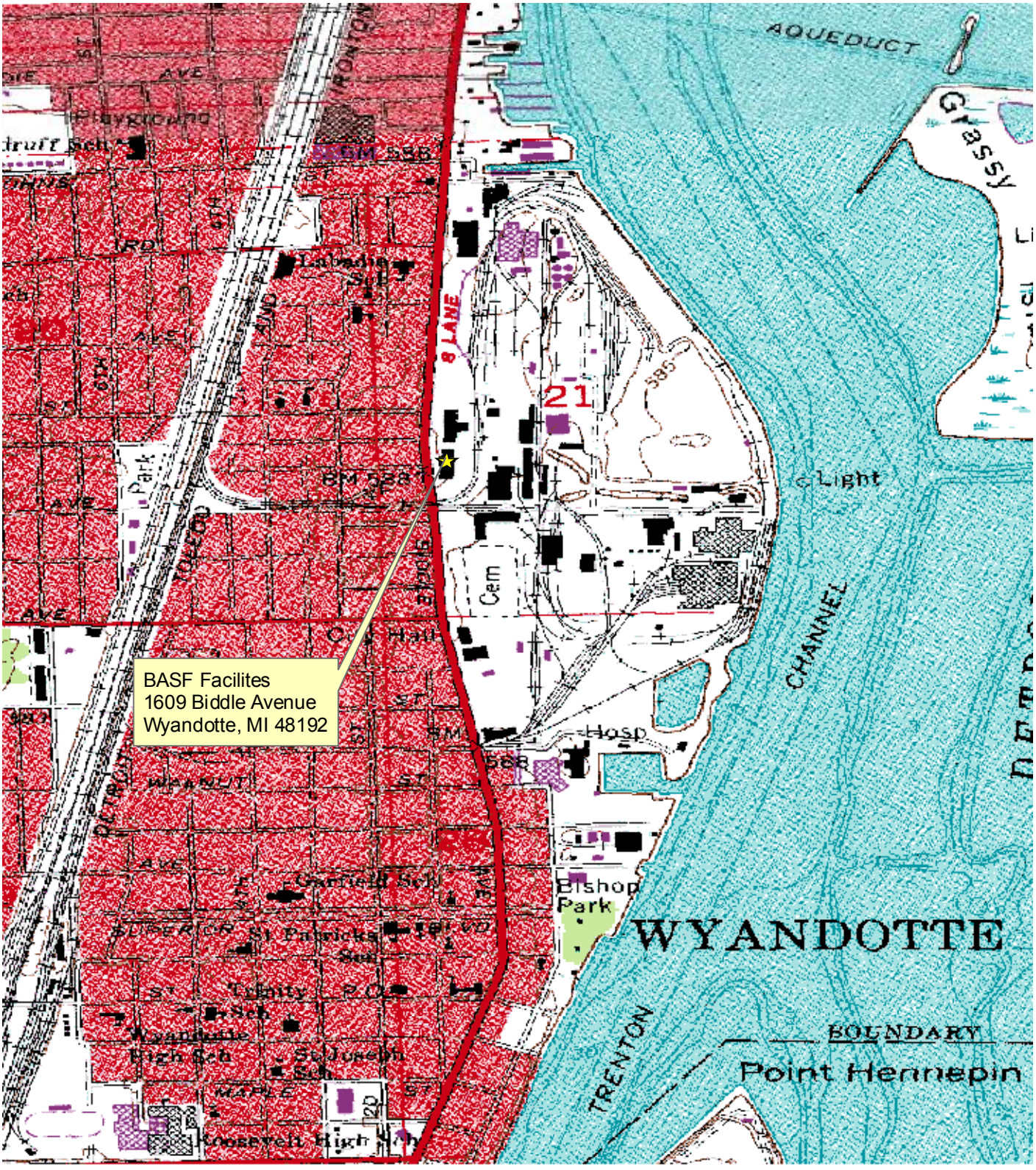
Animals -- 14

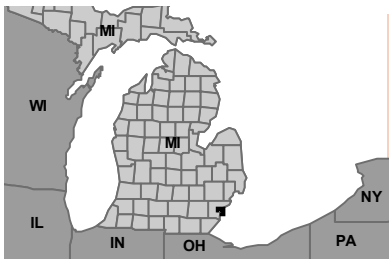
Status	*Species/Listing Name*
E	Bat, Indiana (*Myotis sodalis*)
E	Beetle, American burying (*Nicrophorus americanus*)
E	Beetle, Hungerford's crawling water (*Brychius hungerfordi*)
E	Butterfly, Karner blue (*Lycaeides melissa samuelis*)
E	Butterfly, Mitchell's satyr (*Neonympha mitchellii mitchellii*)
E	Clubshell Entire Range; Except where listed as Experimental Populations (*Pleurobema clava*)
T	Eagle, bald lower 48 States (*Haliaeetus leucocephalus*)
T	Lynx, Canada lower 48 States DPS (*Lynx canadensis*)
E	Plover, piping Great Lakes watershed (*Charadrius melodus*)
E	Puma (=cougar), eastern (*Puma (=Felis) concolor couguar*)
E	Riffleshell, northern (*Epioblasma torulosa rangiana*)
T	Snake, copperbelly water MI, OH, IN N of 400 N. Lat. (*Nerodia erythrogaster neglecta*)
E	Warbler (=wood), Kirtland's (*Dendroica kirtlandii*)
E	Wolf, gray lower 48 States, except MN and where XN; Mexico (*Canis lupus*)

Plants -- 8

Status	*Species/Listing Name*

T	Daisy, lakeside (*Hymenoxys herbacea*)
T	Fern, American hart's-tongue (*Asplenium scolopendrium var. americanum*)
T	Goldenrod, Houghton's (*Solidago houghtonii*)
T	Iris, dwarf lake (*Iris lacustris*)
E	Monkey-flower, Michigan (*Mimulus glabratus var. michiganensis*)
T	Orchid, eastern prairie fringed (*Platanthera leucophaea*)
T	Pogonia, small whorled (*Isotria medeoloides*)
T	Thistle, Pitcher's (*Cirsium pitcheri*)





ENSR | AECOM

BASF
North Works Facility
1609 Biddle Avenue
Wayne County
Wyandotte, MI 48192

SCALE	DWG DATE	PROJECT NO.
1:19755	08/14	00760-180

Figure Number

1

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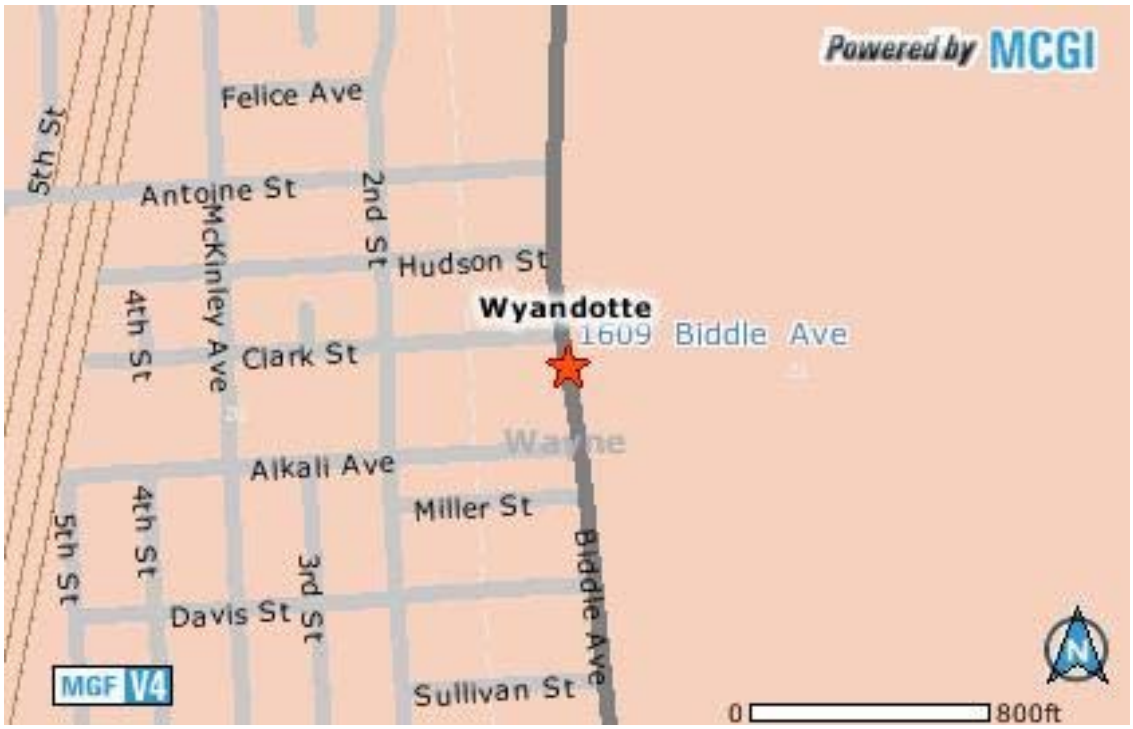
ENSR | AECOM

1609 Biddle Ave
Wyandotte, MI



August 2006

United States Department of the Interior

FISH AND WILDLIFE SERVICE
East Lansing Field Office (ES)
2651 Coolidge Road, Suite 101
East Lansing, Michigan 48823-6316

IN REPLY REFER TO:

September 22, 2006

Ms. Kristen Wandland
ENSR/AECOM
7041 Old Wake Forest Road
Suite 103
Raleigh, NC 27616

Re: Endangered Species List Request, Proposed BASF Corporation Corrective Measure Study, North Works Facility, 1609 Biddle Avenue, Wyandotte, Wayne County, Michigan

Dear Ms. Wandland:

Thank you for your August 14, 2006 request for information regarding federally listed and proposed threatened and endangered species, candidate species, or critical habitat near your proposed project. Your request and this response are made pursuant to the Endangered Species Act of 1973, as amended (Act). Under this project, a corrective measure study is being conducted at the above BASF facility.

We agree with your notification that the endangered Indiana bat (*Myotis sodalis*) and northern riffleshell (*Epioblasma torulosa rangiana*) may occur near your proposed project. Wayne County is within the breeding range of the Indiana bat and the northern riffleshell have been present in the Detroit River. However, according to your project site description, these species are unlikely to be affected by this study because suitable habitat is not present at the project site. No other federally protected species are known to occur in the vicinity of your project. This precludes the need for further action on this project as required by the Act. If, however, more than six months pass, project plans change, or new information becomes available that indicates listed species or proposed species may be affected, you should conduct further consultation with this office.

We appreciate your concern for endangered and threatened species. Any questions can be directed to Tameka Dandridge of this office at Tameka_Dandridge@fws.gov or 517/351-8315.

Sincerely,

Craig A. Czarnecki
Field Supervisor

cc: MDNR-Wildlife Division, Lansing, MI (Attn: Lori Sargent)

s: admin/archives/sep06/se list/ENSR-BASF.tnd.doc

STATE OF MICHIGAN

JENNIFER M. GRANHOLM
GOVERNOR

DEPARTMENT OF NATURAL RESOURCES
LANSING

REBECCA A. HUMPHRIES
DIRECTOR

September 28, 2006

Ms. Kristen Wandland
ENSR
810 Duth Square Blvd., Suite 202
Columbia, SC 29210-7318

RE: **Proposed Corrective Measure Study; ENSR Project No. 001760-180**

Dear Ms. Wandland:

The location of the proposed project was checked against known localities for rare species and unique natural features, which are recorded in a statewide database. This continuously updated database is a comprehensive source of information on Michigan's endangered, threatened and special concern species, exemplary natural communities and other unique natural features. Records in the database indicate that a qualified observer has documented the presence of special natural features at a site. The absence of records may mean that a site has not been surveyed. Records may not always be up-to-date. In some cases, the only way to obtain a definitive statement on the presence of rare species is to have a competent biologist perform a field survey.

Under Act 451 of 1994, the Natural Resources and Environmental Protection Act, Part 365, Endangered Species Protection, "a person shall not take, possess, transport, ...fish, plants, and wildlife indigenous to the state and determined to be endangered or threatened," unless first receiving an Endangered Species Permit from the Department of Natural Resources, Wildlife Division. *Responsibility to protect endangered and threatened species is not limited to the list below. Other species may be present that have not been recorded in the database.*

The presence of threatened or endangered species does not preclude activities or development, but may require alterations in the project plan. Special concern species are not protected under endangered species legislation, but recommendations regarding their protection may be provided. Protection of special concern species will help prevent them from declining to the point of being listed as threatened or endangered in the future.

If the project is located on or adjacent to wetlands, lakes, streams, or other regulated resources, additional permits may be required. To obtain more information regarding permits in these areas, please visit the DEQ's website at http://www.michigan.gov/deq. Or you may contact the Michigan Department of Environmental Quality, Land and Water Management Division at 517-241-1515.

The following is a summary of the results for the project in Wayne County, section 21, T3S R11E.

The following list includes unique features that are known to occur on or near the site(s) and may be impacted by the project. Federally threatened or endangered species are marked with an asterisk (*). Please contact the U.S. Fish and Wildlife Service, 2651 Coolidge Road, Suite 101, East Lansing, MI, 48823 or (517) 351-2555 for information on federal regulations that apply to these species.

common name	status	scientific name
Common tern	state threatened	*Sterna hirundo*
Spotted turtle	state threatened	*Clemmys guttata*
Lake sturgeon	state threatened	*Acipenser fulvescens*
Silver chub	special concern	*Macrhybopsis storeriana*

NATURAL RESOURCES COMMISSION
Keith J. Charters, Chair • Mary Brown • Darnell Earley • Bob Garner • Gerald Hall • John Madigan • Frank Wheatlake

The **common tern** has been known to occur in the area. Common terns nest mainly on bare sandy, gravelly parts of islands or peninsulas where they are safe from mammalian predation. Nesting usually begins the second week of May in southern counties, with later starts farther north, and concludes by early August. Significant disturbance around nesting colonies can disrupt nesting behavior and result in nest abandonment or egg and chic mortality.

The **spotted turtle** has also been known to occur in the area. Spotted turtles inhabit shallow ponds, wet meadows, tamarack swamps, bogs, fens, marsh channels, sphagnum seepages, and slow streams. Common qualities of occupied habitats include clear, shallow water with a mud or muck bottom and ample aquatic and emergent vegetation. Spotted turtles often wander on land and may turn up in temporary ponds. Spotted turtles are difficult to find in summer, due to reduced movement and lack of basking activity. When frightened while in or adjacent to water, they will dive to the bottom and bury themselves in the mud or beneath vegetation. They typically hibernate in shallow water from mid-October to late March.

Spotted turtles are omnivorous, but with a decided preference for animal food. Females will seek a sunny, open spot with sandy or loamy soil that is moist but well drained to lay eggs. If such places are scarce, they may nest in grassy sites or in the tops of grass or sedge hummocks. June is the main month females choose to leave their drying pools to nest. Most spotted turtles emerge from the nest in August or September.

Months of activity: March through October
Length of breeding season: March to May
Age at sexual maturity: About 8-10 years

Protection of upland nesting habitat adjacent to identified and active core wetland habitats is required for the continued survival of this species.

The **lake sturgeon** has been known to occur in the area. Lake sturgeon are generally bottom dwelling and occur in large rivers and lakes where small benthic organisms that serve as food are abundant. They are most often associated with deep run and pool habitats of rivers where aquatic vegetation is minimal. Lake spawning may occur in rocky areas around islands or wave-swept shorelines with gravel to rubble substrates. River spawning occurs in clear water over large gravel bottoms. Sturgeon mature very slowly and seldom spawn before 20 years of age. Females spawn infrequently, only once every three to seven years, while males may spawn once every one to two years. Spawning season protection dates are from April 1 through July 15, or until August 31 in the Detroit River, Lake St. Clair, and Lake Erie.

The **silver chub** has been know to occur in the area. The silver chub inhabits sand-, silt-, and sometimes gravel-bottomed pools and backwaters of small to large river; lakes. Spawning occurs in June and July.

In summary, the project site may include suitable habitat for the above listed species. Potential impacts might include direct destruction of species and disturbance of critical habitat. Responses and correspondence can be sent to:

Michigan Department of Natural Resources
Wildlife Division – Natural Heritage Program
PO Box 30180
Lansing, MI 48909

Thank you for your advance coordination in addressing the protection of Michigan's natural resource heritage. If you have further questions, please call me at 517-373-1263 or e-mail at SargenL2@michigan.gov .

Sincerely,

Lori G. Sargent
Endangered Species Specialist
Wildlife Division

Appendix F

Food Web Model

Table F-1
Exposure Parameters for Ecological Receptors
BASF North Works Facility
Wyandotte, Michigan
Screening Ecological Risk Assessment

Receptor	Body Weight (kg)	Assumed Diet Fraction of diet as %; Amount as kg/day				Food Ingestion Rate (kg_{dw}/day)	Food Ingestion Rate (kg_{ww}/day)	Fraction Abiotic Media in Diet	Exposure Duration (unitless)
			Terrestrial Invertebrates	Small Mammals	Terrestrial Plants			Soil	
Omnivores									
Raccoon (*Procyon lotor*)	5.700 [a]	%	52%	10%	33%	0.2873 [c]	1.3645 [d]	5%	1 [g]
		kg/day	0.7469 [b]	0.1436 [b]	0.4740 [b]			0.0144 [e]	
Insectivores									
American Robin (*Turdus migratorius*)	0.08 [a]	%	40%	--	55%	0.0112 [c]	0.0534 [d]	5%	0.75 [g]
		kg/day	0.0225 [b]	-- [b]	0.0309 [b]			0.0006 [e]	
Short-tailed shrew (*Blarina brevicauda*)	0.015 [a]	%	90%	--	6%	0.0017 [c]	0.0083 [d]	4%	1 [g]
		kg/day	0.0075 [b]	-- [b]	0.0005 [b]			0.0001 [e]	
Herbivore									
Eastern cottontail (*Sylvilagus floridanus*)	1.231 [a]	%	--	--	99%	0.0474 [c]	0.2370 [d]	1%	1 [g]
		kg/day	-- [b]	-- [b]	0.2346 [b]			0.00047 [e]	

Table F-1
Exposure Parameters for Ecological Receptors
BASF North Works Facility
Wyandotte, Michigan
Screening Ecological Risk Assessment

General Notes:

[1] Water content of prey organisms and vegetation assumed to be 80%

[2] Food ingestion rates are wet weight for food items and dry weight for sediment/soil ingestion. As needed, rate may be converted.

See individual organism notes for source, units, and conversion.

kg = kilogram ww = wet weight

dw = dry weight bw = body weight

Footnotes for individual species parameters and assumptions continued on next page.

Notes for Red-tailed Hawk (*Buteo jamaicensis*):

[a] Average body weight of adult male and female red-tailed hawk from Michigan, Pennsylvania, Ohio, and Idaho studies (USEPA, 1993).

[b] Red-tailed hawk diet assumed to be all small mammal, although birds and reptiles are also likely prey.

[c] Wet weight food ingestion rate converted to dry weight assuming 80% moisture in food.

[d] Average food ingestion rate (FIR) of *B. jamaicensis* from adult outdoor captive individuals in Michigan study (USEPA, 1993).

[e] Assumption based on best professional judgement.

[f] Estimated water ingestion rate (kg/day) using the allometric equation developed by Calder and Braun (1983) where WI = (0.059*Wt^0.67)

[g] Red-tailed hawk assumed to be present and actively foraging year-round.

Notes for Red Fox (*Vulpes vulpes*):

[a] Average of adult male and female red fox body weights in spring (Illinois study) and fall (Iowa study) (USEPA, 1993).

[b] Average year-round dietary composition for red fox from a study in Illinois farms and woods (USEPA, 1993). Birds included in small mammal fraction.

[c] Wet weight food ingestion rate converted to dry weight assuming 80% moisture in food.

[d] Average food ingestion rate of male and female adult red fox nonbreeding and prior to whelp, and female in first four weeks following welp in North Dakota captive study (USEPA, 1993).

[e] Beyer and Connor, 1992

[f] Estimated water ingestion rate (kg/day) using the allometric equation developed by Calder and Braun (1983) where WI = (0.099*Wt^0.90)

[g] Red fox assumed to be present and actively foraging year-round.

Table F-1
Exposure Parameters for Ecological Receptors
BASF North Works Facility
Wyandotte, Michigan
Screening Ecological Risk Assessment

Notes for Raccoon (*Procyon lotor*):

[a] Average body weight of adult male and female raccoons in Illinois, Missouri, and Alabama studies (USEPA, 1993).

[b] Average four-season dietary composition for *P. lotor* in Maryland and Tennesse studies, and New York summer study (USEPA, 1993).

[c] Food ingestion rate calculated using alorithm developed by Nagy, 1987; where FI (kg_{dw}/day) = $0.0687*Wt^{0.822}$

[d] Dry weight food ingestion rate converted to wet weight food ingestion rate:

$$FIR_{ww} \text{ Sum } \{[(\text{Proportion of food}_i \text{ in diet}) \times (FIR_{dw})] / (1\text{-moisture content}_i)\}$$

[e] Beyer and Connor, 1992

[f] Estimated water ingestion rate of adult male and female raccoon (USEPA, 1993a)

[g] Raccoon assumed to be present and actively foraging year-round.

Notes for American robin (*Turdus migratorius*):

[a] Average four-season body weight of adult male and female *T.migratorius* in Pennsylvania study (U.S. EPA, 1993).

[b] Average of year-round diet of American robin in eastern United States and summer diet of robins in south central New York (U.S. EPA, 1993) .

[c] Food ingestion rate calculated using alorithm developed by Nagy, 1987; where FI (kg_{dw}/day) = $0.0582*Wt^{0.651}$

[d] Dry weight food ingestion rate converted to wet weight food ingestion rate:

$$FIR_{ww} \text{ Sum } \{[(\text{Proportion of food}_i \text{ in diet}) \times (FIR_{dw})] / (1\text{-moisture content}_i)\}$$

[e] Assumption based on best professional judgement.

[f] Estimated using equation from Calder and Braun (1983) and body weights from Clench and Leberman (1978).

[g] American robin assumed assumed to be present and actively 9 months per year.

Notes for Short-tailed Shrew (*Blarina brevicauda*):

[a] Average body weight of adult male and female in New Hampshire Study (U.S. EPA, 1993)

[b] Estimated diet based on volume in stomach from a New York study (June through October) and a year-long study of diet based on frequency of occurrence in stomach contents in Eastern U.S. states (USEPA, 1993).

[c] Wet weight food ingestion rate converted to dry weight assuming 80% moisture in food.

[d] Average food ingestion rate of short-tailed shrew based on lab studies in Ohio (USEPA, 1993).

[e] Assumption based on best professional judgement.

[f] Water ingestion rate of adult male and female short-tailed shrew in an Illinois lab study (USEPA, 1993a)

[g] Short-tailed shrew assumed to be present and actively foraging year-round.

Table F-1
Exposure Parameters for Ecological Receptors
BASF North Works Facility
Wyandotte, Michigan
Screening Ecological Risk Assessment

Notes for Canada Goose (*Branta canadensis*):

[a] Average body weight of adult male and female Canada Goose (location not specified) (U.S. EPA, 1993)
[b] Canada goose assumed to forage in terrestrial upland areas only
[c] Wet weight food ingestion rate converted to dry weight assuming 80% moisture in food.
[d] Average food ingestion rate of Canada goose based on captive studies (U.S. EPA, 1993)
[e] Assumption based on best professional judgement.
[f] Estimated water ingestion rate of adult male and female Canada goose (USEPA, 1993a)
[g] Canada goose assumed to be assumed assumed to be present and actively foraging 9 months per year

Notes for Eastern Cottontail (*Sylvilagus floridanus*):

[a] Average body weight of adult male and female Eastern cottontail in Illinois study (USEPA, 1993).
[b] Estimation of dietary composition (Chapman and Feldhamer, 1982).
[c] Wet weight food ingestion rate converted to dry weight assuming 80% moisture in food.
[d] Average food ingestion rate of eastern cottontail from Sample et al. (1996)
[e] Assumption based on best professional judgement.
[f] Average water intake rate of eastern cottontail from Sample et al. (1996)
[g] Eastern cottontail assumed to be actively foraging year-round.

Table F-2
Toxicity Reference Values
BASF North Works Facility
Wyandotte, Michigan
Screening Ecological Risk Assessment

Constituent		NOAEL Test Species	Test NOAEL (mg/kgbw-day)	LOAEL Test Species	Test LOAEL (mg/kgbw-day)
INORGANICS					
ANTIMONY	[b]	Mouse	0.125	Mouse	1.25
	[m]	NA	0.0125	NA	0.125
ARSENIC	[a]	Dog	1.04	Dog	1.66
	[a]	Chicken	2.24	Mallard	17.3
CADMIUM	[a]	Rat	0.77	Rat	7.7
	[a]	Multiple species	1.47	Multiple species	6.35
CHROMIUM	[a]	Multiple species	2.4	Multiple species	9.62
	[a]	Multiple species	2.66	Multiple species	15.6
COPPER	[a]	Pig	5.6	Pig	9.34
	[a]	Chicken	4.05	Chicken	12.1
LEAD	[a]	Rat	4.7	Rat	8.9
	[a]	Chicken	1.63	Chicken	3.26
MERCURY	[b]	Mouse	13.2	Mouse	132
	[b]	Mallard	0.0064	Mallard	0.064
NICKEL	[a]	Mouse	1.7	Mouse	3.4
	[a]	Multiple species	6.71	Multiple species	18.6
SELENIUM	[a]	Pig	0.143	Pig	0.215
	[a]	Chicken	0.29	Mallard	0.579
SILVER	[a]	Pig	6.02	Pig	60.2
	[a]	Turkey	2.02	Turkey	20.2
THALLIUM	[b]	Rat	0.0074	Rat	0.074
	[c,j]	Starling	0.35	Starling	3.5
TIN	[b]	Mouse	23.4	Mouse	35
	[b]	Japanese Quail	6.8	Japanese Quail	16.9
TOTAL CYANIDE	[b]	Rat	68.7	Rat	687
	[c,k]	Kestrel	0.04	Kestrel	0.4
VANADIUM	[a]	Mouse	4.16	Mouse	8.31
	[a]	Chicken	0.344	Chicken	0.688
ZINC	[a]	Multiple species	75.4	Multiple species	298
	[a]	Multiple species	66.1	Multiple species	187
Semivolatile Organic Compounds					
BENZO(A)ANTHRACENE	[b,d]	Mouse	0.615	Mouse	3.01
	[c,e]	Mallard	40	Mallard	400
BENZO(A)PYRENE	[b,d]	Mouse	0.615	Mouse	3.01
	[c,e]	Mallard	40	Mallard	400
CHRYSENE	[b,d]	Mouse	0.615	Mouse	3.01
	[c,e]	Mallard	40	Mallard	400
NAPHTHALENE	[b,n]	Rat	65.6	Rat	328
	[c,e]	Mallard	40	Mallard	400
2,4-DIMETHYLPHENOL		NA	NA	NA	NA
		NA	NA	NA	NA
BENZALDEHYDE		NA	NA	NA	NA
		NA	NA	NA	NA
CARBAZOLE	[c,o]	Rat	50	Rat	500
	[m]	NA	5	NA	50
DIBENZOFURAN	[c,l]	Rat	12.5	Rat	125
		NA	NA	NA	NA
PENTACHLOROPHENOL	[b]	Rat	0.24	Rat	2.4
	[m]	NA	0.024	NA	0.24

Table F-2
Toxicity Reference Values
BASF North Works Facility
Wyandotte, Michigan
Screening Ecological Risk Assessment

Constituent		NOAEL Test Species	Test NOAEL (mg/kgbw-day)	LOAEL Test Species	Test LOAEL (mg/kgbw-day)
Pesticides and PCBs					
4,4-DDT	[a]	Rat	0.147	Rat	0.735
	[a]	Chicken	0.227	Chicken	2.27
BETA-BHC	[b,f]	Rat	1.6	Rat	3.2
	[b,f]	Japanese Quail	0.56	Japanese Quail	2.25
DIELDRIN	[a]	Rat	0.015	Rat	0.030
	[a]	Mallard	0.0709	Mallard	3.78
ENDRIN ALDEHYDE	[b,g]	Mouse	0.092	Mouse	0.92
	[b,g]	Mallard	0.3	Mallard	3
ENDRIN KETONE	[b,g]	Mouse	0.092	Mouse	0.92
	[b,g]	Mallard	0.3	Mallard	3
Total PCBs	[b,h]	Mink	0.137	Mink	0.685
	[b,i]	Screech Owl	0.41	Screech Owl	4.1

Notes:
NA - Not available
LOAEL - Lowest Observed Adverse Effects Level
NOAEL - No Observed Adverse Effects Level
-- Not Evaluated
kg = kilogram
bw = body weight
mg = milligram

NOAEL-based TRVs were preferably based on chronic NOAELs, with an emphasis on studies that measured effects on survival, reproduction, and growth endpoints applicable to the protection of wildlife populations.
The following steps were followed to select LOAEL-based TRVs -
If a LOAEL was reported for the study used to derive the NOAEL-based TRV, that LOAEL value was selected as the LOAEL-based TRV.
In the case where the geometric mean of several NOAELs for growth and reproductive endpoints was used as the NOAEL-based TRV (i.e., EcoSSL-based TRVs), the geometric mean of the LOAELs for growth and reproduction was calculated and selected as the LOAEL-based TRV.
For EcoSSL-based TRVs, when the NOAEL-based TRV was based on a single NOAEL and no corresponding LOAEL was available, the upper-bound LOAEL for growth and reproduction was used.
For TRVs derived from other sources, when there was no paired LOAEL, a factor of 10 was applied to the NOAEL-based TRV to estimate a LOAEL-based TRV.

[a] - TRVs derived by USEPA during development of Eco-SSLs. See individual Eco-SSL documents for details (http://www.epa.gov/ecotox/ecossl). The process for derivation of wildlife TRVs is described in Attachment 4-5 of U.S. EPA (2003).
[b] - TRVs derived by Oak Ridge National Laboratory (Sample, et al, 1996).
[c] - TRVs derived from scientific literature. See additional footnotes for details.
[d] - Eco-SSL for high molecular weight polycyclic aromatic hydrocarbons selected as TRV.
[e] - TRV based on a subchronic toxicity study that exposed mallards to a mixture of naphthalenes, naphthenes and phenanthrene (Patton and Deter, 1980 as cited in Eisler, 1987).
[f] - Study conducted with mixed isomers.
[g] - Value for endrin used as a surrogate.
[h] - Value for Aroclor-1254 used as a surrogate.
[i] - Value for Aroclor-1242 used as a surrogate.
[j] - TRV derived by USEPA (1999) based on an acute toxicity study with the starling (Schafer, 1972 as cited in USEPA 1999).
[k] - TRV derived by USEPA (1999) based on an acute toxicity study with the American kestrel (Wiemeyer, et al., 1986 as cited in USEPA 1999).
[l] - TRV based on a subchronic toxicity study that exposed rats to dibenzofuran in the diet (Thomas et al., 1940).
[m] - When no avian studies were identified, the avian TRV was derived by multiplying the mammalian TRV by an uncertainty factor of 0.1.
[n] - Eco-SSL for low molecular weight polycyclic aromatic hydrocarbons selected as TRV.
[o] - TRV based on an acute study with the rat (The Merck Index, 1976).

Thomas J. O. et al., 1940. Effects of Continued Feeding of Diphenylene Oxide. Food Res. 5:23-30.
USEPA, 1999. Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities. United States Environmental Protection Agency, Office of Solid Waste and Emergency Response. EPA530-D-99-001A. August, 1999.
Eisler, R., 1987. "Polycyclic Aromatic Hydrocarbon Hazards to Fish, Wildlife, and Invertebrates: A Synoptic Review"; U.S. Fish and Wildlife Service Biological Report 85 (1.11), 81 pp.
The Merck Index. An Encyclopedia of Chemicals, Drugs, and Biologicals. 9th ed. Ed. S. Budavari. Merck and Co. Inc., Rahway, NJ. 1976. p.227.

Table F-3
Uptake Factors Used in Ecological Risk Assessment Food Chain Modeling
BASF North Works Facility
Wyandotte, Michigan
Screening Ecological Risk Assessment

COI	log K_{ow}	Terrestrial Invertebrates (1) (mg $COPC_{invert}/kg_{dw}$)/(mg $COPC_{soil}/kg_{dw}$)	Plants (2) (mg $COPC_{plant}/kg_{dw}$)/(mg $COPC_{soil}/kg_{dw}$)	Small Mammal (Short-tailed Shrew) Bioconcentration Factors (3) soil-omnivore BCF_{S-OM}	Small Mammal (Short-tailed Shrew) Bioconcentration Factors (3) plant-omnivore BCF_{P-OM}	Small Mammal (Short-tailed Shrew) Fraction of Diet Invertebrate F_I	Small Mammal (Short-tailed Shrew) Fraction of Diet Plant F_P	Food Chain Trophic Level Shrew TL_3	Food Chain Trophic Level Prey TL_{n-Ai}
Inorganics									
Antimony	NA	0.22 [a]	regression [e]	1.36E-05 [a]	6.20E-04 [a]	90%	10%	1	1
Arsenic	NA	regression [e]	0.03752 [e]	regression [e]		90%	10%	1	1
Cadmium	NA	regression [e]	regression [e]	regression [e]		90%	10%	1	1
Chromium	NA	0.306 [e]	0.041 [e]	regression [e]		90%	10%	1	1
Copper	NA	0.515 [e]	regression [e]	regression [e]		90%	10%	1	1
Lead	NA	regression [e]	regression [e]	regression [e]		90%	10%	1	1
Mercury	NA	0.46 [a]	0.14 [a]	7.10E-05 [a]	3.24E-03 [a]	90%	10%	1	1
Nickel	NA	1.059 [e]	regression [e]	regression [e]		90%	10%	1	1
Selenium	NA	regression [e]	regression [e]	regression [e]		90%	10%	1	1
Silver	NA	2.045 [e]	0.014 [e]	4.00E-03 [e]	4.00E-03 [e]	90%	10%	1	1
Thallium	NA	0.22 [a]	0.004 [a]	5.46E-04 [a]	2.48E-02 [a]	90%	10%	1	1
Tin	NA	0.22 [d]	0.05 [f]	1.16E-03 [f]	8.17E-03 [f]	90%	10%	1	1
Total Cyanide	NA	1.12 [a]	0.05 [f]	1.16E-03 [f]	8.17E-03 [f]	90%	10%	1	1
Vanadium	NA	0.042 [e]	0.00485 [e]	1.23E-02 [e]	1.23E-02 [e]	90%	10%	1	1
Zinc	NA	regression [e]	regression [e]	regression [e]					
Semivolatile Organic Compounds									
Benzo(a)anthracene	5.70	1.59 [e]	regression [e]	0.00E+00 [e]	0.00E+00 [e]	90%	10%	8.0	1
Benzo(a)pyrene	6.11	1.33 [e]	regression [e]	0.00E+00 [e]	0.00E+00 [e]	90%	10%	11	1
Chrysene	5.74	2.29 [e]	regression [e]	0.00E+00 [e]	0.00E+00 [e]	90%	10%	8.0	1
Naphthalene	3.30	4.4 [e]	12.2 [e]	0.00E+00 [e]	0.00E+00 [e]	90%	10%	1.1	1
2,4-Dimethylphenol	2.30	5.47 [b]	1.814 [c]	5.01E-09 [a]	2.00E-08 [a]	90%	10%	1	1
Benzaldehyde	1.48	1.16 [b]	5.402 [c]	7.59E-10 [a]	3.03E-09 [a]	90%	10%	1	1
Carbazole	3.23	32 [b]	0.526 [c]	5.80E-07 [a]	2.64E-05 [a]	90%	10%	1	1
Dibenzofuran	4.12	169 [b]	0.161 [c]	4.50E-06 [a]	2.05E-04 [a]	90%	10%	1.3	1
Pentachlorophenol	5.08	1034 [b]	0.045 [c]	4.12E-05 [a]	1.87E-03 [a]	90%	10%	3.6	1
Pesticides									
4,4-DDT	6.07	6666 [b]	0.012 [c]	2.94E-05 [a]	1.18E-04 [a]	90%	10%	11	1
Beta-BHC	3.83	98 [b]	0.236 [c]	1.71E-07 [a]	6.84E-07 [a]	90%	10%	1.2	1
Dieldrin	5.27	regression [e]	0.41 [e]	4.67E-06 [a]	1.87E-05 [a]	90%	10%	4.8	1
Endrin aldehyde	4.80	610 [b]	0.065 [c]	1.58E-06 [a]	6.34E-06 [a]	90%	10%	2.5	1
Endrin ketone	4.80	610 [b]	0.065 [c]	1.58E-06 [a]	6.34E-06 [a]	90%	10%	2.5	1
Polychlorinated Biphenyls									
Total PCBs	6.02	1.13 [a]	0.0128 [a,c]	3.58E-04 [a]	1.63E-02 [a]	90%	10%	11	1

Notes:
-- = Not calculated. Either no uptake factor was available, or constituent not a COPC in that medium.
(1) Unless noted as regression, tissue concentration calculated by: COI_{prey} (mg/kg_{ww}) = $COI_{ss/sed}$ (mg/kg_{dw}) x BCF (($mg_{COI\ prey}/kg_{dw}$)/($mg_{COI\ ss/sed}/kg_{dw}$)) x (16.7% solid)
(2) Unless noted as regression, tissue concentration calculated by: COI_{plant} (mg/kg_{ww}) = COI_{soil} (mg/kg_{dw}) x UF (($mg_{COI\ plant}/kg_{dw}$)/($mg_{COI\ soil}/kg_{dw}$)) x (% solid)
(3) Unless noted as regression, tissue concentration calculated by: COI_{prey} (mg/kg_{ww}) = Sum[(COI_{soil} (mg/kg_{dw}) x soil-omnivore BCF) + (plant-omnivore BCF x F_p x COI_{plant}) + (COI_{invert} x (TL_3/TL_{n-Ai}) x F_i)]
[a] Recommended value from USEPA, 1999.
[b] BAF calculated using the algorithm of Southworth et al (1978) where:
log BAF = 0.819 x log Kow - 1.146
[c] RUF calculated using the algorthim of Travis and Arms (1983) where:
log RUF = 1.588-0.578 x log Kow
[d] Assumed 0.22 based on empirical data from USEPA, 1999.
[e] Eco-SSLs Attachment 4-1: Exposure Factors and Bioaccumulation Models for Derivation of Wildlife Eco-SSLs. USEPA 2005
[f] Used average of other inorganic COI

Table F-4
EPCs Used in Food Chain Modeling
BASF North Works Facility
Wyandotte, Michigan
Screening Ecological Risk Assessment

COI	Maximum Exposure Point Concentrations															
	AOC 7A				AOC 6				SWMU G				SWMU H			
	Soil (mg/kg_{dw})	Invertebrate (mg/kg_{ww})	Plant (mg/kg_{ww})	Mammal (mg/kg_{ww})	Soil (mg/kg_{dw})	Invertebrate (mg/kg_{ww})	Plant (mg/kg_{ww})	Mammal (mg/kg_{ww})	Soil (mg/kg_{dw})	Invertebrate (mg/kg_{ww})	Plant (mg/kg_{ww})	Mammal (mg/kg_{ww})	Soil (mg/kg_{dw})	Invertebrate (mg/kg_{ww})	Plant (mg/kg_{ww})	Mammal (mg/kg_{ww})
Inorganics																
Antimony	--	--	--	--	8.00E-01	2.94E-02	3.84E-03	2.65E-02	2.60E+00	9.55E-02	1.16E-02	8.60E-02	1.73E+01	6.36E-01	6.86E-02	5.72E-01
Arsenic	--	--		--	3.47E+01	4.93E-01	1.56E-01	1.44E-02	1.01E+02	1.05E+00	4.55E-01	3.44E-02	2.25E+01	3.63E-01	1.01E-01	1.01E-02
Cadmium	--	--	--	--	1.40E+00	1.81E+00	8.97E-02	3.33E-02	2.30E+00	2.68E+00	1.18E-01	4.22E-02	2.70E+00	3.05E+00	1.28E-01	4.55E-02
Chromium	2.91E+01	1.49E+00	1.43E-01	2.76E-01	--	--		--	3.36E+01	1.72E+00	1.65E-01	3.06E-01	6.46E+01	3.30E+00	3.18E-01	4.95E-01
Copper	3.70E+01	3.18E+00	9.71E-01	1.30E+00	4.42E+01	3.80E+00	1.04E+00	1.33E+00	9.53E+01	8.20E+00	1.41E+00	1.49E+00	5.27E+01	4.53E+00	1.12E+00	1.37E+00
Lead	--	--	--	--	1.92E+02	9.35E+00	6.07E-01	1.10E+00	2.38E+02	1.11E+01	6.85E-01	1.21E+00	1.90E+02	9.27E+00	6.04E-01	1.10E+00
Mercury	4.80E+00	3.71E-01	7.89E-02	3.34E-01	2.10E+00	1.62E-01	3.45E-02	1.46E-01	5.40E+00	4.18E-01	8.88E-02	3.76E-01	1.10E+00	8.51E-02	1.81E-02	7.66E-02
Nickel	--	--	--	--	2.50E+01	4.42E+00	1.44E-01	3.50E-01	2.56E+01	4.53E+00	1.47E-01	3.54E-01	6.92E+01	1.22E+01	3.09E-01	5.63E-01
Selenium	1.70E+00	2.29E-01	1.11E-01	8.06E-02	6.30E-01	1.10E-01	3.70E-02	5.54E-02	4.40E-01	8.49E-02	2.49E-02	4.84E-02	--	--	--	--
Silver	1.00E+01	3.42E+00	1.68E-02	3.11E+00	--	--		--	--	--		--	--	--		--
Thallium	--	--	--	--	--	--	--	--	--	--	--	--	1.60E+00	5.88E-02	7.68E-04	5.38E-02
Tin	--	--	--	--	--	--	--	--	--	--	--	--	1.14E+02	4.19E+00	6.70E-01	3.90E+00
Total Cyanide	5.70E+00	1.07E+00	3.35E-02	9.66E-01	--	--		--	--	--		--	--	--		--
Vanadium	--	--		--	1.90E+01	1.33E-01	1.11E-02	3.54E-01	2.97E+01	2.08E-01	1.73E-02	5.53E-01	2.82E+01	1.98E-01	1.64E-02	5.25E-01
Zinc	--	--	--	--	2.35E+02	8.56E+01	1.19E+01	1.15E+01	3.35E+02	9.62E+01	1.45E+01	1.18E+01	1.63E+02	7.59E+01	9.74E+00	1.12E+01
Semivolatile Organic Compounds																
Benzo(a)anthracene	--	--	--	--	1.50E+01	3.98E+00	4.00E-02	2.87E+01	--	--	--	--	--	--	--	--
Benzo(a)pyrene	--	--	--	--	1.10E+01	2.44E+00	1.58E-01	2.42E+01	3.70E+00	8.22E-01	5.47E-02	8.14E+00	--	--	--	--
Chrysene	--	--	--	--	1.60E+01	6.12E+00	4.16E-02	4.41E+01	--	--	--	--	--	--	--	--
Naphthalene	--	--	--	--	1.25E+00	9.19E-01	1.83E+00	9.09E-01	8.10E-01	5.95E-01	1.19E+00	5.89E-01	5.50E-01	4.04E-01	8.05E-01	4.00E-01
2,4-Dimethylphenol	--	--	--	--	--	--	--	--	5.70E-02	5.21E-02	1.24E-02	4.69E-02	--	--	--	--
Benzaldehyde	--	--	--	--	9.90E-02	1.92E-02	6.42E-02	1.73E-02	--	--	--	--	--	--	--	--
Carbazole	--	--	--	--	1.10E+00	5.88E+00	6.94E-02	5.29E+00	--	--	--	--	5.50E-02	2.94E-01	3.47E-03	2.65E-01
Dibenzofuran	--	--	--	--	7.80E-01	2.20E+01	1.51E-02	2.58E+01	4.30E-01	1.21E+01	8.31E-03	1.42E+01	6.30E-02	1.78E+00	1.22E-03	2.08E+00
Pentachlorophenol	--	--	--	--	--	--	--	--	6.20E-01	1.07E+02	3.35E-03	3.47E+02	--	--	--	--
Pesticides																
4,4-DDT	--	--	--	--	--	--	--	--	1.55E-02	1.73E+01	2.23E-05	1.71E+02	1.20E-02	1.34E+01	1.73E-05	1.32E+02
Beta-BHC	--	--	--	--	--	--	--	--	--	--	--	--	9.40E-03	1.54E-01	2.66E-04	1.38E-01
Dieldrin	--	--	--	--	--	--	--	--	--	--	--	--	1.20E-02	3.38E-02	5.90E-04	1.46E-01
Endrin aldehyde	--	--	--	--	--	--	--	--	--	--	--	--	1.20E-02	1.22E+00	9.36E-05	2.75E+00
Endrin ketone	--	--	--	--	--	--	--	--	--	--	--	--	1.40E-02	1.43E+00	1.09E-04	3.21E+00
Polychlorinated Biphenyls																
Total PCBs	--	--	--	--	--	--	--	--	1.10E+00	2.08E-01	1.69E-03	2.06E+00	1.70E+00	3.21E-01	2.62E-03	3.18E+00

-- = Not a COI
EPC = Exposure Point Concentration
mg/kg - milligrams per kilogram

Table F-4
EPCs Used in Food Chain Modeling
BASF North Works Facility
Wyandotte, Michigan
Screening Ecological Risk Assessment

COI	Average Exposure Point Concentrations															
	AOC 7A				AOC 6				SWMU G				SWMU H			
	Soil (mg/kg_{dw})	Invertebrate (mg/kg_{ww})	Plant (mg/kg_{ww})	Mammal (mg/kg_{ww})	Soil (mg/kg_{dw})	Invertebrate (mg/kg_{ww})	Plant (mg/kg_{ww})	Mammal (mg/kg_{ww})	Soil (mg/kg_{dw})	Invertebrate (mg/kg_{ww})	Plant (mg/kg_{ww})	Mammal (mg/kg_{ww})	Soil (mg/kg_{dw})	Invertebrate (mg/kg_{ww})	Plant (mg/kg_{ww})	Mammal (mg/kg_{ww})
Inorganics																
Antimony	--	--	--	--	6.03E-01	2.22E-02	2.95E-03	2.00E-02	6.17E-01	2.27E-02	3.01E-03	2.04E-02	7.09E+00	2.60E-01	2.97E-02	2.34E-01
Arsenic	--	--		--	1.58E+01	2.83E-01	7.10E-02	7.53E-03	2.67E+01	4.10E-01	1.20E-01	1.16E-02	1.76E+01	3.05E-01	7.92E-02	8.24E-03
Cadmium	--	--	--	--	7.50E-01	1.10E+00	6.38E-02	2.48E-02	7.90E-01	1.15E+00	6.56E-02	2.55E-02	1.17E+00	1.56E+00	8.11E-02	3.06E-02
Chromium	1.61E+01	8.23E-01	7.93E-02	1.79E-01	--	--		--	1.55E+01	7.92E-01	7.62E-02	1.74E-01	4.29E+01	2.19E+00	2.11E-01	3.66E-01
Copper	2.13E+01	1.83E+00	7.80E-01	1.20E+00	2.45E+01	2.11E+00	8.25E-01	1.22E+00	3.39E+01	2.91E+00	9.38E-01	1.28E+00	3.21E+01	2.76E+00	9.17E-01	1.27E+00
Lead	--	--	--	--	6.44E+01	3.87E+00	3.29E-01	6.81E-01	7.33E+01	4.30E+00	3.54E-01	7.21E-01	8.23E+01	4.72E+00	3.78E-01	7.59E-01
Mercury	1.27E+00	9.81E-02	2.09E-02	8.84E-02	9.15E-01	7.07E-02	1.50E-02	6.37E-02	7.69E-01	5.95E-02	1.26E-02	5.36E-02	5.35E-01	4.14E-02	8.80E-03	3.73E-02
Nickel	--	--	--	--	1.45E+01	2.56E+00	9.58E-02	2.71E-01	1.34E+01	2.36E+00	9.03E-02	2.61E-01	3.00E+01	5.31E+00	1.65E-01	3.81E-01
Selenium	5.83E-01	1.04E-01	3.40E-02	5.39E-02	3.89E-01	7.75E-02	2.17E-02	4.62E-02	3.14E-01	6.63E-02	1.71E-02	4.27E-02	--	--	--	--
Silver	1.31E+00	4.46E-01	2.19E-03	4.06E-01	--	--		--	--	--		--	--	--		--
Thallium	--	--	--	--	--	--	--	--	--	--	--	--	1.00E+00	3.67E-02	4.80E-04	3.36E-02
Tin	--	--	--	--	--	--	--	--	--	--	--	--	3.31E+01	1.22E+00	1.95E-01	1.13E+00
Total Cyanide	1.66E+00	3.11E-01	9.78E-03	2.82E-01	--	--		--	--	--		--	--	--		--
Vanadium	--	--		--	1.25E+01	8.77E-02	7.28E-03	2.33E-01	1.30E+01	9.15E-02	7.59E-03	2.43E-01	2.36E+01	1.66E-01	1.37E-02	4.40E-01
Zinc	--	--	--	--	9.70E+01	6.41E+01	7.31E+00	1.08E+01	1.09E+02	6.65E+01	7.79E+00	1.09E+01	1.13E+02	6.73E+01	7.94E+00	1.10E+01
Semivolatile Organic Compounds																
Benzo(a)anthracene	--	--	--	--	4.93E+00	1.31E+00	2.07E-02	9.42E+00	--	--	--	--	--	--	--	--
Benzo(a)pyrene	--	--	--	--	3.85E+00	8.54E-01	5.68E-02	8.46E+00	8.10E-01	1.33E+01	1.24E-02	1.32E+02	--	--	--	--
Chrysene	--	--	--	--	5.01E+00	1.92E+00	2.09E-02	1.38E+01	--	--	--	--	--	--	--	--
Naphthalene	--	--	--	--	4.25E-01	3.12E-01	6.21E-01	3.09E-01	3.52E-01	1.01E+01	5.15E-01	1.00E+01	2.15E-01	1.58E-01	3.15E-01	1.56E-01
2,4-Dimethylphenol	--	--	--	--	--	--	--	--	5.70E-02	5.58E+00	1.24E-02	5.02E+00	--	--	--	--
Benzaldehyde	--	--	--	--	9.35E-02	1.81E-02	6.06E-02	1.63E-02	--	--	--	--	--	--	--	--
Carbazole	--	--	--	--	4.59E-01	2.45E+00	2.90E-02	2.21E+00	--	--	--	--	4.65E-02	2.48E-01	2.94E-03	2.24E-01
Dibenzofuran	--	--	--	--	3.14E-01	8.86E+00	6.06E-03	1.04E+01	1.93E-01	8.33E+00	3.74E-03	9.75E+00	5.00E-02	1.41E+00	9.66E-04	1.65E+00
Pentachlorophenol	--	--	--	--	--	--	--	--	1.29E-01	7.30E+00	6.99E-04	2.37E+01	--	--	--	--
Pesticides																
4,4-DDT	--	--	--	--	--	--	--	--	9.80E-03	3.13E+00	1.41E-05	3.10E+01	6.90E-03	7.68E+00	9.94E-06	7.60E+01
Beta-BHC	--	--	--	--	--	--	--	--	--	--	--	--	7.20E-03	1.18E-01	2.04E-04	1.06E-01
Dieldrin	--	--	--	--	--	--	--	--	--	--	--	--	7.30E-03	2.19E-02	3.59E-04	9.45E-02
Endrin aldehyde	--	--	--	--	--	--	--	--	--	--	--	--	7.30E-03	7.44E-01	5.69E-05	1.67E+00
Endrin ketone	--	--	--	--	--	--	--	--	--	--	--	--	7.60E-03	7.74E-01	5.93E-05	1.74E+00
Polychlorinated Biphenyls																
Total PCBs	--	--	--	--	--	--	--	--	3.84E-01	1.33E-02	5.91E-04	1.32E-01	5.49E-01	1.04E-01	8.45E-04	1.02E+00

-- = Not a COI
EPC = Exposure Point Concentration
mg/kg - milligrams per kilogram

TABLE F-5
POTENTIAL RISKS TO THE AMERICAN ROBIN - MAXIMUM EXPOSURE
AOC 6
BASF, WYANDOTTE, MI

COI	Site Concentrations			Potential Daily Dose (mg/kg_{bw}-day)				NOAEL TRV (mg/kg_{bw}day)	NOAEL HQ	LOAEL TRV (mg/kg_{bw}day)	LOAEL HQ
	Surface Soil (mg/kg_{dw})	Terrestrial Invertebrate (mg/kg_{ww})	Terrestrial Plant (mg/kg_{ww})	Surface Soil	Terrestrial Invertebrates	Terrestrial Plant	Total				
Inorganics											
Antimony	8.0E-01	2.9E-02	3.8E-03	4.2E-03	6.2E-03	1.1E-03	1.2E-02	1.3E-02	9.2E-01	1.3E-01	9.2E-02
Arsenic	3.5E+01	4.9E-01	1.6E-01	1.8E-01	1.0E-01	4.5E-02	3.3E-01	2.2E+00	1.5E-01	1.7E+01	1.9E-02
Cadmium	1.4E+00	1.8E+00	9.0E-02	7.4E-03	3.8E-01	2.6E-02	4.1E-01	1.5E+00	2.8E-01	6.4E+00	6.5E-02
Copper	4.4E+01	3.8E+00	1.0E+00	2.3E-01	8.0E-01	3.0E-01	1.3E+00	4.1E+00	3.3E-01	1.2E+01	1.1E-01
Lead	1.9E+02	9.3E+00	6.1E-01	1.0E+00	2.0E+00	1.8E-01	3.2E+00	1.6E+00	1.9E+00	3.3E+00	9.7E-01
Mercury	2.1E+00	1.6E-01	3.5E-02	1.1E-02	3.4E-02	1.0E-02	5.5E-02	6.4E-03	8.6E+00	6.4E-02	8.6E-01
Nickel	2.5E+01	4.4E+00	1.4E-01	1.3E-01	9.3E-01	4.2E-02	1.1E+00	6.7E+00	1.6E-01	1.9E+01	5.9E-02
Selenium	6.3E-01	1.1E-01	3.7E-02	3.3E-03	2.3E-02	1.1E-02	3.7E-02	2.9E-01	1.3E-01	5.8E-01	6.4E-02
Vanadium	1.9E+01	1.3E-01	1.1E-02	1.0E-01	2.8E-02	3.2E-03	1.3E-01	3.4E-01	3.8E-01	6.9E-01	1.9E-01
Zinc	2.4E+02	8.6E+01	1.2E+01	1.2E+00	1.8E+01	3.5E+00	2.3E+01	6.6E+01	3.4E-01	1.9E+02	1.2E-01
Semivolatile Organic Compounds											
Benzo(a)anthracene	1.5E+01	4.0E+00	4.0E-02	7.9E-02	8.4E-01	1.2E-02	9.3E-01	4.0E+01	2.3E-02	4.0E+02	2.3E-03
Benzo(a)pyrene	1.1E+01	2.4E+00	1.6E-01	5.8E-02	5.1E-01	4.6E-02	6.2E-01	4.0E+01	1.5E-02	4.0E+02	1.5E-03
Chrysene	1.6E+01	6.1E+00	4.2E-02	8.4E-02	1.3E+00	1.2E-02	1.4E+00	4.0E+01	3.5E-02	4.0E+02	3.5E-03
Naphthalene	1.3E+00	9.2E-01	1.8E+00	6.6E-03	1.9E-01	5.3E-01	7.3E-01	4.0E+01	1.8E-02	4.0E+02	1.8E-03
Benzaldehyde	9.9E-02	1.9E-02	6.4E-02	5.2E-04	4.0E-03	1.9E-02	2.3E-02	NA	NC	NA	NC
Carbazole	1.1E+00	5.9E+00	6.9E-02	5.8E-03	1.2E+00	2.0E-02	1.3E+00	5.0E+00	2.5E-01	5.0E+01	2.5E-02
Dibenzofuran	7.8E-01	2.2E+01	1.5E-02	4.1E-03	4.6E+00	4.4E-03	4.6E+00	NA	NC	NA	NC

TABLE F-6
POTENTIAL RISKS TO THE RACCOON - MAXIMUM EXPOSURE
AOC 6
BASF, WYANDOTTE, MI

COI	Site Concentrations				Potential Daily Dose (mg/kg_{bw}-day)					NOAEL TRV (mg/kg_{bw}day)	NOAEL HQ	LOAEL TRV (mg/kg_{bw}day)	LOAEL HQ
	Surface Soil (mg/kg_{dw})	Terrestrial Invertebrate (mg/kg_{ww})	Small Mammal (mg/kg_{ww})	Terrestrial Plant (mg/kg_{ww})	Surface Soil	Terrestrial Invertebrates	Small Mammal	Terrestrial Plant	Total				
Inorganics													
Antimony	8.0E-01	2.9E-02	2.6E-02	3.8E-03	2.0E-03	3.9E-03	6.7E-04	3.2E-04	6.9E-03	1.3E-01	5.5E-02	1.3E+00	5.5E-03
Arsenic	3.5E+01	4.9E-01	1.4E-02	1.6E-01	8.7E-02	6.5E-02	3.6E-04	1.3E-02	1.7E-01	1.0E+00	1.6E-01	1.7E+00	1.0E-01
Cadmium	1.4E+00	1.8E+00	3.3E-02	9.0E-02	3.5E-03	2.4E-01	8.4E-04	7.5E-03	2.5E-01	7.7E-01	3.2E-01	7.7E+00	3.2E-02
Copper	4.4E+01	3.8E+00	1.3E+00	1.0E+00	1.1E-01	5.0E-01	3.4E-02	8.7E-02	7.3E-01	5.6E+00	1.3E-01	9.3E+00	7.8E-02
Lead	1.9E+02	9.3E+00	1.1E+00	6.1E-01	4.8E-01	1.2E+00	2.8E-02	5.0E-02	1.8E+00	4.7E+00	3.8E-01	8.9E+00	2.0E-01
Mercury	2.1E+00	1.6E-01	1.5E-01	3.5E-02	5.3E-03	2.1E-02	3.7E-03	2.9E-03	3.3E-02	1.3E+01	2.5E-03	1.3E+02	2.5E-04
Nickel	2.5E+01	4.4E+00	3.5E-01	1.4E-01	6.3E-02	5.8E-01	8.8E-03	1.2E-02	6.6E-01	1.7E+00	3.9E-01	3.4E+00	2.0E-01
Selenium	6.3E-01	1.1E-01	5.5E-02	3.7E-02	1.6E-03	1.4E-02	1.4E-03	3.1E-03	2.1E-02	1.4E-01	1.4E-01	2.2E-01	9.5E-02
Vanadium	1.9E+01	1.3E-01	3.5E-01	1.1E-02	4.8E-02	1.7E-02	8.9E-03	9.2E-04	7.5E-02	4.2E+00	1.8E-02	8.3E+00	9.0E-03
Zinc	2.4E+02	8.6E+01	1.2E+01	1.2E+01	5.9E-01	1.1E+01	2.9E-01	9.9E-01	1.3E+01	7.5E+01	1.7E-01	3.0E+02	4.4E-02
Semivolatile Organic Compounds													
Benzo(a)anthracene	1.5E+01	4.0E+00	2.9E+01	4.0E-02	3.8E-02	5.2E-01	7.2E-01	3.3E-03	1.3E+00	6.2E-01	2.1E+00	3.0E+00	4.3E-01
Benzo(a)pyrene	1.1E+01	2.4E+00	2.4E+01	1.6E-01	2.8E-02	3.2E-01	6.1E-01	1.3E-02	9.7E-01	6.2E-01	1.6E+00	3.0E+00	3.2E-01
Chrysene	1.6E+01	6.1E+00	4.4E+01	4.2E-02	4.0E-02	8.0E-01	1.1E+00	3.5E-03	2.0E+00	6.2E-01	3.2E+00	3.0E+00	6.5E-01
Naphthalene	1.3E+00	9.2E-01	9.1E-01	1.8E+00	3.1E-03	1.2E-01	2.3E-02	1.5E-01	3.0E-01	6.6E+01	4.6E-03	3.3E+02	9.1E-04
Benzaldehyde	9.9E-02	1.9E-02	1.7E-02	6.4E-02	2.5E-04	2.5E-03	4.3E-04	5.3E-03	8.5E-03	NA	NC	NA	NC
Carbazole	1.1E+00	5.9E+00	5.3E+00	6.9E-02	2.8E-03	7.7E-01	1.3E-01	5.8E-03	9.1E-01	5.0E+01	1.8E-02	5.0E+02	1.8E-03
Dibenzofuran	7.8E-01	2.2E+01	2.6E+01	1.5E-02	2.0E-03	2.9E+00	6.5E-01	1.3E-03	3.5E+00	1.3E+01	2.8E-01	1.3E+02	2.8E-02

TABLE F-7
POTENTIAL RISKS TO THE SHORT-TAILED SHREW - MAXIMUM EXPOSURE
AOC 6
BASF, WYANDOTTE, MI

COI	Site Concentrations			Potential Daily Dose (mg/kg_{bw}-day)				NOAEL TRV (mg/kg_{bw}day)	NOAEL HQ	LOAEL TRV (mg/kg_{bw}day)	LOAEL HQ
	Surface Soil (mg/kg_{dw})	Terrestrial Invertebrate (mg/kg_{ww})	Terrestrial Plant (mg/kg_{ww})	Surface Soil	Terrestrial Invertebrates	Terrestrial Plant	Total				
Inorganics											
Antimony	8.0E-01	2.9E-02	3.8E-03	3.6E-03	1.5E-02	1.3E-04	1.8E-02	1.3E-01	1.5E-01	1.3E+00	1.5E-02
Arsenic	3.5E+01	4.9E-01	1.6E-01	1.5E-01	2.5E-01	5.2E-03	4.1E-01	1.0E+00	3.9E-01	1.7E+00	2.4E-01
Cadmium	1.4E+00	1.8E+00	9.0E-02	6.2E-03	9.0E-01	3.0E-03	9.1E-01	7.7E-01	1.2E+00	7.7E+00	1.2E-01
Copper	4.4E+01	3.8E+00	1.0E+00	2.0E-01	1.9E+00	3.5E-02	2.1E+00	5.6E+00	3.8E-01	9.3E+00	2.3E-01
Lead	1.9E+02	9.3E+00	6.1E-01	8.5E-01	4.7E+00	2.0E-02	5.5E+00	4.7E+00	1.2E+00	8.9E+00	6.2E-01
Mercury	2.1E+00	1.6E-01	3.5E-02	9.3E-03	8.1E-02	1.1E-03	9.2E-02	1.3E+01	6.9E-03	1.3E+02	6.9E-04
Nickel	2.5E+01	4.4E+00	1.4E-01	1.1E-01	2.2E+00	4.8E-03	2.3E+00	1.7E+00	1.4E+00	3.4E+00	6.8E-01
Selenium	6.3E-01	1.1E-01	3.7E-02	2.8E-03	5.5E-02	1.2E-03	5.9E-02	1.4E-01	4.1E-01	2.2E-01	2.8E-01
Vanadium	1.9E+01	1.3E-01	1.1E-02	8.4E-02	6.7E-02	3.7E-04	1.5E-01	4.2E+00	3.6E-02	8.3E+00	1.8E-02
Zinc	2.4E+02	8.6E+01	1.2E+01	1.0E+00	4.3E+01	4.0E-01	4.4E+01	7.5E+01	5.9E-01	3.0E+02	1.5E-01
Semivolatile Organic Compounds											
Benzo(a)anthracene	1.5E+01	4.0E+00	4.0E-02	6.7E-02	2.0E+00	1.3E-03	2.1E+00	6.2E-01	3.3E+00	3.0E+00	6.8E-01
Benzo(a)pyrene	1.1E+01	2.4E+00	1.6E-01	4.9E-02	1.2E+00	5.3E-03	1.3E+00	6.2E-01	2.1E+00	3.0E+00	4.2E-01
Chrysene	1.6E+01	6.1E+00	4.2E-02	7.1E-02	3.1E+00	1.4E-03	3.1E+00	6.2E-01	5.1E+00	3.0E+00	1.0E+00
Naphthalene	1.3E+00	9.2E-01	1.8E+00	5.6E-03	4.6E-01	6.1E-02	5.3E-01	6.6E+01	8.0E-03	3.3E+02	1.6E-03
Benzaldehyde	9.9E-02	1.9E-02	6.4E-02	4.4E-04	9.6E-03	2.1E-03	1.2E-02	NA	NC	NA	NC
Carbazole	1.1E+00	5.9E+00	6.9E-02	4.9E-03	2.9E+00	2.3E-03	2.9E+00	5.0E+01	5.9E-02	5.0E+02	5.9E-03
Dibenzofuran	7.8E-01	2.2E+01	1.5E-02	3.5E-03	1.1E+01	5.0E-04	1.1E+01	1.3E+01	8.8E-01	1.3E+02	8.8E-02

TABLE F-8
POTENTIAL RISKS TO THE EASTERN COTTONTAIL - MAXIMUM EXPOSURE
AOC 6
BASF, WYANDOTTE, MI

COI	Site Concentrations		Potential Daily Dose (mg/kg_{bw}-day)			NOAEL TRV (mg/kg_{bw}day)	NOAEL HQ	LOAEL TRV (mg/kg_{bw}day)	LOAEL HQ
	Surface Soil (mg/kg_{dw})	Terrestrial Plant (mg/kg_{ww})	Surface Soil	Terrestrial Plant	Total				
Inorganics									
Antimony	8.0E-01	3.8E-03	3.1E-04	7.3E-04	1.0E-03	1.3E-01	8.3E-03	1.3E+00	8.3E-04
Arsenic	3.5E+01	1.6E-01	1.3E-02	3.0E-02	4.3E-02	1.0E+00	4.1E-02	1.7E+00	2.6E-02
Cadmium	1.4E+00	9.0E-02	5.4E-04	1.7E-02	1.8E-02	7.7E-01	2.3E-02	7.7E+00	2.3E-03
Copper	4.4E+01	1.0E+00	1.7E-02	2.0E-01	2.2E-01	5.6E+00	3.8E-02	9.3E+00	2.3E-02
Lead	1.9E+02	6.1E-01	7.4E-02	1.2E-01	1.9E-01	4.7E+00	4.0E-02	8.9E+00	2.1E-02
Mercury	2.1E+00	3.5E-02	8.1E-04	6.6E-03	7.4E-03	1.3E+01	5.6E-04	1.3E+02	5.6E-05
Nickel	2.5E+01	1.4E-01	9.6E-03	2.8E-02	3.7E-02	1.7E+00	2.2E-02	3.4E+00	1.1E-02
Selenium	6.3E-01	3.7E-02	2.4E-04	7.0E-03	7.3E-03	1.4E-01	5.1E-02	2.2E-01	3.4E-02
Vanadium	1.9E+01	1.1E-02	7.3E-03	2.1E-03	9.4E-03	4.2E+00	2.3E-03	8.3E+00	1.1E-03
Zinc	2.4E+02	1.2E+01	9.0E-02	2.3E+00	2.4E+00	7.5E+01	3.1E-02	3.0E+02	7.9E-03
Semivolatile Organic Compounds									
Benzo(a)anthracene	1.5E+01	4.0E-02	5.8E-03	7.6E-03	1.3E-02	6.2E-01	2.2E-02	3.0E+00	4.5E-03
Benzo(a)pyrene	1.1E+01	1.6E-01	4.2E-03	3.0E-02	3.4E-02	6.2E-01	5.6E-02	3.0E+00	1.1E-02
Chrysene	1.6E+01	4.2E-02	6.2E-03	7.9E-03	1.4E-02	6.2E-01	2.3E-02	3.0E+00	4.7E-03
Naphthalene	1.3E+00	1.8E+00	4.8E-04	3.5E-01	3.5E-01	6.6E+01	5.3E-03	3.3E+02	1.1E-03
Benzaldehyde	9.9E-02	6.4E-02	3.8E-05	1.2E-02	1.2E-02	NA	NC	NA	NC
Carbazole	1.1E+00	6.9E-02	4.2E-04	1.3E-02	1.4E-02	5.0E+01	2.7E-04	5.0E+02	2.7E-05
Dibenzofuran	7.8E-01	1.5E-02	3.0E-04	2.9E-03	3.2E-03	1.3E+01	2.5E-04	1.3E+02	2.5E-05

TABLE F-9
POTENTIAL RISKS TO THE AMERICAN ROBIN - MAXIMUM EXPOSURE
AOC 7A
BASF, WYANDOTTE, MI

COI	Site Concentrations			Potential Daily Dose (mg/kg_{bw}-day)				NOAEL TRV (mg/kg_{bw}day)	NOAEL HQ	LOAEL TRV (mg/kg_{bw}day)	LOAEL HQ
	Surface Soil (mg/kg_{dw})	Terrestrial Invertebrate (mg/kg_{ww})	Terrestrial Plant (mg/kg_{ww})	Surface Soil	Terrestrial Invertebrates	Terrestrial Plant	Total				
Inorganics											
Chromium	2.9E+01	1.5E+00	1.4E-01	1.5E-01	3.1E-01	4.1E-02	5.1E-01	2.7E+00	1.9E-01	1.6E+01	3.3E-02
Copper	3.7E+01	3.2E+00	9.7E-01	1.9E-01	6.7E-01	2.8E-01	1.1E+00	4.1E+00	2.8E-01	1.2E+01	9.5E-02
Mercury	4.8E+00	3.7E-01	7.9E-02	2.5E-02	7.8E-02	2.3E-02	1.3E-01	6.4E-03	2.0E+01	6.4E-02	2.0E+00
Selenium	1.7E+00	2.3E-01	1.1E-01	9.0E-03	4.8E-02	3.2E-02	8.9E-02	2.9E-01	3.1E-01	5.8E-01	1.5E-01
Silver	1.0E+01	3.4E+00	1.7E-02	5.3E-02	7.2E-01	4.9E-03	7.8E-01	2.0E+00	3.8E-01	2.0E+01	3.8E-02
Total Cyanide	5.7E+00	1.1E+00	3.4E-02	3.0E-02	2.2E-01	9.7E-03	2.6E-01	4.0E-02	6.6E+00	4.0E-01	6.6E-01

TABLE F-10
POTENTIAL RISKS TO THE RACCOON - MAXIMUM EXPOSURE
AOC 7A
BASF, WYANDOTTE, MI

COI	Site Concentrations				Potential Daily Dose (mg/kg_{bw}-day)					NOAEL TRV ($mg/kg_{bw}day$)	NOAEL HQ	LOAEL TRV ($mg/kg_{bw}day$)	LOAEL HQ
	Surface Soil (mg/kg_{dw})	Terrestrial Invertebrate (mg/kg_{ww})	Small Mammal (mg/kg_{ww})	Terrestrial Plant (mg/kg_{ww})	Surface Soil	Terrestrial Invertebrates	Small Mammal	Terrestrial Plant	Total				
Inorganics													
Chromium	2.9E+01	1.5E+00	2.8E-01	1.4E-01	7.3E-02	1.9E-01	6.9E-03	1.2E-02	2.9E-01	2.4E+00	1.2E-01	9.6E+00	3.0E-02
Copper	3.7E+01	3.2E+00	1.3E+00	9.7E-01	9.3E-02	4.2E-01	3.3E-02	8.1E-02	6.2E-01	5.6E+00	1.1E-01	9.3E+00	6.7E-02
Mercury	4.8E+00	3.7E-01	3.3E-01	7.9E-02	1.2E-02	4.9E-02	8.4E-03	6.6E-03	7.6E-02	1.3E+01	5.7E-03	1.3E+02	5.7E-04
Selenium	1.7E+00	2.3E-01	8.1E-02	1.1E-01	4.3E-03	3.0E-02	2.0E-03	9.2E-03	4.5E-02	1.4E-01	3.2E-01	2.2E-01	2.1E-01
Silver	1.0E+01	3.4E+00	3.1E+00	1.7E-02	2.5E-02	4.5E-01	7.8E-02	1.4E-03	5.5E-01	6.0E+00	9.2E-02	6.0E+01	9.2E-03
Total Cyanide	5.7E+00	1.1E+00	9.7E-01	3.4E-02	1.4E-02	1.4E-01	2.4E-02	2.8E-03	1.8E-01	6.9E+01	2.6E-03	6.9E+02	2.6E-04

TABLE F-11
POTENTIAL RISKS TO THE SHORT-TAILED SHREW - MAXIMUM EXPOSURE
AOC 7A
BASF, WYANDOTTE, MI

COI	Site Concentrations			Potential Daily Dose (mg/kg_{bw}-day)				NOAEL TRV (mg/kg_{bw}day)	NOAEL HQ	LOAEL TRV (mg/kg_{bw}day)	LOAEL HQ
	Surface Soil (mg/kg_{dw})	Terrestrial Invertebrate (mg/kg_{ww})	Terrestrial Plant (mg/kg_{ww})	Surface Soil	Terrestrial Invertebrates	Terrestrial Plant	Total				
Inorganics											
Chromium	2.9E+01	1.5E+00	1.4E-01	1.3E-01	7.4E-01	4.8E-03	8.8E-01	2.4E+00	3.7E-01	9.6E+00	9.1E-02
Copper	3.7E+01	3.2E+00	9.7E-01	1.6E-01	1.6E+00	3.2E-02	1.8E+00	5.6E+00	3.2E-01	9.3E+00	1.9E-01
Mercury	4.8E+00	3.7E-01	7.9E-02	2.1E-02	1.9E-01	2.6E-03	2.1E-01	1.3E+01	1.6E-02	1.3E+02	1.6E-03
Selenium	1.7E+00	2.3E-01	1.1E-01	7.5E-03	1.1E-01	3.7E-03	1.3E-01	1.4E-01	8.8E-01	2.2E-01	5.8E-01
Silver	1.0E+01	3.4E+00	1.7E-02	4.4E-02	1.7E+00	5.6E-04	1.8E+00	6.0E+00	2.9E-01	6.0E+01	2.9E-02
Total Cyanide	5.7E+00	1.1E+00	3.4E-02	2.5E-02	5.3E-01	1.1E-03	5.6E-01	6.9E+01	8.1E-03	6.9E+02	8.1E-04

TABLE F-12
POTENTIAL RISKS TO THE EASTERN COTTONTAIL - MAXIMUM EXPOSURE
AOC 7A
BASF, WYANDOTTE, MI

COI	Site Concentrations		Potential Daily Dose (mg/kg_{bw}-day)			NOAEL TRV (mg/kg_{bw}day)	NOAEL HQ	LOAEL TRV (mg/kg_{bw}day)	LOAEL HQ
	Surface Soil (mg/kg_{dw})	Terrestrial Plant (mg/kg_{ww})	Surface Soil	Terrestrial Plant	Total				
Inorganics									
Chromium	2.9E+01	1.4E-01	1.1E-02	2.7E-02	3.8E-02	2.4E+00	1.6E-02	9.6E+00	4.0E-03
Copper	3.7E+01	9.7E-01	1.4E-02	1.9E-01	2.0E-01	5.6E+00	3.6E-02	9.3E+00	2.1E-02
Mercury	4.8E+00	7.9E-02	1.8E-03	1.5E-02	1.7E-02	1.3E+01	1.3E-03	1.3E+02	1.3E-04
Selenium	1.7E+00	1.1E-01	6.5E-04	2.1E-02	2.2E-02	1.4E-01	1.5E-01	2.2E-01	1.0E-01
Silver	1.0E+01	1.7E-02	3.9E-03	3.2E-03	7.1E-03	6.0E+00	1.2E-03	6.0E+01	1.2E-04
Total Cyanide	5.7E+00	3.4E-02	2.2E-03	6.4E-03	8.6E-03	6.9E+01	1.2E-04	6.9E+02	1.2E-05

TABLE F-13
POTENTIAL RISKS TO THE AMERICAN ROBIN - MAXIMUM EXPOSURE
SWMU G
BASF, WYANDOTTE, MI

COI	Site Concentrations			Potential Daily Dose (mg/kg_{bw}-day)				NOAEL TRV (mg/kg_{bw}day)	NOAEL HQ	LOAEL TRV (mg/kg_{bw}day)	LOAEL HQ
	Surface Soil (mg/kg_{dw})	Terrestrial Invertebrate (mg/kg_{ww})	Terrestrial Plant (mg/kg_{ww})	Surface Soil	Terrestrial Invertebrates	Terrestrial Plant	Total				
Inorganics											
Antimony	2.6E+00	9.6E-02	1.2E-02	1.4E-02	2.0E-02	3.4E-03	3.7E-02	1.3E-02	3.0E+00	1.3E-01	3.0E-01
Arsenic	1.0E+02	1.0E+00	4.5E-01	5.3E-01	2.2E-01	1.3E-01	8.9E-01	2.2E+00	4.0E-01	1.7E+01	5.1E-02
Cadmium	2.3E+00	2.7E+00	1.2E-01	1.2E-02	5.7E-01	3.4E-02	6.1E-01	1.5E+00	4.2E-01	6.4E+00	9.6E-02
Chromium	3.4E+01	1.7E+00	1.7E-01	1.8E-01	3.6E-01	4.8E-02	5.9E-01	2.7E+00	2.2E-01	1.6E+01	3.8E-02
Copper	9.5E+01	8.2E+00	1.4E+00	5.0E-01	1.7E+00	4.1E-01	2.6E+00	4.1E+00	6.5E-01	1.2E+01	2.2E-01
Lead	2.4E+02	1.1E+01	6.9E-01	1.3E+00	2.3E+00	2.0E-01	3.8E+00	1.6E+00	2.3E+00	3.3E+00	1.2E+00
Mercury	5.4E+00	4.2E-01	8.9E-02	2.8E-02	8.8E-02	2.6E-02	1.4E-01	6.4E-03	2.2E+01	6.4E-02	2.2E+00
Nickel	2.6E+01	4.5E+00	1.5E-01	1.3E-01	9.5E-01	4.3E-02	1.1E+00	6.7E+00	1.7E-01	1.9E+01	6.1E-02
Selenium	4.4E-01	8.5E-02	2.5E-02	2.3E-03	1.8E-02	7.2E-03	2.7E-02	2.9E-01	9.5E-02	5.8E-01	4.7E-02
Vanadium	3.0E+01	2.1E-01	1.7E-02	1.6E-01	4.4E-02	5.0E-03	2.1E-01	3.4E-01	6.0E-01	6.9E-01	3.0E-01
Zinc	3.4E+02	9.6E+01	1.5E+01	1.8E+00	2.0E+01	4.2E+00	2.6E+01	6.6E+01	4.0E-01	1.9E+02	1.4E-01
Semivolatile Organic Compounds											
Benzo(a)pyrene	3.7E+00	8.2E-01	5.5E-02	1.9E-02	1.7E-01	1.6E-02	2.1E-01	4.0E+01	5.2E-03	4.0E+02	5.2E-04
Naphthalene	8.1E-01	6.0E-01	1.2E+00	4.3E-03	1.3E-01	3.4E-01	4.7E-01	4.0E+01	1.2E-02	4.0E+02	1.2E-03
2,4-Dimethylphenol	5.7E-02	5.2E-02	1.2E-02	3.0E-04	1.1E-02	3.6E-03	1.5E-02	NA	NC	NA	NC
Dibenzofuran	4.3E-01	1.2E+01	8.3E-03	2.3E-03	2.6E+00	2.4E-03	2.6E+00	NA	NC	NA	NC
Pentachlorophenol	6.2E-01	1.1E+02	3.3E-03	3.3E-03	2.3E+01	9.7E-04	2.3E+01	2.4E-02	9.4E+02	2.4E-01	9.4E+01
Pesticides											
4,4-DDT	1.6E-02	1.7E+01	2.2E-05	8.2E-05	3.6E+00	6.5E-06	3.6E+00	2.3E-01	1.6E+01	2.3E+00	1.6E+00
Polychlorinated Biphenyls											
Total PCBs	1.1E+00	2.1E-01	1.7E-03	5.8E-03	4.4E-02	4.9E-04	5.0E-02	4.1E-01	1.2E-01	4.1E+00	1.2E-02

TABLE F-14
POTENTIAL RISKS TO THE RACCOON - MAXIMUM EXPOSURE
SWMU G
BASF, WYANDOTTE, MI

COI	Site Concentrations				Potential Daily Dose (mg/kg_{bw}-day)					NOAEL TRV (mg/kg_{bw}day)	NOAEL HQ	LOAEL TRV (mg/kg_{bw}day)	LOAEL HQ
	Surface Soil (mg/kg_{dw})	Terrestrial Invertebrate (mg/kg_{ww})	Small Mammal (mg/kg_{ww})	Terrestrial Plant (mg/kg_{ww})	Surface Soil	Terrestrial Invertebrates	Small Mammal	Terrestrial Plant	Total				
Inorganics													
Antimony	2.6E+00	9.6E-02	8.6E-02	1.2E-02	6.6E-03	1.3E-02	2.2E-03	9.6E-04	2.2E-02	1.3E-01	1.8E-01	1.3E+00	1.8E-02
Arsenic	1.0E+02	1.0E+00	3.4E-02	4.5E-01	2.5E-01	1.4E-01	8.7E-04	3.8E-02	4.3E-01	1.0E+00	4.1E-01	1.7E+00	2.6E-01
Cadmium	2.3E+00	2.7E+00	4.2E-02	1.2E-01	5.8E-03	3.5E-01	1.1E-03	9.8E-03	3.7E-01	7.7E-01	4.8E-01	7.7E+00	4.8E-02
Chromium	3.4E+01	1.7E+00	3.1E-01	1.7E-01	8.5E-02	2.2E-01	7.7E-03	1.4E-02	3.3E-01	2.4E+00	1.4E-01	9.6E+00	3.4E-02
Copper	9.5E+01	8.2E+00	1.5E+00	1.4E+00	2.4E-01	1.1E+00	3.7E-02	1.2E-01	1.5E+00	5.6E+00	2.6E-01	9.3E+00	1.6E-01
Lead	2.4E+02	1.1E+01	1.2E+00	6.9E-01	6.0E-01	1.5E+00	3.1E-02	5.7E-02	2.1E+00	4.7E+00	4.6E-01	8.9E+00	2.4E-01
Mercury	5.4E+00	4.2E-01	3.8E-01	8.9E-02	1.4E-02	5.5E-02	9.5E-03	7.4E-03	8.5E-02	1.3E+01	6.5E-03	1.3E+02	6.5E-04
Nickel	2.6E+01	4.5E+00	3.5E-01	1.5E-01	6.5E-02	5.9E-01	8.9E-03	1.2E-02	6.8E-01	1.7E+00	4.0E-01	3.4E+00	2.0E-01
Selenium	4.4E-01	8.5E-02	4.8E-02	2.5E-02	1.1E-03	1.1E-02	1.2E-03	2.1E-03	1.6E-02	1.4E-01	1.1E-01	2.2E-01	7.2E-02
Vanadium	3.0E+01	2.1E-01	5.5E-01	1.7E-02	7.5E-02	2.7E-02	1.4E-02	1.4E-03	1.2E-01	4.2E+00	2.8E-02	8.3E+00	1.4E-02
Zinc	3.4E+02	9.6E+01	1.2E+01	1.5E+01	8.4E-01	1.3E+01	3.0E-01	1.2E+00	1.5E+01	7.5E+01	2.0E-01	3.0E+02	5.0E-02
Semivolatile Organic Compounds													
Benzo(a)pyrene	3.7E+00	8.2E-01	8.1E+00	5.5E-02	9.3E-03	1.1E-01	2.1E-01	4.5E-03	3.3E-01	6.2E-01	5.3E-01	3.0E+00	1.1E-01
Naphthalene	8.1E-01	6.0E-01	5.9E-01	1.2E+00	2.0E-03	7.8E-02	1.5E-02	9.9E-02	1.9E-01	6.6E+01	2.9E-03	3.3E+02	5.9E-04
2,4-Dimethylphenol	5.7E-02	5.2E-02	4.7E-02	1.2E-02	1.4E-04	6.8E-03	1.2E-03	1.0E-03	9.2E-03	NA	NC	NA	NC
Dibenzofuran	4.3E-01	1.2E+01	1.4E+01	8.3E-03	1.1E-03	1.6E+00	3.6E-01	6.9E-04	1.9E+00	1.3E+01	1.6E-01	1.3E+02	1.6E-02
Pentachlorophenol	6.2E-01	1.1E+02	3.5E+02	3.3E-03	1.6E-03	1.4E+01	8.7E+00	2.8E-04	2.3E+01	2.4E-01	9.5E+01	2.4E+00	9.5E+00
Pesticides													
4,4-DDT	1.6E-02	1.7E+01	1.7E+02	2.2E-05	3.9E-05	2.3E+00	4.3E+00	1.9E-06	6.6E+00	1.5E-01	4.5E+01	7.4E-01	8.9E+00
Polychlorinated Biphenyls													
Total PCBs	1.1E+00	2.1E-01	2.1E+00	1.7E-03	2.8E-03	2.7E-02	5.2E-02	1.4E-04	8.2E-02	1.4E-01	6.0E-01	6.9E-01	1.2E-01

TABLE F-15
POTENTIAL RISKS TO THE SHORT-TAILED SHREW - MAXIMUM EXPOSURE
SWMU G
BASF, WYANDOTTE, MI

COI	Site Concentrations			Potential Daily Dose (mg/kg_{bw}-day)				NOAEL TRV (mg/kg_{bw}day)	NOAEL HQ	LOAEL TRV (mg/kg_{bw}day)	LOAEL HQ
	Surface Soil (mg/kg_{dw})	Terrestrial Invertebrate (mg/kg_{ww})	Terrestrial Plant (mg/kg_{ww})	Surface Soil	Terrestrial Invertebrates	Terrestrial Plant	Total				
Inorganics											
Antimony	2.6E+00	9.6E-02	1.2E-02	1.2E-02	4.8E-02	3.9E-04	6.0E-02	1.3E-01	4.8E-01	1.3E+00	4.8E-02
Arsenic	1.0E+02	1.0E+00	4.5E-01	4.5E-01	5.2E-01	1.5E-02	9.9E-01	1.0E+00	9.5E-01	1.7E+00	5.9E-01
Cadmium	2.3E+00	2.7E+00	1.2E-01	1.0E-02	1.3E+00	3.9E-03	1.4E+00	7.7E-01	1.8E+00	7.7E+00	1.8E-01
Chromium	3.4E+01	1.7E+00	1.7E-01	1.5E-01	8.6E-01	5.5E-03	1.0E+00	2.4E+00	4.2E-01	9.6E+00	1.1E-01
Copper	9.5E+01	8.2E+00	1.4E+00	4.2E-01	4.1E+00	4.7E-02	4.6E+00	5.6E+00	8.2E-01	9.3E+00	4.9E-01
Lead	2.4E+02	1.1E+01	6.9E-01	1.1E+00	5.6E+00	2.3E-02	6.6E+00	4.7E+00	1.4E+00	8.9E+00	7.5E-01
Mercury	5.4E+00	4.2E-01	8.9E-02	2.4E-02	2.1E-01	3.0E-03	2.4E-01	1.3E+01	1.8E-02	1.3E+02	1.8E-03
Nickel	2.6E+01	4.5E+00	1.5E-01	1.1E-01	2.3E+00	4.9E-03	2.4E+00	1.7E+00	1.4E+00	3.4E+00	7.0E-01
Selenium	4.4E-01	8.5E-02	2.5E-02	2.0E-03	4.2E-02	8.3E-04	4.5E-02	1.4E-01	3.2E-01	2.2E-01	2.1E-01
Vanadium	3.0E+01	2.1E-01	1.7E-02	1.3E-01	1.0E-01	5.8E-04	2.4E-01	4.2E+00	5.7E-02	8.3E+00	2.8E-02
Zinc	3.4E+02	9.6E+01	1.5E+01	1.5E+00	4.8E+01	4.8E-01	5.0E+01	7.5E+01	6.6E-01	3.0E+02	1.7E-01
Semivolatile Organic Compounds											
Benzo(a)pyrene	3.7E+00	8.2E-01	5.5E-02	1.6E-02	4.1E-01	1.8E-03	4.3E-01	6.2E-01	7.0E-01	3.0E+00	1.4E-01
Naphthalene	8.1E-01	6.0E-01	1.2E+00	3.6E-03	3.0E-01	3.9E-02	3.4E-01	6.6E+01	5.2E-03	3.3E+02	1.0E-03
2,4-Dimethylphenol	5.7E-02	5.2E-02	1.2E-02	2.5E-04	2.6E-02	4.1E-04	2.7E-02	NA	NC	NA	NC
Dibenzofuran	4.3E-01	1.2E+01	8.3E-03	1.9E-03	6.1E+00	2.8E-04	6.1E+00	1.3E+01	4.9E-01	1.3E+02	4.9E-02
Pentachlorophenol	6.2E-01	1.1E+02	3.3E-03	2.8E-03	5.3E+01	1.1E-04	5.3E+01	2.4E-01	2.2E+02	2.4E+00	2.2E+01
Pesticides											
4,4-DDT	1.6E-02	1.7E+01	2.2E-05	6.9E-05	8.6E+00	7.4E-07	8.6E+00	1.5E-01	5.9E+01	7.4E-01	1.2E+01
Polychlorinated Biphenyls											
Total PCBs	1.1E+00	2.1E-01	1.7E-03	4.9E-03	1.0E-01	5.6E-05	1.1E-01	1.4E-01	7.9E-01	6.9E-01	1.6E-01

TABLE F-16
POTENTIAL RISKS TO THE EASTERN COTTONTAIL - MAXIMUM EXPOSURE
SWMU G
BASF, WYANDOTTE, MI

COI	Site Concentrations		Potential Daily Dose (mg/kg_{bw}-day)			NOAEL TRV (mg/kg_{bw}day)	NOAEL HQ	LOAEL TRV (mg/kg_{bw}day)	LOAEL HQ
	Surface Soil (mg/kg_{dw})	Terrestrial Plant (mg/kg_{ww})	Surface Soil	Terrestrial Plant	Total				
Inorganics									
Antimony	2.6E+00	1.2E-02	1.0E-03	2.2E-03	3.2E-03	1.3E-01	2.6E-02	1.3E+00	2.6E-03
Arsenic	1.0E+02	4.5E-01	3.9E-02	8.7E-02	1.3E-01	1.0E+00	1.2E-01	1.7E+00	7.6E-02
Cadmium	2.3E+00	1.2E-01	8.9E-04	2.2E-02	2.3E-02	7.7E-01	3.0E-02	7.7E+00	3.0E-03
Chromium	3.4E+01	1.7E-01	1.3E-02	3.2E-02	4.4E-02	2.4E+00	1.9E-02	9.6E+00	4.6E-03
Copper	9.5E+01	1.4E+00	3.7E-02	2.7E-01	3.1E-01	5.6E+00	5.5E-02	9.3E+00	3.3E-02
Lead	2.4E+02	6.9E-01	9.2E-02	1.3E-01	2.2E-01	4.7E+00	4.7E-02	8.9E+00	2.5E-02
Mercury	5.4E+00	8.9E-02	2.1E-03	1.7E-02	1.9E-02	1.3E+01	1.4E-03	1.3E+02	1.4E-04
Nickel	2.6E+01	1.5E-01	9.9E-03	2.8E-02	3.8E-02	1.7E+00	2.2E-02	3.4E+00	1.1E-02
Selenium	4.4E-01	2.5E-02	1.7E-04	4.7E-03	4.9E-03	1.4E-01	3.4E-02	2.2E-01	2.3E-02
Vanadium	3.0E+01	1.7E-02	1.1E-02	3.3E-03	1.5E-02	4.2E+00	3.5E-03	8.3E+00	1.8E-03
Zinc	3.4E+02	1.5E+01	1.3E-01	2.8E+00	2.9E+00	7.5E+01	3.8E-02	3.0E+02	9.7E-03
Semivolatile Organic Compounds									
Benzo(a)pyrene	3.7E+00	5.5E-02	1.4E-03	1.0E-02	1.2E-02	6.2E-01	1.9E-02	3.0E+00	3.9E-03
Naphthalene	8.1E-01	1.2E+00	3.1E-04	2.3E-01	2.3E-01	6.6E+01	3.5E-03	3.3E+02	6.9E-04
2,4-Dimethylphenol	5.7E-02	1.2E-02	2.2E-05	2.4E-03	2.4E-03	NA	NC	NA	NC
Dibenzofuran	4.3E-01	8.3E-03	1.7E-04	1.6E-03	1.7E-03	1.3E+01	1.4E-04	1.3E+02	1.4E-05
Pentachlorophenol	6.2E-01	3.3E-03	2.4E-04	6.4E-04	8.8E-04	2.4E-01	3.7E-03	2.4E+00	3.7E-04
Pesticides									
4,4-DDT	1.6E-02	2.2E-05	6.0E-06	4.3E-06	1.0E-05	1.5E-01	7.0E-05	7.4E-01	1.4E-05
Polychlorinated Biphenyls									
Total PCBs	1.1E+00	1.7E-03	4.2E-04	3.2E-04	7.5E-04	1.4E-01	5.4E-03	6.9E-01	1.1E-03

TABLE F-17
POTENTIAL RISKS TO THE AMERICAN ROBIN - MAXIMUM EXPOSURE
SWMU H
BASF, WYANDOTTE, MI

COI	Site Concentrations			Potential Daily Dose (mg/kg_{bw}-day)				NOAEL TRV (mg/kg_{bw}day)	NOAEL HQ	LOAEL TRV (mg/kg_{bw}day)	LOAEL HQ
	Surface Soil (mg/kg_{dw})	Terrestrial Invertebrate (mg/kg_{ww})	Terrestrial Plant (mg/kg_{ww})	Surface Soil	Terrestrial Invertebrates	Terrestrial Plant	Total				
Inorganics											
Antimony	1.7E+01	6.4E-01	6.9E-02	9.1E-02	1.3E-01	2.0E-02	2.5E-01	1.3E-02	2.0E+01	1.3E-01	2.0E+00
Arsenic	2.3E+01	3.6E-01	1.0E-01	1.2E-01	7.7E-02	2.9E-02	2.2E-01	2.2E+00	1.0E-01	1.7E+01	1.3E-02
Cadmium	2.7E+00	3.0E+00	1.3E-01	1.4E-02	6.4E-01	3.7E-02	6.9E-01	1.5E+00	4.7E-01	6.4E+00	1.1E-01
Chromium	6.5E+01	3.3E+00	3.2E-01	3.4E-01	7.0E-01	9.2E-02	1.1E+00	2.7E+00	4.2E-01	1.6E+01	7.2E-02
Copper	5.3E+01	4.5E+00	1.1E+00	2.8E-01	9.6E-01	3.2E-01	1.6E+00	4.1E+00	3.8E-01	1.2E+01	1.3E-01
Lead	1.9E+02	9.3E+00	6.0E-01	1.0E+00	2.0E+00	1.7E-01	3.1E+00	1.6E+00	1.9E+00	3.3E+00	9.6E-01
Mercury	1.1E+00	8.5E-02	1.8E-02	5.8E-03	1.8E-02	5.2E-03	2.9E-02	6.4E-03	4.5E+00	6.4E-02	4.5E-01
Nickel	6.9E+01	1.2E+01	3.1E-01	3.6E-01	2.6E+00	9.0E-02	3.0E+00	6.7E+00	4.5E-01	1.9E+01	1.6E-01
Thallium	1.6E+00	5.9E-02	7.7E-04	8.4E-03	1.2E-02	2.2E-04	2.1E-02	3.5E-01	6.0E-02	3.5E+00	6.0E-03
Tin	1.1E+02	4.2E+00	6.7E-01	6.0E-01	8.8E-01	1.9E-01	1.7E+00	6.8E+00	2.5E-01	1.7E+01	9.9E-02
Vanadium	2.8E+01	2.0E-01	1.6E-02	1.5E-01	4.2E-02	4.8E-03	2.0E-01	3.4E-01	5.7E-01	6.9E-01	2.8E-01
Zinc	1.6E+02	7.6E+01	9.7E+00	8.6E-01	1.6E+01	2.8E+00	2.0E+01	6.6E+01	3.0E-01	1.9E+02	1.1E-01
Semivolatile Organic Compounds											
Naphthalene	5.5E-01	4.0E-01	8.1E-01	2.9E-03	8.5E-02	2.3E-01	3.2E-01	4.0E+01	8.0E-03	4.0E+02	8.0E-04
Carbazole	5.5E-02	2.9E-01	3.5E-03	2.9E-04	6.2E-02	1.0E-03	6.3E-02	5.0E+00	1.3E-02	5.0E+01	1.3E-03
Dibenzofuran	6.3E-02	1.8E+00	1.2E-03	3.3E-04	3.7E-01	3.5E-04	3.8E-01	NA	NC	NA	NC
Pesticides											
4,4-DDT	1.2E-02	1.3E+01	1.7E-05	6.3E-05	2.8E+00	5.0E-06	2.8E+00	2.3E-01	1.2E+01	2.3E+00	1.2E+00
Beta-BHC	9.4E-03	1.5E-01	2.7E-04	5.0E-05	3.2E-02	7.7E-05	3.3E-02	5.6E-01	5.8E-02	2.3E+00	1.4E-02
Dieldrin	1.2E-02	3.4E-02	5.9E-04	6.3E-05	7.1E-03	1.7E-04	7.4E-03	7.1E-02	1.0E-01	3.8E+00	1.9E-03
Endrin aldehyde	1.2E-02	1.2E+00	9.4E-05	6.3E-05	2.6E-01	2.7E-05	2.6E-01	3.0E-01	8.6E-01	3.0E+00	8.6E-02
Endrin ketone	1.4E-02	1.4E+00	1.1E-04	7.4E-05	3.0E-01	3.2E-05	3.0E-01	3.0E-01	1.0E+00	3.0E+00	1.0E-01
Polychlorinated Biphenyls											
Total PCBs	1.7E+00	3.2E-01	2.6E-03	9.0E-03	6.8E-02	7.6E-04	7.7E-02	4.1E-01	1.9E-01	4.1E+00	1.9E-02

TABLE F-18
POTENTIAL RISKS TO THE RACCOON - MAXIMUM EXPOSURE
SWMU H
BASF, WYANDOTTE, MI

COI	Site Concentrations				Potential Daily Dose (mg/kg_{bw}-day)					NOAEL TRV (mg/kg_{bw}day)	NOAEL HQ	LOAEL TRV (mg/kg_{bw}day)	LOAEL HQ
	Surface Soil (mg/kg_{dw})	Terrestrial Invertebrate (mg/kg_{ww})	Small Mammal (mg/kg_{ww})	Terrestrial Plant (mg/kg_{ww})	Surface Soil	Terrestrial Invertebrates	Small Mammal	Terrestrial Plant	Total				
Inorganics													
Antimony	1.7E+01	6.4E-01	5.7E-01	6.9E-02	4.4E-02	8.3E-02	1.4E-02	5.7E-03	1.5E-01	1.3E-01	1.2E+00	1.3E+00	1.2E-01
Arsenic	2.3E+01	3.6E-01	1.0E-02	1.0E-01	5.7E-02	4.8E-02	2.5E-04	8.4E-03	1.1E-01	1.0E+00	1.1E-01	1.7E+00	6.8E-02
Cadmium	2.7E+00	3.0E+00	4.5E-02	1.3E-01	6.8E-03	4.0E-01	1.1E-03	1.1E-02	4.2E-01	7.7E-01	5.4E-01	7.7E+00	5.4E-02
Chromium	6.5E+01	3.3E+00	4.9E-01	3.2E-01	1.6E-01	4.3E-01	1.2E-02	2.6E-02	6.3E-01	2.4E+00	2.6E-01	9.6E+00	6.6E-02
Copper	5.3E+01	4.5E+00	1.4E+00	1.1E+00	1.3E-01	5.9E-01	3.4E-02	9.3E-02	8.5E-01	5.6E+00	1.5E-01	9.3E+00	9.1E-02
Lead	1.9E+02	9.3E+00	1.1E+00	6.0E-01	4.8E-01	1.2E+00	2.8E-02	5.0E-02	1.8E+00	4.7E+00	3.8E-01	8.9E+00	2.0E-01
Mercury	1.1E+00	8.5E-02	7.7E-02	1.8E-02	2.8E-03	1.1E-02	1.9E-03	1.5E-03	1.7E-02	1.3E+01	1.3E-03	1.3E+02	1.3E-04
Nickel	6.9E+01	1.2E+01	5.6E-01	3.1E-01	1.7E-01	1.6E+00	1.4E-02	2.6E-02	1.8E+00	1.7E+00	1.1E+00	3.4E+00	5.3E-01
Thallium	1.6E+00	5.9E-02	5.4E-02	7.7E-04	4.0E-03	7.7E-03	1.4E-03	6.4E-05	1.3E-02	7.4E-03	1.8E+00	7.4E-02	1.8E-01
Tin	1.1E+02	4.2E+00	3.9E+00	6.7E-01	2.9E-01	5.5E-01	9.8E-02	5.6E-02	9.9E-01	2.3E+01	4.2E-02	3.5E+01	2.8E-02
Vanadium	2.8E+01	2.0E-01	5.2E-01	1.6E-02	7.1E-02	2.6E-02	1.3E-02	1.4E-03	1.1E-01	4.2E+00	2.7E-02	8.3E+00	1.3E-02
Zinc	1.6E+02	7.6E+01	1.1E+01	9.7E+00	4.1E-01	1.0E+01	2.8E-01	8.1E-01	1.1E+01	7.5E+01	1.5E-01	3.0E+02	3.8E-02
Semivolatile Organic Compounds													
Naphthalene	5.5E-01	4.0E-01	4.0E-01	8.1E-01	1.4E-03	5.3E-02	1.0E-02	6.7E-02	1.3E-01	6.6E+01	2.0E-03	3.3E+02	4.0E-04
Carbazole	5.5E-02	2.9E-01	2.6E-01	3.5E-03	1.4E-04	3.9E-02	6.7E-03	2.9E-04	4.6E-02	5.0E+01	9.1E-04	5.0E+02	9.1E-05
Dibenzofuran	6.3E-02	1.8E+00	2.1E+00	1.2E-03	1.6E-04	2.3E-01	5.2E-02	1.0E-04	2.9E-01	1.3E+01	2.3E-02	1.3E+02	2.3E-03
Pesticides													
4,4-DDT	1.2E-02	1.3E+01	1.3E+02	1.7E-05	3.0E-05	1.8E+00	3.3E+00	1.4E-06	5.1E+00	1.5E-01	3.5E+01	7.4E-01	6.9E+00
Beta-BHC	9.4E-03	1.5E-01	1.4E-01	2.7E-04	2.4E-05	2.0E-02	3.5E-03	2.2E-05	2.4E-02	1.6E+00	1.5E-02	3.2E+00	7.4E-03
Dieldrin	1.2E-02	3.4E-02	1.5E-01	5.9E-04	3.0E-05	4.4E-03	3.7E-03	4.9E-05	8.2E-03	1.5E-02	5.5E-01	3.0E-02	2.7E-01
Endrin aldehyde	1.2E-02	1.2E+00	2.8E+00	9.4E-05	3.0E-05	1.6E-01	6.9E-02	7.8E-06	2.3E-01	9.2E-02	2.5E+00	9.2E-01	2.5E-01
Endrin ketone	1.4E-02	1.4E+00	3.2E+00	1.1E-04	3.5E-05	1.9E-01	8.1E-02	9.1E-06	2.7E-01	9.2E-02	2.9E+00	9.2E-01	2.9E-01
Polychlorinated Biphenyls													
Total PCBs	1.7E+00	3.2E-01	3.2E+00	2.6E-03	4.3E-03	4.2E-02	8.0E-02	2.2E-04	1.3E-01	1.4E-01	9.2E-01	6.9E-01	1.8E-01

TABLE F-19
POTENTIAL RISKS TO THE SHORT-TAILED SHREW - MAXIMUM EXPOSURE
SWMU H
BASF, WYANDOTTE, MI

COI	Site Concentrations			Potential Daily Dose (mg/kg_{bw}-day)				NOAEL TRV (mg/kg_{bw}day)	NOAEL HQ	LOAEL TRV (mg/kg_{bw}day)	LOAEL HQ
	Surface Soil (mg/kg_{dw})	Terrestrial Invertebrate (mg/kg_{ww})	Terrestrial Plant (mg/kg_{ww})	Surface Soil	Terrestrial Invertebrates	Terrestrial Plant	Total				
Inorganics											
Antimony	1.7E+01	6.4E-01	6.9E-02	7.7E-02	3.2E-01	2.3E-03	4.0E-01	1.3E-01	3.2E+00	1.3E+00	3.2E-01
Arsenic	2.3E+01	3.6E-01	1.0E-01	1.0E-01	1.8E-01	3.4E-03	2.8E-01	1.0E+00	2.7E-01	1.7E+00	1.7E-01
Cadmium	2.7E+00	3.0E+00	1.3E-01	1.2E-02	1.5E+00	4.3E-03	1.5E+00	7.7E-01	2.0E+00	7.7E+00	2.0E-01
Chromium	6.5E+01	3.3E+00	3.2E-01	2.9E-01	1.6E+00	1.1E-02	1.9E+00	2.4E+00	8.1E-01	9.6E+00	2.0E-01
Copper	5.3E+01	4.5E+00	1.1E+00	2.3E-01	2.3E+00	3.7E-02	2.5E+00	5.6E+00	4.5E-01	9.3E+00	2.7E-01
Lead	1.9E+02	9.3E+00	6.0E-01	8.4E-01	4.6E+00	2.0E-02	5.5E+00	4.7E+00	1.2E+00	8.9E+00	6.2E-01
Mercury	1.1E+00	8.5E-02	1.8E-02	4.9E-03	4.2E-02	6.0E-04	4.8E-02	1.3E+01	3.6E-03	1.3E+02	3.6E-04
Nickel	6.9E+01	1.2E+01	3.1E-01	3.1E-01	6.1E+00	1.0E-02	6.4E+00	1.7E+00	3.8E+00	3.4E+00	1.9E+00
Thallium	1.6E+00	5.9E-02	7.7E-04	7.1E-03	2.9E-02	2.6E-05	3.6E-02	7.4E-03	4.9E+00	7.4E-02	4.9E-01
Tin	1.1E+02	4.2E+00	6.7E-01	5.1E-01	2.1E+00	2.2E-02	2.6E+00	2.3E+01	1.1E-01	3.5E+01	7.5E-02
Vanadium	2.8E+01	2.0E-01	1.6E-02	1.3E-01	9.9E-02	5.5E-04	2.2E-01	4.2E+00	5.4E-02	8.3E+00	2.7E-02
Zinc	1.6E+02	7.6E+01	9.7E+00	7.2E-01	3.8E+01	3.2E-01	3.9E+01	7.5E+01	5.2E-01	3.0E+02	1.3E-01
Semivolatile Organic Compounds											
Naphthalene	5.5E-01	4.0E-01	8.1E-01	2.4E-03	2.0E-01	2.7E-02	2.3E-01	6.6E+01	3.5E-03	3.3E+02	7.0E-04
Carbazole	5.5E-02	2.9E-01	3.5E-03	2.4E-04	1.5E-01	1.2E-04	1.5E-01	5.0E+01	2.9E-03	5.0E+02	2.9E-04
Dibenzofuran	6.3E-02	1.8E+00	1.2E-03	2.8E-04	8.9E-01	4.1E-05	8.9E-01	1.3E+01	7.1E-02	1.3E+02	7.1E-03
Pesticides											
4,4-DDT	1.2E-02	1.3E+01	1.7E-05	5.3E-05	6.7E+00	5.8E-07	6.7E+00	1.5E-01	4.5E+01	7.4E-01	9.1E+00
Beta-BHC	9.4E-03	1.5E-01	2.7E-04	4.2E-05	7.7E-02	8.9E-06	7.7E-02	1.6E+00	4.8E-02	3.2E+00	2.4E-02
Dieldrin	1.2E-02	3.4E-02	5.9E-04	5.3E-05	1.7E-02	2.0E-05	1.7E-02	1.5E-02	1.1E+00	3.0E-02	5.7E-01
Endrin aldehyde	1.2E-02	1.2E+00	9.4E-05	5.3E-05	6.1E-01	3.1E-06	6.1E-01	9.2E-02	6.6E+00	9.2E-01	6.6E-01
Endrin ketone	1.4E-02	1.4E+00	1.1E-04	6.2E-05	7.1E-01	3.6E-06	7.1E-01	9.2E-02	7.7E+00	9.2E-01	7.7E-01
Polychlorinated Biphenyls											
Total PCBs	1.7E+00	3.2E-01	2.6E-03	7.5E-03	1.6E-01	8.7E-05	1.7E-01	1.4E-01	1.2E+00	6.9E-01	2.5E-01

TABLE F-20
POTENTIAL RISKS TO THE EASTERN COTTONTAIL - MAXIMUM EXPOSURE
SWMU H
BASF, WYANDOTTE, MI

COI	Site Concentrations		Potential Daily Dose (mg/kg_{bw}-day)			NOAEL TRV (mg/kg_{bw}day)	NOAEL HQ	LOAEL TRV (mg/kg_{bw}day)	LOAEL HQ
	Surface Soil (mg/kg_{dw})	Terrestrial Plant (mg/kg_{ww})	Surface Soil	Terrestrial Plant	Total				
Inorganics									
Antimony	1.7E+01	6.9E-02	6.7E-03	1.3E-02	2.0E-02	1.3E-01	1.6E-01	1.3E+00	1.6E-02
Arsenic	2.3E+01	1.0E-01	8.7E-03	1.9E-02	2.8E-02	1.0E+00	2.7E-02	1.7E+00	1.7E-02
Cadmium	2.7E+00	1.3E-01	1.0E-03	2.4E-02	2.6E-02	7.7E-01	3.3E-02	7.7E+00	3.3E-03
Chromium	6.5E+01	3.2E-01	2.5E-02	6.1E-02	8.5E-02	2.4E+00	3.6E-02	9.6E+00	8.9E-03
Copper	5.3E+01	1.1E+00	2.0E-02	2.1E-01	2.3E-01	5.6E+00	4.2E-02	9.3E+00	2.5E-02
Lead	1.9E+02	6.0E-01	7.3E-02	1.2E-01	1.9E-01	4.7E+00	4.0E-02	8.9E+00	2.1E-02
Mercury	1.1E+00	1.8E-02	4.2E-04	3.4E-03	3.9E-03	1.3E+01	2.9E-04	1.3E+02	2.9E-05
Nickel	6.9E+01	3.1E-01	2.7E-02	5.9E-02	8.6E-02	1.7E+00	5.0E-02	3.4E+00	2.5E-02
Thallium	1.6E+00	7.7E-04	6.2E-04	1.5E-04	7.6E-04	7.4E-03	1.0E-01	7.4E-02	1.0E-02
Tin	1.1E+02	6.7E-01	4.4E-02	1.3E-01	1.7E-01	2.3E+01	7.3E-03	3.5E+01	4.9E-03
Vanadium	2.8E+01	1.6E-02	1.1E-02	3.1E-03	1.4E-02	4.2E+00	3.4E-03	8.3E+00	1.7E-03
Zinc	1.6E+02	9.7E+00	6.3E-02	1.9E+00	1.9E+00	7.5E+01	2.5E-02	3.0E+02	6.4E-03
Semivolatile Organic Compounds									
Naphthalene	5.5E-01	8.1E-01	2.1E-04	1.5E-01	1.5E-01	6.6E+01	2.3E-03	3.3E+02	4.7E-04
Carbazole	5.5E-02	3.5E-03	2.1E-05	6.6E-04	6.8E-04	5.0E+01	1.4E-05	5.0E+02	1.4E-06
Dibenzofuran	6.3E-02	1.2E-03	2.4E-05	2.3E-04	2.6E-04	1.3E+01	2.1E-05	1.3E+02	2.1E-06
Pesticides									
4,4-DDT	1.2E-02	1.7E-05	4.6E-06	3.3E-06	7.9E-06	1.5E-01	5.4E-05	7.4E-01	1.1E-05
Beta-BHC	9.4E-03	2.7E-04	3.6E-06	5.1E-05	5.4E-05	1.6E+00	3.4E-05	3.2E+00	1.7E-05
Dieldrin	1.2E-02	5.9E-04	4.6E-06	1.1E-04	1.2E-04	1.5E-02	7.8E-03	3.0E-02	3.9E-03
Endrin aldehyde	1.2E-02	9.4E-05	4.6E-06	1.8E-05	2.2E-05	9.2E-02	2.4E-04	9.2E-01	2.4E-05
Endrin ketone	1.4E-02	1.1E-04	5.4E-06	2.1E-05	2.6E-05	9.2E-02	2.8E-04	9.2E-01	2.8E-05
Polychlorinated Biphenyls									
Total PCBs	1.7E+00	2.6E-03	6.5E-04	5.0E-04	1.2E-03	1.4E-01	8.4E-03	6.9E-01	1.7E-03

TABLE F-21
POTENTIAL RISKS TO THE AMERICAN ROBIN - AVERAGE EXPOSURE
AOC 7A
BASF, WYANDOTTE, MI

COI	Site Concentrations			Potential Daily Dose (mg/kg_{bw}-day)				NOAEL TRV (mg/kg_{bw}day)	NOAEL HQ	LOAEL TRV (mg/kg_{bw}day)	LOAEL HQ
	Surface Soil (mg/kg_{dw})	Terrestrial Invertebrate (mg/kg_{ww})	Terrestrial Plant (mg/kg_{ww})	Surface Soil	Terrestrial Invertebrates	Terrestrial Plant	Total				
Inorganics											
Mercury	1.3E+00	9.8E-02	2.1E-02	6.7E-03	2.1E-02	6.0E-03	3.3E-02	6.4E-03	5.2E+00	6.4E-02	5.2E-01

NC - Not Calculated

TABLE F-22
POTENTIAL RISKS TO THE AMERICAN ROBIN - AVERAGE EXPOSURE
SWMU G
BASF, WYANDOTTE, MI

COI	Site Concentrations			Potential Daily Dose (mg/kg_{bw}-day)				NOAEL TRV (mg/kg_{bw}day)	NOAEL HQ	LOAEL TRV (mg/kg_{bw}day)	LOAEL HQ
	Surface Soil (mg/kg_{dw})	Terrestrial Invertebrate (mg/kg_{ww})	Terrestrial Plant (mg/kg_{ww})	Surface Soil	Terrestrial Invertebrates	Terrestrial Plant	Total				
Inorganics											
Lead	7.3E+01	4.3E+00	3.5E-01	3.9E-01	9.1E-01	1.0E-01	1.4E+00	1.6E+00	8.6E-01	3.3E+00	4.3E-01
Mercury	7.7E-01	5.9E-02	1.3E-02	4.1E-03	1.3E-02	3.7E-03	2.0E-02	6.4E-03	3.2E+00	6.4E-02	3.2E-01
Semivolatile Organic Compounds											
Pentachlorophenol	1.3E-01	7.3E+00	7.0E-04	6.8E-04	1.5E+00	2.0E-04	1.5E+00	2.4E-02	6.4E+01	2.4E-01	6.4E+00
Pesticides											
4,4-DDT	9.8E-03	3.1E+00	1.4E-05	5.2E-05	6.6E-01	4.1E-06	6.6E-01	2.3E-01	2.9E+00	2.3E+00	2.9E-01

TABLE F-23
POTENTIAL RISKS TO THE RACCOON - AVERAGE EXPOSURE
SWMU G
BASF, WYANDOTTE, MI

COI	Site Concentrations				Potential Daily Dose (mg/kg_{bw}-day)					NOAEL TRV (mg/kg_{bw}day)	NOAEL HQ	LOAEL TRV (mg/kg_{bw}day)	LOAEL HQ
	Surface Soil (mg/kg_{dw})	Terrestrial Invertebrate (mg/kg_{ww})	Small Mammal (mg/kg_{ww})	Terrestrial Plant (mg/kg_{ww})	Surface Soil	Terrestrial Invertebrates	Small Mammal	Terrestrial Plant	Total				
Semivolatile Organic Compounds													
Pentachlorophenol	1.3E-01	7.3E+00	2.4E+01	7.0E-04	3.3E-04	9.6E-01	6.0E-01	5.8E-05	1.6E+00	2.4E-01	6.5E+00	2.4E+00	6.5E-01
Pesticides													
4,4-DDT	9.8E-03	3.1E+00	3.1E+01	1.4E-05	2.5E-05	4.1E-01	7.8E-01	1.2E-06	1.2E+00	1.5E-01	8.1E+00	7.4E-01	1.6E+00

TABLE F-24
POTENTIAL RISKS TO THE SHORT-TAILED SHREW - AVERAGE EXPOSURE
SWMU G
BASF, WYANDOTTE, MI

COI	Site Concentrations			Potential Daily Dose (mg/kg_{bw}-day)				NOAEL TRV (mg/kg_{bw}day)	NOAEL HQ	LOAEL TRV (mg/kg_{bw}day)	LOAEL HQ
	Surface Soil (mg/kg_{dw})	Terrestrial Invertebrate (mg/kg_{ww})	Terrestrial Plant (mg/kg_{ww})	Surface Soil	Terrestrial Invertebrates	Terrestrial Plant	Total				
Semivolatile Organic Compounds											
Pentachlorophenol	1.3E-01	7.3E+00	7.0E-04	5.7E-04	3.6E+00	2.3E-05	3.6E+00	2.4E-01	1.5E+01	2.4E+00	1.5E+00
Pesticides											
4,4-DDT	9.8E-03	3.1E+00	1.4E-05	4.4E-05	1.6E+00	4.7E-07	1.6E+00	1.5E-01	1.1E+01	7.4E-01	2.1E+00

NC - Not Calculated

TABLE F-25
POTENTIAL RISKS TO THE AMERICAN ROBIN - AVERAGE EXPOSURE
SWMU H
BASF, WYANDOTTE, MI

COI	Site Concentrations			Potential Daily Dose (mg/kg_{bw}-day)				NOAEL TRV (mg/kg_{bw}day)	NOAEL HQ	LOAEL TRV (mg/kg_{bw}day)	LOAEL HQ
	Surface Soil (mg/kg_{dw})	Terrestrial Invertebrate (mg/kg_{ww})	Terrestrial Plant (mg/kg_{ww})	Surface Soil	Terrestrial Invertebrates	Terrestrial Plant	Total				
Inorganics											
Antimony	7.1E+00	2.6E-01	3.0E-02	3.7E-02	5.5E-02	8.6E-03	1.0E-01	1.3E-02	8.1E+00	1.3E-01	8.1E-01
Pesticides											
4,4-DDT	6.9E-03	7.7E+00	9.9E-06	3.6E-05	1.6E+00	2.9E-06	1.6E+00	2.3E-01	7.1E+00	2.3E+00	7.1E-01

TABLE F-26
POTENTIAL RISKS TO THE RACCOON - AVERAGE EXPOSURE
SWMU H
BASF, WYANDOTTE, MI

COI	Site Concentrations				Potential Daily Dose (mg/kg_{bw}-day)					NOAEL TRV (mg/kg_{bw}day)	NOAEL HQ	LOAEL TRV (mg/kg_{bw}day)	LOAEL HQ
	Surface Soil (mg/kg_{dw})	Terrestrial Invertebrate (mg/kg_{ww})	Small Mammal (mg/kg_{ww})	Terrestrial Plant (mg/kg_{ww})	Surface Soil	Terrestrial Invertebrates	Small Mammal	Terrestrial Plant	Total				
Pesticides													
4,4-DDT	6.9E-03	7.7E+00	7.6E+01	9.9E-06	1.7E-05	1.0E+00	1.9E+00	8.3E-07	2.9E+00	1.5E-01	2.0E+01	7.4E-01	4.0E+00

TABLE F-27
POTENTIAL RISKS TO THE SHORT-TAILED SHREW - AVERAGE EXPOSURE
SWMU H
BASF, WYANDOTTE, MI

COI	Site Concentrations			Potential Daily Dose (mg/kg_{bw}-day)				NOAEL TRV (mg/kg_{bw}day)	NOAEL HQ	LOAEL TRV (mg/kg_{bw}day)	LOAEL HQ
	Surface Soil (mg/kg_{dw})	Terrestrial Invertebrate (mg/kg_{ww})	Terrestrial Plant (mg/kg_{ww})	Surface Soil	Terrestrial Invertebrates	Terrestrial Plant	Total				
Inorganics											
Nickel	3.0E+01	5.3E+00	1.7E-01	1.3E-01	2.7E+00	5.5E-03	2.8E+00	1.7E+00	1.6E+00	3.4E+00	8.2E-01
Pesticides											
4,4-DDT	6.9E-03	7.7E+00	9.9E-06	3.1E-05	3.8E+00	3.3E-07	3.8E+00	1.5E-01	2.6E+01	7.4E-01	5.2E+00

NC = Not calculated

Appendix G

Background Groundwater Statistics

Table G-1
Summary Statistics of Inorganic Analytes in Background Groundwater[1]
BASF North Works Facility
Wyandotte, Michigan

Inorganic Analyte	Units	Lowest Appl. Criteria (all GSI)	FOD [3]	Minimum	Maximum [4]	Data Distribution[5]	90th percentile	95th percentile	Comments
ANTIMONY	ug/l	2	3:0:38	60U	7.8J	NA	NA	NA	Data not appropriate to calculate stats as half DL (60U) is greater than max detect and only 3 detects.
ARSENIC	ug/l	50	17:32:38	4.7	77.6	none	45.1	70.32	
BARIUM	ug/l	440	38:32:38	15.3	228	Log-normal	136.5	181.85	
BERYLLIUM	ug/l	2.4	0:0:38	5U	5U	NA	NA	NA	Data not appropriate to calculate stats as berylllium was never detected.
CADMIUM	ug/l	2.2	6:0:38	5U	1.1J	NA	NA	NA	Data not appropriate to calculate stats as half DL (5U) is greater than max detect. There are not a sufficient number of detects (6) to calculate background stats.
CHROMIUM	ug/l	11	27:32:38	1.7	595	none	36.88	261.03	Criterion is for hexavalent chromium, results are for total chromium.
COBALT	ug/l	100	20:18:38	1.2	8.1	none	5.76	8.1	
COPPER	ug/l	9	20:32:38	1.9	27.5	none	12.5	23.73	
LEAD	ug/l	10	14:32:38	1.5	65.2	none	34.22	59.285	
MERCURY[2]	ng/l	1.3	34:31:40	0.25	196	Log-normal	38.7	119.02	
NICKEL	ug/l	52	35:32:38	1.7	162	Log-normal	43.63	92.515	
SELENIUM	ug/l	5	12:32:38	2.5	11.6	none	6.77	10.3	
SILVER	ug/l	0.2	0:0:38	10U	10U	NA	NA	NA	Data not appropriate to calculate stats as silver was never detected.
THALLIUM	ug/l	1.2	7:32:38	2.9	10.2	none	8.29	9.68	
TIN	ug/l	No criterion.	0:0:38	100U	100U	NA	NA	NA	Data not appropriate to calculate stats as tin was never detected.
VANADIUM	ug/l	12	16:32:38	2.1	39.6	none	25	30.11	
ZINC	ug/l	120	22:32:38	7.2	122	none	83.72	110.95	

Notes:

[1] Statistical analyses were conducted using data from background groundwater monitoring wells BG-MW-1, WHI-2-3S, WHI-3-1S, WHI-3-3S, WHI-4-2S, RFI-MW-24, RFI-MW-28, and P35N from the August 2006, November 2006, February 2007, and May 2007 sampling events.

[2] Concentrations for mercury are expressed in nanograms per liter (ng/l).

[3] Frequency of Detection - Number of detected samples (inc. FD): Number of samples used to calculate statistics: Number of total samples (inc. FD). Results may have been excluded from statistical analyses due to elevated detection limits.

[4] Maximum detected concentration of each chemical, after duplicates have been averaged (only if stats calculated)

[5] Normal and log-normal data distributions evaluated using Shapiro-Wilk test for normality, alpha=0.05

NA - Compound not statistically analyzed because of lack of detected concentration data. Value used for background is lowest detection level reported for that compound.

Orange highlighting indicates 90th percentile is higher than GSI criteria.

ANTIMONY

The data is not approriate for calcuating a background concentration. The 60U values will bias background results high and there is insufficient data to calculate background.

Well ID	Sample Date	Concentration (µg/L)	Qualifier	Concentration Used for Statistics(µg/L)	Rank
WHI4-2S	8/15/06 9:40 AM	60	UJ		1
WHI3-3S	8/15/06 10:55 AM	60	UJ		2
WHI3-1S	8/15/06 11:38 AM	60	UJ		3
WHI2-3S	8/15/06 2:30 PM	60	UJ		4
BG-MW-1	8/15/06 4:10 PM	60	UJ		5
P35N	8/17/06 5:45 PM	60	U		6
RFI-MW28	8/23/06 2:30 PM	60	U		7
RFI-MW28	8/23/06 2:30 PM	60	U		8
RFI-MW24	8/23/06 3:40 PM	60	U		9
WHI3-3S	11/7/06 9:35 AM	5.7	J		10
P35NR	11/7/06 2:50 PM	6.7	J		11
RFI-MW28	11/8/06 8:35 AM	60	U		12
RFI-MW24	11/8/06 9:15 AM	60	U		13
WHI2-3S	11/8/06 9:25 AM	60	U		14
WHI2-3S	11/8/06 9:25 AM	7.8	J		15
WHI3-1S	11/9/06 9:15 AM	60	U		16
BG-MW-1	11/9/06 10:10 AM	60	U		17
WHI4-2S	11/9/06 11:15 AM	60	U		18
WHI3-3S	2/12/07 4:40 PM	60	U		19
RFI-MW28	2/13/07 12:25 PM	60	U		20
WHI2-3S	2/13/07 3:20 PM	60	U		21
RFI-MW24	2/13/07 4:30 PM	60	U		22
WHI3-1S	2/14/07 4:40 PM	60	U		23
WHI3-1S	2/14/07 4:40 PM	60	U		24
WHI4-2S	2/15/07 9:45 AM	60	U		25
BG-MW-1	2/16/07 9:40 AM	60	U		26
P35NR	2/16/07 11:20 AM	60	U		27
WHI2-3S	5/5/07 10:15 AM	60	U		28
P35NR	5/5/07 12:40 PM	60	U		29
BG-MW-1	5/5/07 1:00 PM	60	U		30
BG-MW-1	5/5/07 1:00 PM	60	U		31
WHI4-2S	5/5/07 1:50 PM	60	U		32
WHI3-3S	5/5/07 2:20 PM	60	U		33
WHI3-3S	5/5/07 2:20 PM	60	U		34
WHI3-1S	5/5/07 2:45 PM	60	U		35
RFI-MW28	5/7/07 9:20 AM	60	U		36
RFI-MW28	5/7/07 9:20 AM	60	U		37
RFI-MW24	5/7/07 10:30 AM	60	U		38
					39
					40
					41
					42
					43
					44
					45

Parent and duplicate samples.

STATISTICAL DATA SET		
Minimum	0	
Maximum	0	
2nd Maximum		
Mean	#DIV/0!	
Median	#NUM!	
Standard Deviation	#DIV/0!	
No. of samples used for statistics	0	Rank Place
90P		0.9
95P		0.95

RAW DATA SET		
Maximum (all data)	7.8J	Includes FD
Minimum	60U	Includes FD
No. of detects	3	
No. of samples used for statistics	0	OK
No. of total samples	38	Includes FD
Percent Detects	7.89%	

3:0:38

sys_sample_code	task_code	sys_loc_code	matrix_code	sample_date	sample_type_code	chemical_name	result_numeric	interpreted_qualifiers	detect_flag	reportable_result	result_unit	analytic_method	loc_name	validated_yn
WHI3-1S-G-1203-S 12/9/2003	LD	WHI3-1S	WG	12/9/03 12:00 AM	N	ANTIMONY	3.1	UJ	N	Yes	ug/L	6010B	Background-Biddle Ave.	N
BGMW-1-G-0905-S	2005-3Q	BG-MW-1	WG	9/13/05 4:50 PM	N	ANTIMONY	0.36	U	N	YES	ug/l	SW6020	Background - Off Site on Alk	Y
WHI4-2S-G-0905-S	2005-3Q	WHI4-2S	WG	9/13/05 5:30 PM	N	ANTIMONY	5.5		Y	YES	ug/l	SW6020	Background	Y
WHI3-3S-G-0905-S	2005-3Q	WHI3-3S	WG	9/13/05 6:20 PM	N	ANTIMONY	0.14	U	N	YES	ug/l	SW6020	Background	Y
WHI3-1S-G-0905-S	2005-3Q	WHI2-3S	WG	9/14/05 7:30 AM	N	ANTIMONY	0.72	U	N	YES	ug/l	SW6020	Background	Y
WHI2-3S-G-0905-S	2005-3Q	WHI2-3S	WG	9/14/05 8:30 AM	N	ANTIMONY	0.67	U	N	YES	ug/l	SW6020	Background	Y
RFIMW-24-G-0905-S	2005-3Q	RFI-MW24	WG	9/14/05 11:30 AM	N	ANTIMONY	0.25	U	N	YES	ug/l	SW6020	Background	Y
WHI-4-2S	2006-3Q	WHI4-2S	WG	8/15/06 9:40 AM	N	ANTIMONY	60	UJ	N	YES	ug/l	SW6010B	Background	Y
WHI-3-3S	2006-3Q	WHI3-3S	WG	8/15/06 10:55 AM	N	ANTIMONY	60	UJ	N	YES	ug/l	SW6010B	Background	Y
WHI-3-1S	2006-3Q	WHI3-1S	WG	8/15/06 11:38 AM	N	ANTIMONY	60	UJ	N	YES	ug/l	SW6010B	Background-Biddle Ave.	Y
WHI-2-3S	2006-3Q	WHI2-3S	WG	8/15/06 2:30 PM	N	ANTIMONY	60	UJ	N	YES	ug/l	SW6010B	Background	Y
BG-MW-1	2006-3Q	BG-MW-1	WG	8/15/06 4:10 PM	N	ANTIMONY	60	UJ	N	YES	ug/l	SW6010B	Background - Off Site on Alk	Y
P35N-G-0806-S	2006-3Q	P35N	WG	8/17/06 5:45 PM	N	ANTIMONY	60	U	N	YES	ug/l	SW6010B	Background-Hospital	Y
RFI-MW-28-G-0806-D	2006-3Q	RFI-MW28	WG	8/23/06 2:30 PM	FD	ANTIMONY	60	U	N	YES	ug/l	SW6010B	Background	Y
RFI-MW-28-G-0806-S	2006-3Q	RFI-MW28	WG	8/23/06 2:30 PM	N	ANTIMONY	60	U	N	YES	ug/l	SW6010B	Background	Y
RFI-MW-24-G-0806-S	2006-3Q	RFI-MW24	WG	8/23/06 3:40 PM	N	ANTIMONY	60	U	N	YES	ug/l	SW6010B	Background	Y
WHI3-3S-G-1106-S	2006-4Q	WHI3-3S	WG	11/7/06 9:35 AM	N	ANTIMONY	5.7	J	Y	YES	ug/l	SW6010B	Background	Y
P35NR-G-1106-S	2006-4Q	P35NR	WG	11/7/06 2:50 PM	N	ANTIMONY	6.7	J	Y	YES	ug/l	SW6010B		Y
RFI-MW28-G-1106-S	2006-4Q	RFI-MW28	WG	11/8/06 8:35 AM	N	ANTIMONY	60	U	N	YES	ug/l	SW6010B	Background	Y
RFI-MW24-G-1106-S	2006-4Q	RFI-MW24	WG	11/8/06 9:15 AM	N	ANTIMONY	60	U	N	YES	ug/l	SW6010B	Background	Y
WHI2-3S-G-1106-D	2006-4Q	WHI2-3S	WG	11/8/06 9:25 AM	FD	ANTIMONY	60	U	N	YES	ug/l	SW6010B	Background	Y

WHI2-3S-G-1106-S	2006-4Q	WHI2-3S	WG	11/8/06 9:25 AM	N	ANTIMONY	7.8	J	Y	YES	ug/l	SW6010B	Background	Y
WHI3-1S-G-1106-S	2006-4Q	WHI3-1S	WG	11/9/06 9:15 AM	N	ANTIMONY	60	U	N	YES	ug/l	SW6010B	Background-Biddle Ave.	Y
BG-MW-1-G-1106-S	2006-4Q	BG-MW-1	WG	11/9/06 10:10 AM	N	ANTIMONY	60	U	N	YES	ug/l	SW6010B	Background - Off Site on Alk	Y
WHI4-2S-G-1106-S	2006-4Q	WHI4-2S	WG	11/9/06 11:15 AM	N	ANTIMONY	60	U	N	YES	ug/l	SW6010B	Background	Y
WHI3-3S-G-0207-S	2007-1Q	WHI3-3S	WG	2/12/07 4:40 PM	N	ANTIMONY	60	U	N	YES	ug/l	SW6010B	Background	Y
RFI-MW28-G-0207-S	2007-1Q	RFI-MW28	WG	2/13/07 12:25 PM	N	ANTIMONY	60	U	N	YES	ug/l	SW6010B	Background	Y
WHI2-3S-G-0207-S	2007-1Q	WHI2-3S	WG	2/13/07 3:20 PM	N	ANTIMONY	60	U	N	YES	ug/l	SW6010B	Background	Y
RFI-MW24-G-0207-S	2007-1Q	RFI-MW24	WG	2/13/07 4:30 PM	N	ANTIMONY	60	U	N	YES	ug/l	SW6010B	Background	Y
WHI3-1S-G-0207-D	2007-1Q	WHI3-1S	WG	2/14/07 4:40 PM	FD	ANTIMONY	60	U	N	YES	ug/l	SW6010B	Background-Biddle Ave.	Y
WHI3-1S-G-0207-S	2007-1Q	WHI3-1S	WG	2/14/07 4:40 PM	N	ANTIMONY	60	U	N	YES	ug/l	SW6010B	Background-Biddle Ave.	Y
WHI4-2S-G-0207-S	2007-1Q	WHI4-2S	WG	2/15/07 9:45 AM	N	ANTIMONY	60	U	N	YES	ug/l	SW6010B	Background	Y
BG-MW-1-G-0207-S	2007-1Q	BG-MW-1	WG	2/16/07 9:40 AM	N	ANTIMONY	60	U	N	YES	ug/l	SW6010B	Background - Off Site on Alk	Y
P35NR-G-0207-S	2007-1Q	P35NR	WG	2/16/07 11:20 AM	N	ANTIMONY	60	U	N	YES	ug/l	SW6010B		Y
WHI2-3S-G-0507-S	2007-2Q	WHI2-3S	WG	5/5/07 10:15 AM	N	ANTIMONY	60	U	N	Yes	ug/l	SW6010B	Background	Y
P35NR-G-0507-S	2007-2Q	P35NR	WG	5/5/07 12:40 PM	N	ANTIMONY	60	U	N	Yes	ug/l	SW6010B		Y
BG-MW-1-G-0507-D	2007-2Q	BG-MW-1	WG	5/5/07 1:00 PM	FD	ANTIMONY	60	U	N	Yes	ug/l	SW6010B	Background - Off Site on Alk	Y
BG-MW-1-G-0507-S	2007-2Q	BG-MW-1	WG	5/5/07 1:00 PM	N	ANTIMONY	60	U	N	Yes	ug/l	SW6010B	Background - Off Site on Alk	Y
WHI4-2S-G-0507-S	2007-2Q	WHI4-2S	WG	5/5/07 1:50 PM	N	ANTIMONY	60	U	N	YES	ug/l	SW6010B	Background	Y
WHI3-3S-G-0507-D	2007-2Q	WHI3-3S	WG	5/5/07 2:20 PM	FD	ANTIMONY	60	U	N	Yes	ug/l	SW6010B	Background	Y
WHI3-3S-G-0507-S	2007-2Q	WHI3-3S	WG	5/5/07 2:20 PM	N	ANTIMONY	60	U	N	Yes	ug/l	SW6010B	Background	Y
WHI3-1S-G-0507-S	2007-2Q	WHI3-1S	WG	5/5/07 2:45 PM	N	ANTIMONY	60	U	N	Yes	ug/l	SW6010B	Background-Biddle Ave.	Y
RFI-MW28-G-0507-D	2007-2Q	RFI-MW28	WG	5/7/07 9:20 AM	FD	ANTIMONY	60	U	N	Yes	ug/l	SW6010B	Background	Y
RFI-MW28-G-0507-S	2007-2Q	RFI-MW28	WG	5/7/07 9:20 AM	N	ANTIMONY	60	U	N	Yes	ug/l	SW6010B	Background	Y
RFI-MW24-G-0507-S	2007-2Q	RFI-MW24	WG	5/7/07 10:30 AM	N	ANTIMONY	60	U	N	Yes	ug/l	SW6010B	Background	Y

Older data excluded from background statistics.
Parent and duplicate samples.

ARSENIC

Well ID	Sample Date	Concentration (µg/L)	Qualifier	Concentration Used for Statistics (µg/L)	Rank	Comments
WHI4-2S	5/5/07 1:50 PM	4.7	J	4.7	1	
WHI4-2S	8/15/06 9:40 AM	10	U	5	2	
WHI3-3S	8/15/06 10:55 AM	10	U	5	3	
BG-MW-1	8/15/06 4:10 PM	10	U	5	4	
RFI-MW24	8/23/06 3:40 PM	10	U	5	5	
WHI3-3S	11/7/06 9:35 AM	10	U	5	6	
P35NR	11/7/06 2:50 PM	10	U	5	7	
RFI-MW24	11/8/06 9:15 AM	10	U	5	8	
BG-MW-1	11/9/06 10:10 AM	10	U	5	9	
WHI4-2S	11/9/06 11:15 AM	10	U	5	10	
WHI3-3S	2/12/07 4:40 PM	10	U	5	11	
RFI-MW24	2/13/07 4:30 PM	10	U	5	12	
WHI3-1S	2/14/07 4:40 PM	10/10	U/U	5	13	Averaged with Duplicate Sample
BG-MW-1	2/16/07 9:40 AM	10	U	5	14	
P35NR	2/16/07 11:20 AM	10	U	5	15	
P35NR	5/5/07 12:40 PM	10	U	5	16	
BG-MW-1	5/5/07 1:00 PM	10/10	U/U	5	17	Averaged with Duplicate Sample
WHI3-3S	5/5/07 2:20 PM	10/10	U/U	5	18	Averaged with Duplicate Sample
RFI-MW24	5/7/07 10:30 AM	10	U	5	19	
WHI3-1S	11/9/06 9:15 AM	5.1	J	5.1	20	
WHI4-2S	2/15/07 9:45 AM	6.5	J	6.5	21	
P35N	8/17/06 5:45 PM	8.5	J	8.5	22	
WHI3-1S	5/5/07 2:45 PM	9.6	J	9.6	23	
WHI3-1S	8/15/06 11:38 AM	28.8		28.8	24	
RFI-MW28	2/13/07 12:25 PM	29.9		29.9	25	
RFI-MW28	5/7/07 9:20 AM	35.3/32.7		34.0	26	Averaged with Duplicate Sample
RFI-MW28	11/8/06 8:35 AM	36.7		36.7	27	
RFI-MW28	8/23/06 2:30 PM	41.7/42		41.9	28	Averaged with Duplicate Sample
WHI2-3S	2/13/07 3:20 PM	45.1		45.1	29	
WHI2-3S	5/5/07 10:15 AM	45.1		45.1	30	
WHI2-3S	8/15/06 2:30 PM	66.4		66.4	31	
WHI2-3S	11/8/06 9:25 AM	77.6/78.6		77.6	32	Averaged with Duplicate Sample

STATISTICAL DATA SET		
Minimum	4.7	
Maximum	77.6	
2nd Maximum	66.4	
Mean	16.559375	
Median	5	
Standard Deviation	20.00857654	
No. of samples used for statistics	32	*Rank Place*
90P	45.1	*29.7*
95P	70.32	*31.35*

RAW DATA SET		
Maximum (all data)	78.6	Includes FD
Minimum	10U	Includes FD
No. of detects	17	
No. of samples used for statistics	32	OK
No. of total samples	38	Includes FD
Percent Detects	44.74%	

17:32:38

sys_sample_code	task_code	sys_loc_code	matrix_code	sample_date	sample_type_code	chemical_name	result_numeric	interpreted_qualifiers	detect_flag	reportable_result	result_unit	analytic_method	loc_name	validated_yn
WHI3-1S-G-1203-S 12/9/2003	LD	WHI3-1S	WG	12/9/03 12:00 AM	N	ARSENIC	0.016		Y	Yes	mg/l	6010B	Background-Biddle Ave.	N
BGMW-1-G-0905-S	2005-3Q	BG-MW-1	WG	9/13/05 4:50 PM	N	ARSENIC	1.1	U	N	YES	ug/l	SW6020	Background - Off Site on Alk	Y
WHI4-2S-G-0905-S	2005-3Q	WHI4-2S	WG	9/13/05 5:30 PM	N	ARSENIC	10		Y	YES	ug/l	SW6020	Background	Y
WHI3-3S-G-0905-S	2005-3Q	WHI3-3S	WG	9/13/05 6:20 PM	N	ARSENIC	0.82	U	N	YES	ug/l	SW6020	Background	Y
WHI3-1S-G-0905-S	2005-3Q	WHI2-3S	WG	9/14/05 7:30 AM	N	ARSENIC	9.6		Y	YES	ug/l	SW6020	Background	Y
WHI2-3S-G-0905-S	2005-3Q	WHI2-3S	WG	9/14/05 8:30 AM	N	ARSENIC	47.2		Y	YES	ug/l	SW6020	Background	Y
RFIMW-24-G-0905-S	2005-3Q	RFI-MW24	WG	9/14/05 11:30 AM	N	ARSENIC	2.1	U	N	YES	ug/l	SW6020	Background	Y
WHI-4-2S	2006-3Q	WHI4-2S	WG	8/15/06 9:40 AM	N	ARSENIC	10	U	N	YES	ug/l	SW6010B	Background	Y
WHI-3-3S	2006-3Q	WHI3-3S	WG	8/15/06 10:55 AM	N	ARSENIC	10	U	N	YES	ug/l	SW6010B	Background	Y
WHI-3-1S	2006-3Q	WHI3-1S	WG	8/15/06 11:38 AM	N	ARSENIC	28.8		Y	YES	ug/l	SW6010B	Background-Biddle Ave.	Y
WHI-2-3S	2006-3Q	WHI2-3S	WG	8/15/06 2:30 PM	N	ARSENIC	66.4		Y	YES	ug/l	SW6010B	Background	Y
BG-MW-1	2006-3Q	BG-MW-1	WG	8/15/06 4:10 PM	N	ARSENIC	10	U	N	YES	ug/l	SW6010B	Background - Off Site on Alk	Y
P35N-G-0806-S	2006-3Q	P35N	WG	8/17/06 5:45 PM	N	ARSENIC	8.5	J	Y	YES	ug/l	SW6010B	Background-Hospital	Y
RFI-MW-28-G-0806-D	2006-3Q	RFI-MW28	WG	8/23/06 2:30 PM	FD	ARSENIC	42		Y	YES	ug/l	SW6010B	Background	Y
RFI-MW-28-G-0806-S	2006-3Q	RFI-MW28	WG	8/23/06 2:30 PM	N	ARSENIC	41.7		Y	YES	ug/l	SW6010B	Background	Y
RFI-MW-24-G-0806-S	2006-3Q	RFI-MW24	WG	8/23/06 3:40 PM	N	ARSENIC	10	U	N	YES	ug/l	SW6010B	Background	Y
WHI3-3S-G-1106-S	2006-4Q	WHI3-3S	WG	11/7/06 9:35 AM	N	ARSENIC	10	U	N	YES	ug/l	SW6010B	Background	Y
P35NR-G-1106-S	2006-4Q	P35NR	WG	11/7/06 2:50 PM	N	ARSENIC	10	U	N	YES	ug/l	SW6010B		Y
RFI-MW28-G-1106-S	2006-4Q	RFI-MW28	WG	11/8/06 8:35 AM	N	ARSENIC	36.7		Y	YES	ug/l	SW6010B	Background	Y
RFI-MW24-G-1106-S	2006-4Q	RFI-MW24	WG	11/8/06 9:15 AM	N	ARSENIC	10	U	N	YES	ug/l	SW6010B	Background	Y
WHI2-3S-G-1106-D	2006-4Q	WHI2-3S	WG	11/8/06 9:25 AM	FD	ARSENIC	78.6		Y	YES	ug/l	SW6010B	Background	Y
WHI2-3S-G-1106-S	2006-4Q	WHI2-3S	WG	11/8/06 9:25 AM	N	ARSENIC	76.6		Y	YES	ug/l	SW6010B	Background	Y

WHI3-1S-G-1106-S	2006-4Q	WHI3-1S	WG	11/9/06 9:15 AM	N	ARSENIC	5.1	J	Y	YES	ug/l	SW6010B	Background-Biddle Ave.	Y
BG-MW-1-G-1106-S	2006-4Q	BG-MW-1	WG	11/9/06 10:10 AM	N	ARSENIC	10	U	N	YES	ug/l	SW6010B	Background - Off Site on Alk	Y
WHI4-2S-G-1106-S	2006-4Q	WHI4-2S	WG	11/9/06 11:15 AM	N	ARSENIC	10	U	N	YES	ug/l	SW6010B	Background	Y
WHI3-3S-G-0207-S	2007-1Q	WHI3-3S	WG	2/12/07 4:40 PM	N	ARSENIC	10	U	N	YES	ug/l	SW6010B	Background	Y
RFI-MW28-G-0207-S	2007-1Q	RFI-MW28	WG	2/13/07 12:25 PM	N	ARSENIC	29.9		Y	Yes	ug/l	SW6010B	Background	Y
WHI2-3S-G-0207-S	2007-1Q	WHI2-3S	WG	2/13/07 3:20 PM	N	ARSENIC	45.1		Y	Yes	ug/l	SW6010B	Background	Y
RFI-MW24-G-0207-S	2007-1Q	RFI-MW24	WG	2/13/07 4:30 PM	N	ARSENIC	10	U	N	YES	ug/l	SW6010B	Background	Y
WHI3-1S-G-0207-D	2007-1Q	WHI3-1S	WG	2/14/07 4:40 PM	FD	ARSENIC	10	U	N	YES	ug/l	SW6010B	Background-Biddle Ave.	Y
WHI3-1S-G-0207-S	2007-1Q	WHI3-1S	WG	2/14/07 4:40 PM	N	ARSENIC	10	U	N	YES	ug/l	SW6010B	Background-Biddle Ave.	Y
WHI4-2S-G-0207-S	2007-1Q	WHI4-2S	WG	2/15/07 9:45 AM	N	ARSENIC	6.5	J	Y	YES	ug/l	SW6010B	Background	Y
BG-MW-1-G-0207-S	2007-1Q	BG-MW-1	WG	2/16/07 9:40 AM	N	ARSENIC	10	U	N	YES	ug/l	SW6010B	Background - Off Site on Alk	Y
P35NR-G-0207-S	2007-1Q	P35NR	WG	2/16/07 11:20 AM	N	ARSENIC	10	U	N	YES	ug/l	SW6010B		Y
WHI2-3S-G-0507-S	2007-2Q	WHI2-3S	WG	5/5/07 10:15 AM	N	ARSENIC	45.1		Y	Yes	ug/l	SW6010B	Background	Y
P35NR-G-0507-S	2007-2Q	P35NR	WG	5/5/07 12:40 PM	N	ARSENIC	10	U	N	Yes	ug/l	SW6010B		Y
BG-MW-1-G-0507-D	2007-2Q	BG-MW-1	WG	5/5/07 1:00 PM	FD	ARSENIC	10	U	N	Yes	ug/l	SW6010B	Background - Off Site on Alk	Y
BG-MW-1-G-0507-S	2007-2Q	BG-MW-1	WG	5/5/07 1:00 PM	N	ARSENIC	10	U	N	Yes	ug/l	SW6010B	Background - Off Site on Alk	Y
WHI4-2S-G-0507-S	2007-2Q	WHI4-2S	WG	5/5/07 1:50 PM	N	ARSENIC	4.7	J	Y	YES	ug/l	SW6010B	Background	Y
WHI3-3S-G-0507-D	2007-2Q	WHI3-3S	WG	5/5/07 2:20 PM	FD	ARSENIC	10	U	N	Yes	ug/l	SW6010B	Background	Y
WHI3-3S-G-0507-S	2007-2Q	WHI3-3S	WG	5/5/07 2:20 PM	N	ARSENIC	10	U	N	Yes	ug/l	SW6010B	Background	Y
WHI3-1S-G-0507-S	2007-2Q	WHI3-1S	WG	5/5/07 2:45 PM	N	ARSENIC	9.6	J	Y	YES	ug/l	SW6010B	Background-Biddle Ave.	Y
RFI-MW28-G-0507-D	2007-2Q	RFI-MW28	WG	5/7/07 9:20 AM	FD	ARSENIC	32.7		Y	Yes	ug/l	SW6010B	Background	Y
RFI-MW28-G-0507-S	2007-2Q	RFI-MW28	WG	5/7/07 9:20 AM	N	ARSENIC	35.3		Y	Yes	ug/l	SW6010B	Background	Y
RFI-MW24-G-0507-S	2007-2Q	RFI-MW24	WG	5/7/07 10:30 AM	N	ARSENIC	10	U	N	Yes	ug/l	SW6010B	Background	Y

Older data excluded from background statistics.
Parent and duplicate samples.

BARIUM

Well ID	Sample Date	Concentration (µg/L)	Qualifier	Concentration Used for Statistics(µg/L)	Rank	Comments
BG-MW-1	2/16/07 9:40 AM	15.3	J	15.3	1	
BG-MW-1	11/9/06 10:10 AM	16.2	J	16.2	2	
BG-MW-1	5/5/07 1:00 PM	16.6/17.3	J/J	16.95	3	Averaged with Duplicate Sample
BG-MW-1	8/15/06 4:10 PM	17.2	J	17.2	4	
RFI-MW24	2/13/07 4:30 PM	24.2	J	24.2	5	
RFI-MW28	5/7/07 9:20 AM	27.2/27.5	J/J	27.35	6	Averaged with Duplicate Sample
RFI-MW24	5/7/07 10:30 AM	27.6	J	27.6	7	
RFI-MW28	2/13/07 12:25 PM	28.6	J	28.6	8	
RFI-MW28	11/8/06 8:35 AM	29.2	J	29.2	9	
RFI-MW28	8/23/06 2:30 PM	30.8/31.6	J/J	31.2	10	Averaged with Duplicate Sample
RFI-MW24	11/8/06 9:15 AM	31.6	J	31.6	11	
WHI2-3S	2/13/07 3:20 PM	43.9	J	43.9	12	
WHI3-3S	5/5/07 2:20 PM	45.9/50.8	J/J	48.35	13	Averaged with Duplicate Sample
RFI-MW24	8/23/06 3:40 PM	51.4	J	51.4	14	
WHI2-3S	5/5/07 10:15 AM	60.3	J	60.3	15	
P35NR	5/5/07 12:40 PM	62.3	J	62.3	16	
P35NR	2/16/07 11:20 AM	63.4	J	63.4	17	
WHI3-3S	2/12/07 4:40 PM	69.4	J	69.4	18	
WHI3-1S	5/5/07 2:45 PM	76.3	J	76.3	19	
WHI2-3S	11/8/06 9:25 AM	78/77	J/J	77.5	20	Averaged with Duplicate Sample
WHI3-3S	11/7/06 9:35 AM	78.2	J	78.2	21	
WHI2-3S	8/15/06 2:30 PM	80.8	J	80.8	22	
WHI4-2S	2/15/07 9:45 AM	87.3	J	87.3	23	
WHI4-2S	11/9/06 11:15 AM	88.1	J	88.1	24	
P35NR	11/7/06 2:50 PM	88.7	J	88.7	25	
WHI4-2S	8/15/06 9:40 AM	98.7	J	98.7	26	
WHI3-1S	2/14/07 4:40 PM	96.5/102	J/J	99.25	27	Averaged with Duplicate Sample
WHI4-2S	5/5/07 1:50 PM	102	J	102	28	
WHI3-3S	8/15/06 10:55 AM	112	J	112	29	
WHI3-1S	11/9/06 9:15 AM	147	J	147	30	
WHI3-1S	8/15/06 11:38 AM	157	J	157	31	
P35N	8/17/06 5:45 PM	228		228	32	

STATISTICAL DATA SET		
Minimum	15.3	
Maximum	228	
2nd Maximum	157	
Mean	68.290625	
Median	62.85	
Standard Deviation	47.29695045	
No. of samples used for statistics	32	*Rank Place*
90P	136.5	*29.7*
95P	181.85	*31.35*

RAW DATA SET		
Maximum (all data)	228	Includes FD
Minimum	15.3J	Includes FD
No. of detects	38	
No. of samples used for statistics	32	OK
No. of total samples	38	Includes FD
Percent Detects	100.00%	

38:32:38

sys_sample_code	task_code	sys_loc_code	matrix_code	sample_date	sample_type_code	chemical_name	result_numeric	interpreted_qualifiers	detect_flag	reportable_result	result_unit	analytic_method	loc_name	validated_yn
WHI3-1S-G-1203-S 12/9/2003	LD	WHI3-1S	WG	12/9/03 12:00 AM	N	BARIUM	0.11		Y	Yes	mg/l	6010B	Background-Biddle Ave.	N
WHI-4-2S	2006-3Q	WHI4-2S	WG	8/15/06 9:40 AM	N	BARIUM	98.7	J	Y	YES	ug/l	SW6010B	Background	Y
WHI-3-3S	2006-3Q	WHI3-3S	WG	8/15/06 10:55 AM	N	BARIUM	112	J	Y	YES	ug/l	SW6010B	Background	Y
WHI-3-1S	2006-3Q	WHI3-1S	WG	8/15/06 11:38 AM	N	BARIUM	157	J	Y	YES	ug/l	SW6010B	Background-Biddle Ave.	Y
WHI-2-3S	2006-3Q	WHI2-3S	WG	8/15/06 2:30 PM	N	BARIUM	80.8	J	Y	YES	ug/l	SW6010B	Background	Y
BG-MW-1	2006-3Q	BG-MW-1	WG	8/15/06 4:10 PM	N	BARIUM	17.2	J	Y	YES	ug/l	SW6010B	Background - Off Site on Alk	Y
P35N-G-0806-S	2006-3Q	P35N	WG	8/17/06 5:45 PM	N	BARIUM	228		Y	YES	ug/l	SW6010B	Background-Hospital	Y
RFI-MW-28-G-0806-D	2006-3Q	RFI-MW28	WG	8/23/06 2:30 PM	FD	BARIUM	31.6	J	Y	YES	ug/l	SW6010B	Background	Y
RFI-MW-28-G-0806-S	2006-3Q	RFI-MW28	WG	8/23/06 2:30 PM	N	BARIUM	30.8	J	Y	YES	ug/l	SW6010B	Background	Y
RFI-MW-24-G-0806-S	2006-3Q	RFI-MW24	WG	8/23/06 3:40 PM	N	BARIUM	51.4	J	Y	YES	ug/l	SW6010B	Background	Y
WHI3-3S-G-1106-S	2006-4Q	WHI3-3S	WG	11/7/06 9:35 AM	N	BARIUM	78.2	J	Y	YES	ug/l	SW6010B	Background	Y
P35NR-G-1106-S	2006-4Q	P35NR	WG	11/7/06 2:50 PM	N	BARIUM	88.7	J	Y	YES	ug/l	SW6010B		Y
RFI-MW28-G-1106-S	2006-4Q	RFI-MW28	WG	11/8/06 8:35 AM	N	BARIUM	29.2	J	Y	YES	ug/l	SW6010B	Background	Y
RFI-MW24-G-1106-S	2006-4Q	RFI-MW24	WG	11/8/06 9:15 AM	N	BARIUM	31.6	J	Y	YES	ug/l	SW6010B	Background	Y
WHI2-3S-G-1106-D	2006-4Q	WHI2-3S	WG	11/8/06 9:25 AM	FD	BARIUM	77	J	Y	YES	ug/l	SW6010B	Background	Y
WHI2-3S-G-1106-S	2006-4Q	WHI2-3S	WG	11/8/06 9:25 AM	N	BARIUM	78	J	Y	YES	ug/l	SW6010B	Background	Y
WHI3-1S-G-1106-S	2006-4Q	WHI3-1S	WG	11/9/06 9:15 AM	N	BARIUM	147	J	Y	YES	ug/l	SW6010B	Background-Biddle Ave.	Y
BG-MW-1-G-1106-S	2006-4Q	BG-MW-1	WG	11/9/06 10:10 AM	N	BARIUM	16.2	J	Y	YES	ug/l	SW6010B	Background - Off Site on Alk	Y
WHI4-2S-G-1106-S	2006-4Q	WHI4-2S	WG	11/9/06 11:15 AM	N	BARIUM	88.1	J	Y	YES	ug/l	SW6010B	Background	Y
WHI3-3S-G-0207-S	2007-1Q	WHI3-3S	WG	2/12/07 4:40 PM	N	BARIUM	69.4	J	Y	YES	ug/l	SW6010B	Background	Y
RFI-MW28-G-0207-S	2007-1Q	RFI-MW28	WG	2/13/07 12:25 PM	N	BARIUM	28.6	J	Y	YES	ug/l	SW6010B	Background	Y
WHI2-3S-G-0207-S	2007-1Q	WHI2-3S	WG	2/13/07 3:20 PM	N	BARIUM	43.9	J	Y	YES	ug/l	SW6010B	Background	Y

RFI-MW24-G-0207-S	2007-1Q	RFI-MW24	WG	2/13/07 4:30 PM	N	BARIUM	24.2	J	Y	YES	ug/l	SW6010B	Background	Y
WHI3-1S-G-0207-D	2007-1Q	WHI3-1S	WG	2/14/07 4:40 PM	FD	BARIUM	102	J	Y	YES	ug/l	SW6010B	Background-Biddle Ave.	Y
WHI3-1S-G-0207-S	2007-1Q	WHI3-1S	WG	2/14/07 4:40 PM	N	BARIUM	96.5	J	Y	YES	ug/l	SW6010B	Background-Biddle Ave.	Y
WHI4-2S-G-0207-S	2007-1Q	WHI4-2S	WG	2/15/07 9:45 AM	N	BARIUM	87.3	J	Y	YES	ug/l	SW6010B	Background	Y
BG-MW-1-G-0207-S	2007-1Q	BG-MW-1	WG	2/16/07 9:40 AM	N	BARIUM	15.3	J	Y	YES	ug/l	SW6010B	Background - Off Site on Alk	Y
P35NR-G-0207-S	2007-1Q	P35NR	WG	2/16/07 11:20 AM	N	BARIUM	63.4	J	Y	YES	ug/l	SW6010B		Y
WHI2-3S-G-0507-S	2007-2Q	WHI2-3S	WG	5/5/07 10:15 AM	N	BARIUM	60.3	J	Y	YES	ug/l	SW6010B	Background	Y
P35NR-G-0507-S	2007-2Q	P35NR	WG	5/5/07 12:40 PM	N	BARIUM	62.3	J	Y	YES	ug/l	SW6010B		Y
BG-MW-1-G-0507-D	2007-2Q	BG-MW-1	WG	5/5/07 1:00 PM	FD	BARIUM	17.3	J	Y	YES	ug/l	SW6010B	Background - Off Site on Alk	Y
BG-MW-1-G-0507-S	2007-2Q	BG-MW-1	WG	5/5/07 1:00 PM	N	BARIUM	16.6	J	Y	YES	ug/l	SW6010B	Background - Off Site on Alk	Y
WHI4-2S-G-0507-S	2007-2Q	WHI4-2S	WG	5/5/07 1:50 PM	N	BARIUM	102	J	Y	YES	ug/l	SW6010B	Background	Y
WHI3-3S-G-0507-D	2007-2Q	WHI3-3S	WG	5/5/07 2:20 PM	FD	BARIUM	50.8	J	Y	YES	ug/l	SW6010B	Background	Y
WHI3-3S-G-0507-S	2007-2Q	WHI3-3S	WG	5/5/07 2:20 PM	N	BARIUM	45.9	J	Y	YES	ug/l	SW6010B	Background	Y
WHI3-1S-G-0507-S	2007-2Q	WHI3-1S	WG	5/5/07 2:45 PM	N	BARIUM	76.3	J	Y	YES	ug/l	SW6010B	Background-Biddle Ave.	Y
RFI-MW28-G-0507-D	2007-2Q	RFI-MW28	WG	5/7/07 9:20 AM	FD	BARIUM	27.5	J	Y	YES	ug/l	SW6010B	Background	Y
RFI-MW28-G-0507-S	2007-2Q	RFI-MW28	WG	5/7/07 9:20 AM	N	BARIUM	27.2	J	Y	YES	ug/l	SW6010B	Background	Y
RFI-MW24-G-0507-S	2007-2Q	RFI-MW24	WG	5/7/07 10:30 AM	N	BARIUM	27.6	J	Y	YES	ug/l	SW6010B	Background	Y

Older data excluded from background statistics.
Parent and duplicate samples.

BERYLLIUM

Well ID	Sample Date	Concentration (µg/L)	Qualifier	Concentration Used for Statistics(µg/L)	Rank
					1
					2
					3
					4
					5
					6
					7
					8
					9
					10
					11
					12
					13
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					34
					35
					36
					37
					38
					39
					40
					41
					42
					43
					44
					45

STATISTICAL DATA SET		
Minimum	0	
Maximum	0	
2nd Maximum		
Mean	#DIV/0!	
Median	#NUM!	
Standard Deviation	#DIV/0!	
No. of samples used for statistics	0	Rank Place
90P		0.9
95P		0.95

RAW DATA SET		
Maximum (all data)	5U	Includes FD
Minimum	5U	Includes FD
No. of detects	0	
No. of samples used for statistics	0	OK
No. of total samples	38	Includes FD
Percent Detects	0.00%	

0:0:38

sys_sample_code	task_code	sys_loc_code	matrix_code	sample_date	sample_type_code	chemical_name	result_numeric	interpreted_qualifiers	detect_flag	reportable_result	result_unit	analytic_method	loc_name	validated_yn
WHI3-1S-G-1203-S 12/9/2003	LD	WHI3-1S	WG	12/9/03 12:00 AM	N	BERYLLIUM	0.005	U	N	Yes	mg/l	6010B	Background-Biddle Ave.	N
WHI-4-2S	2006-3Q	WHI4-2S	WG	8/15/06 9:40 AM	N	BERYLLIUM	5	U	N	YES	ug/l	SW6010B	Background	Y
WHI-3-3S	2006-3Q	WHI3-3S	WG	8/15/06 10:55 AM	N	BERYLLIUM	5	U	N	YES	ug/l	SW6010B	Background	Y
WHI-3-1S	2006-3Q	WHI3-1S	WG	8/15/06 11:38 AM	N	BERYLLIUM	5	U	N	YES	ug/l	SW6010B	Background-Biddle Ave.	Y
WHI-2-3S	2006-3Q	WHI2-3S	WG	8/15/06 2:30 PM	N	BERYLLIUM	5	U	N	YES	ug/l	SW6010B	Background	Y
BG-MW-1	2006-3Q	BG-MW-1	WG	8/15/06 4:10 PM	N	BERYLLIUM	5	U	N	YES	ug/l	SW6010B	Background - Off Site on Alk	Y
P35N-G-0806-S	2006-3Q	P35N	WG	8/17/06 5:45 PM	N	BERYLLIUM	5	U	N	YES	ug/l	SW6010B	Background-Hospital	Y
RFI-MW-28-G-0806-D	2006-3Q	RFI-MW28	WG	8/23/06 2:30 PM	FD	BERYLLIUM	5	U	N	YES	ug/l	SW6010B	Background	Y
RFI-MW-28-G-0806-S	2006-3Q	RFI-MW28	WG	8/23/06 2:30 PM	N	BERYLLIUM	5	U	N	YES	ug/l	SW6010B	Background	Y
RFI-MW-24-G-0806-S	2006-3Q	RFI-MW24	WG	8/23/06 3:40 PM	N	BERYLLIUM	5	U	N	YES	ug/l	SW6010B	Background	Y
WHI3-3S-G-1106-S	2006-4Q	WHI3-3S	WG	11/7/06 9:35 AM	N	BERYLLIUM	5	U	N	YES	ug/l	SW6010B	Background	Y
P35NR-G-1106-S	2006-4Q	P35NR	WG	11/7/06 2:50 PM	N	BERYLLIUM	5	U	N	YES	ug/l	SW6010B		Y
RFI-MW28-G-1106-S	2006-4Q	RFI-MW28	WG	11/8/06 8:35 AM	N	BERYLLIUM	5	U	N	YES	ug/l	SW6010B	Background	Y
RFI-MW24-G-1106-S	2006-4Q	RFI-MW24	WG	11/8/06 9:15 AM	N	BERYLLIUM	5	U	N	YES	ug/l	SW6010B	Background	Y
WHI2-3S-G-1106-D	2006-4Q	WHI2-3S	WG	11/8/06 9:25 AM	FD	BERYLLIUM	5	U	N	YES	ug/l	SW6010B	Background	Y
WHI2-3S-G-1106-S	2006-4Q	WHI2-3S	WG	11/8/06 9:25 AM	N	BERYLLIUM	5	U	N	YES	ug/l	SW6010B	Background	Y
WHI3-1S-G-1106-S	2006-4Q	WHI3-1S	WG	11/9/06 9:15 AM	N	BERYLLIUM	5	U	N	YES	ug/l	SW6010B	Background-Biddle Ave.	Y
BG-MW-1-G-1106-S	2006-4Q	BG-MW-1	WG	11/9/06 10:10 AM	N	BERYLLIUM	5	U	N	YES	ug/l	SW6010B	Background - Off Site on Alk	Y
WHI4-2S-G-1106-S	2006-4Q	WHI4-2S	WG	11/9/06 11:15 AM	N	BERYLLIUM	5	U	N	YES	ug/l	SW6010B	Background	Y
WHI3-3S-G-0207-S	2007-1Q	WHI3-3S	WG	2/12/07 4:40 PM	N	BERYLLIUM	5	U	N	YES	ug/l	SW6010B	Background	Y

RFI-MW28-G-0207-S	2007-1Q	RFI-MW28	WG	2/13/07 12:25 PM	N	BERYLLIUM	5	U	N	YES	ug/l	SW6010B	Background	Y
WHI2-3S-G-0207-S	2007-1Q	WHI2-3S	WG	2/13/07 3:20 PM	N	BERYLLIUM	5	U	N	YES	ug/l	SW6010B	Background	Y
RFI-MW24-G-0207-S	2007-1Q	RFI-MW24	WG	2/13/07 4:30 PM	N	BERYLLIUM	5	U	N	YES	ug/l	SW6010B	Background	Y
WHI3-1S-G-0207-D	2007-1Q	WHI3-1S	WG	2/14/07 4:40 PM	FD	BERYLLIUM	5	U	N	YES	ug/l	SW6010B	Background-Biddle Ave.	Y
WHI3-1S-G-0207-S	2007-1Q	WHI3-1S	WG	2/14/07 4:40 PM	N	BERYLLIUM	5	U	N	YES	ug/l	SW6010B	Background-Biddle Ave.	Y
WHI4-2S-G-0207-S	2007-1Q	WHI4-2S	WG	2/15/07 9:45 AM	N	BERYLLIUM	5	U	N	YES	ug/l	SW6010B	Background	Y
BG-MW-1-G-0207-S	2007-1Q	BG-MW-1	WG	2/16/07 9:40 AM	N	BERYLLIUM	5	U	N	YES	ug/l	SW6010B	Background - Off Site on Alk	Y
P35NR-G-0207-S	2007-1Q	P35NR	WG	2/16/07 11:20 AM	N	BERYLLIUM	5	U	N	YES	ug/l	SW6010B		Y
WHI2-3S-G-0507-S	2007-2Q	WHI2-3S	WG	5/5/07 10:15 AM	N	BERYLLIUM	5	U	N	Yes	ug/l	SW6010B	Background	Y
P35NR-G-0507-S	2007-2Q	P35NR	WG	5/5/07 12:40 PM	N	BERYLLIUM	5	U	N	Yes	ug/l	SW6010B		Y
BG-MW-1-G-0507-D	2007-2Q	BG-MW-1	WG	5/5/07 1:00 PM	FD	BERYLLIUM	5	U	N	Yes	ug/l	SW6010B	Background - Off Site on Alk	Y
BG-MW-1-G-0507-S	2007-2Q	BG-MW-1	WG	5/5/07 1:00 PM	N	BERYLLIUM	5	U	N	Yes	ug/l	SW6010B	Background - Off Site on Alk	Y
WHI4-2S-G-0507-S	2007-2Q	WHI4-2S	WG	5/5/07 1:50 PM	N	BERYLLIUM	5	U	N	Yes	ug/l	SW6010B	Background	Y
WHI3-3S-G-0507-D	2007-2Q	WHI3-3S	WG	5/5/07 2:20 PM	FD	BERYLLIUM	5	U	N	Yes	ug/l	SW6010B	Background	Y
WHI3-3S-G-0507-S	2007-2Q	WHI3-3S	WG	5/5/07 2:20 PM	N	BERYLLIUM	5	U	N	Yes	ug/l	SW6010B	Background	Y
WHI3-1S-G-0507-S	2007-2Q	WHI3-1S	WG	5/5/07 2:45 PM	N	BERYLLIUM	5	U	N	Yes	ug/l	SW6010B	Background-Biddle Ave.	Y
RFI-MW28-G-0507-D	2007-2Q	RFI-MW28	WG	5/7/07 9:20 AM	FD	BERYLLIUM	5	U	N	Yes	ug/l	SW6010B	Background	Y
RFI-MW28-G-0507-S	2007-2Q	RFI-MW28	WG	5/7/07 9:20 AM	N	BERYLLIUM	5	U	N	Yes	ug/l	SW6010B	Background	Y
RFI-MW24-G-0507-S	2007-2Q	RFI-MW24	WG	5/7/07 10:30 AM	N	BERYLLIUM	5	U	N	Yes	ug/l	SW6010B	Background	Y

Older data excluded from background statistics.

CADMIUM

Well ID	Sample Date	Concentration (µg/L)	Qualifier	Concentration Used for Statistics(µg/L)	Rank	Comments
					1	
					2	
					3	
					4	
					5	
					6	
					7	
					8	
					9	
					10	
					11	
					12	
					13	Averaged with Duplicate Sample
					14	
					15	
					16	
					17	
					18	
					19	
					20	
					21	
					22	
					23	
					24	
					25	
					26	
					27	
					28	
					29	
					30	
					31	
					32	
					33	
					34	
					35	
					36	
					37	
					38	
					39	
					40	
					41	
					42	
					43	
					44	
					45	

STATISTICAL DATA SET		
Minimum	0	
Maximum	0	
2nd Maximum		
Mean	#DIV/0!	
Median	#NUM!	
Standard Deviation	#DIV/0!	
No. of samples used for statistics	0	Rank Place
90P		0.9
95P		0.95

RAW DATA SET		
Maximum (all data)	1.1J	Includes FD
Minimum	5U	Includes FD
No. of detects	6	
No. of samples used for statistics	0	OK
No. of total samples	38	Includes FD
Percent Detects	15.79%	

6:0:38

sys_sample_code	task_code	sys_loc_code	matrix_code	sample_date	sample_type_code	chemical_name	result_numeric	interpreted_qualifiers	detect_flag	reportable_result	result_unit	analytic_method	loc_name	validated_yn
WHI3-1S-G-1203-S 12/9/2003	LD	WHI3-1S	WG	12/9/03 12:00 AM	N	CADMIUM	0.00041		Y	Yes	mg/l	6010B	Background-Biddle Ave.	N
WHI-3-1S	2006-3Q	WHI3-1S	WG	8/15/06 11:38 AM	N	CADMIUM	0.64	J	Y	YES	ug/l	SW6010B	Background-Biddle Ave.	Y
P35N-G-0806-S	2006-3Q	P35N	WG	8/17/06 5:45 PM	N	CADMIUM	1.1	J+	Y	YES	ug/l	SW6010B	Background-Hospital	Y
RFI-MW-28-G-0806-S	2006-3Q	RFI-MW28	WG	8/23/06 2:30 PM	N	CADMIUM	0.5	J	Y	YES	ug/l	SW6010B	Background	Y
RFI-MW28-G-1106-S	2006-4Q	RFI-MW28	WG	11/8/06 8:35 AM	N	CADMIUM	0.98	J+	Y	YES	ug/l	SW6010B	Background	Y
RFI-MW28-G-0207-S	2007-1Q	RFI-MW28	WG	2/13/07 12:25 PM	N	CADMIUM	0.93	J	Y	YES	ug/l	SW6010B	Background	Y
WHI4-2S-G-0207-S	2007-1Q	WHI4-2S	WG	2/15/07 9:45 AM	N	CADMIUM	0.49	J	Y	YES	ug/l	SW6010B	Background	Y

Older data excluded from background statistics.

CHROMIUM

Well ID	Sample Date	Concentration (µg/L)	Qualifier	Concentration Used for Statistics(µg/L)	Rank	Comments
BG-MW-1	8/15/06 4:10 PM	1.7	J	1.7	1	
WHI4-2S	5/5/07 1:50 PM	2.2	J	2.2	2	
WHI3-3S	11/7/06 9:35 AM	2.4	J	2.4	3	
WHI4-2S	11/9/06 11:15 AM	2.4	J	2.4	4	
WHI3-3S	8/15/06 10:55 AM	2.6	J	2.6	5	
WHI3-3S	5/5/07 2:20 PM	2.6/4.6	J/J	3.6	6	Averaged with Duplicate Sample
WHI3-1S	2/14/07 4:40 PM	3.5/4.8	J/J	4.15	7	Averaged with Duplicate Sample
WHI2-3S	11/8/06 9:25 AM	10/3.4	U/J	4.2	8	Averaged with Duplicate Sample
WHI4-2S	8/15/06 9:40 AM	10	U	5	9	
WHI2-3S	8/15/06 2:30 PM	10	U	5	10	
RFI-MW28	11/8/06 8:35 AM	10	U	5	11	
WHI2-3S	2/13/07 3:20 PM	10	U	5.0	12	
WHI4-2S	2/15/07 9:45 AM	10	U	5	13	
P35NR	2/16/07 11:20 AM	10	U	5	14	
WHI2-3S	5/5/07 10:15 AM	10	U	5	15	
P35NR	5/5/07 12:40 PM	10	U	5	16	
RFI-MW28	5/7/07 9:20 AM	10/10	U/U	5	17	Averaged with Duplicate Sample
WHI3-1S	11/9/06 9:15 AM	5.3	J	5.3	18	
P35NR	11/7/06 2:50 PM	6.1	J	6.1	19	
BG-MW-1	11/9/06 10:10 AM	6.2	J	6.2	20	
WHI3-3S	2/12/07 4:40 PM	6.8	J	6.8	21	
WHI3-1S	5/5/07 2:45 PM	9.5	J	9.5	22	
BG-MW-1	5/5/07 1:00 PM	16.6/13.1		14.85	23	Averaged with Duplicate Sample
RFI-MW28	2/13/07 12:25 PM	15.2		15.2	24	
RFI-MW28	8/23/06 2:30 PM	10/29.4	UJ/J	17.2	25	Averaged with Duplicate Sample
P35N	8/17/06 5:45 PM	23.9		23.9	26	
BG-MW-1	2/16/07 9:40 AM	24.4		24.4	27	
RFI-MW24	2/13/07 4:30 PM	28.5		28.5	28	
RFI-MW24	11/8/06 9:15 AM	35.9		35.9	29	
WHI3-1S	8/15/06 11:38 AM	37.3		37.3	30	
RFI-MW24	5/7/07 10:30 AM	81.2		81.2	31	
RFI-MW24	8/23/06 3:40 PM	595	J	595	32	

STATISTICAL DATA SET		
Minimum	1.7	
Maximum	595	
2nd Maximum	81.2	
Mean	30.4875	
Median	5	
Standard Deviation	104.2361184	
No. of samples used for statistics	32	*Rank Place*
90P	36.88	*29.7*
95P	261.03	*31.35*

RAW DATA SET		
Maximum (all data)	595	Includes FD
Minimum	10U	Includes FD
No. of detects	27	
No. of samples used for statistics	32	OK
No. of total samples	38	Includes FD
Percent Detects	71.05%	

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sys_sample_code	task_code	sys_loc_code	matrix_code	sample_date	sample_type_code	chemical_name	result_numeric	interpreted_qualifiers	detect_flag	reportable_result	result_unit	analytic_method	loc_name	validated_yn
WHI3-1S-G-1203-S 12/9/2003	LD	WHI3-1S	WG	12/9/03 12:00 AM	N	CHROMIUM	0.01	J	Y	Yes	mg/l	6010B	Background-Biddle Ave.	N
BGMW-1-G-0905-S	2005-3Q	BG-MW-1	WG	9/13/05 4:50 PM	N	CHROMIUM	2.1	J+	Y	YES	ug/l	SW6010B	Background - Off Site on Alk	Y
WHI4-2S-G-0905-S	2005-3Q	WHI4-2S	WG	9/13/05 5:30 PM	N	CHROMIUM	7.2		Y	YES	ug/l	SW6010B	Background	Y
WHI3-3S-G-0905-S	2005-3Q	WHI3-3S	WG	9/13/05 6:20 PM	N	CHROMIUM	1.9	J+	Y	YES	ug/l	SW6010B	Background	Y
WHI3-1S-G-0905-S	2005-3Q	WHI2-3S	WG	9/14/05 7:30 AM	N	CHROMIUM	9.3		Y	YES	ug/l	SW6010B	Background	Y
RFIMW-24-G-0905-S	2005-3Q	RFI-MW24	WG	9/14/05 11:30 AM	N	CHROMIUM	951		Y	YES	ug/l	SW6010B	Background	Y
WHI-3-3S	2006-3Q	WHI3-3S	WG	8/15/06 10:55 AM	N	CHROMIUM	2.6	J	Y	YES	ug/l	SW6010B	Background	Y
WHI-3-1S	2006-3Q	WHI3-1S	WG	8/15/06 11:38 AM	N	CHROMIUM	37.3		Y	YES	ug/l	SW6010B	Background-Biddle Ave.	Y
BG-MW-1	2006-3Q	BG-MW-1	WG	8/15/06 4:10 PM	N	CHROMIUM	1.7	J	Y	YES	ug/l	SW6010B	Background - Off Site on Alk	Y
P35N-G-0806-S	2006-3Q	P35N	WG	8/17/06 5:45 PM	N	CHROMIUM	23.9		Y	YES	ug/l	SW6010B	Background-Hospital	Y
RFI-MW-28-G-0806-D	2006-3Q	RFI-MW28	WG	8/23/06 2:30 PM	FD	CHROMIUM	29.4	J	Y	YES	ug/l	SW6010B	Background	Y
RFI-MW-24-G-0806-S	2006-3Q	RFI-MW24	WG	8/23/06 3:40 PM	N	CHROMIUM	595	J	Y	YES	ug/l	SW6010B	Background	Y
WHI3-3S-G-1106-S	2006-4Q	WHI3-3S	WG	11/7/06 9:35 AM	N	CHROMIUM	2.4	J	Y	YES	ug/l	SW6010B	Background	Y
P35NR-G-1106-S	2006-4Q	P35NR	WG	11/7/06 2:50 PM	N	CHROMIUM	6.1	J	Y	YES	ug/l	SW6010B		Y
RFI-MW24-G-1106-S	2006-4Q	RFI-MW24	WG	11/8/06 9:15 AM	N	CHROMIUM	35.9		Y	YES	ug/l	SW6010B	Background	Y
WHI2-3S-G-1106-D	2006-4Q	WHI2-3S	WG	11/8/06 9:25 AM	FD	CHROMIUM	3.4	J	Y	YES	ug/l	SW6010B	Background	Y
WHI3-1S-G-1106-S	2006-4Q	WHI3-1S	WG	11/9/06 9:15 AM	N	CHROMIUM	5.3	J	Y	YES	ug/l	SW6010B	Background-Biddle Ave.	Y
BG-MW-1-G-1106-S	2006-4Q	BG-MW-1	WG	11/9/06 10:10 AM	N	CHROMIUM	6.2	J	Y	YES	ug/l	SW6010B	Background - Off Site on Alk	Y
WHI4-2S-G-1106-S	2006-4Q	WHI4-2S	WG	11/9/06 11:15 AM	N	CHROMIUM	2.4	J	Y	YES	ug/l	SW6010B	Background	Y
WHI3-3S-G-0207-S	2007-1Q	WHI3-3S	WG	2/12/07 4:40 PM	N	CHROMIUM	6.8	J	Y	YES	ug/l	SW6010B	Background	Y
RFI-MW28-G-0207-S	2007-1Q	RFI-MW28	WG	2/13/07 12:25 PM	N	CHROMIUM	15.2		Y	Yes	ug/l	SW6010B	Background	Y

RFI-MW24-G-0207-S	2007-1Q	RFI-MW24	WG	2/13/07 4:30 PM	N	CHROMIUM	28.5		Y	Yes	ug/l	SW6010B	Background	Y
WHI3-1S-G-0207-D	2007-1Q	WHI3-1S	WG	2/14/07 4:40 PM	FD	CHROMIUM	4.8	J	Y	YES	ug/l	SW6010B	Background-Biddle Ave.	Y
WHI3-1S-G-0207-S	2007-1Q	WHI3-1S	WG	2/14/07 4:40 PM	N	CHROMIUM	3.5	J	Y	YES	ug/l	SW6010B	Background-Biddle Ave.	Y
BG-MW-1-G-0207-S	2007-1Q	BG-MW-1	WG	2/16/07 9:40 AM	N	CHROMIUM	24.4		Y	Yes	ug/l	SW6010B	Background - Off Site on Alk	Y
BG-MW-1-G-0507-D	2007-2Q	BG-MW-1	WG	5/5/07 1:00 PM	FD	CHROMIUM	13.1		Y	Yes	ug/l	SW6010B	Background - Off Site on Alk	Y
BG-MW-1-G-0507-S	2007-2Q	BG-MW-1	WG	5/5/07 1:00 PM	N	CHROMIUM	16.6		Y	Yes	ug/l	SW6010B	Background - Off Site on Alk	Y
WHI4-2S-G-0507-S	2007-2Q	WHI4-2S	WG	5/5/07 1:50 PM	N	CHROMIUM	2.2	J	Y	YES	ug/l	SW6010B	Background	Y
WHI3-3S-G-0507-D	2007-2Q	WHI3-3S	WG	5/5/07 2:20 PM	FD	CHROMIUM	4.6	J	Y	YES	ug/l	SW6010B	Background	Y
WHI3-3S-G-0507-S	2007-2Q	WHI3-3S	WG	5/5/07 2:20 PM	N	CHROMIUM	2.6	J	Y	YES	ug/l	SW6010B	Background	Y
WHI3-1S-G-0507-S	2007-2Q	WHI3-1S	WG	5/5/07 2:45 PM	N	CHROMIUM	9.5	J	Y	YES	ug/l	SW6010B	Background-Biddle Ave.	Y
RFI-MW24-G-0507-S	2007-2Q	RFI-MW24	WG	5/7/07 10:30 AM	N	CHROMIUM	81.2		Y	Yes	ug/l	SW6010B	Background	Y

Older data excluded from background statistics.
Parent and duplicate samples.

COBALT

Well ID	Sample Date	Concentration (µg/L)	Qualifier	Concentration Used for Statistics(µg/L)	Rank	Comments
WHI2-3S	2/13/07 3:20 PM	1.2	J	1.2	1	
RFI-MW24	2/13/07 4:30 PM	1.3	J	1.3	2	
RFI-MW28	5/7/07 9:20 AM	1.3/50	J/UJ	1.3	3	Did not average with dup sample
WHI3-1S	2/14/07 4:40 PM	50/1.4	U/J	1.4	4	Used dup sample only
BG-MW-1	5/5/07 1:00 PM	1.5/1.4	J/J	1.45	5	Averaged with Duplicate Sample
WHI3-3S	2/12/07 4:40 PM	1.6	J	1.6	6	
WHI3-1S	5/5/07 2:45 PM	1.6	J	1.6	7	
WHI2-3S	11/8/06 9:25 AM	50/1.7	U/J	1.7	8	Used dup sample only
RFI-MW28	8/23/06 2:30 PM	1.6/1.9	J/J	1.75	9	Averaged with Duplicate Sample
WHI3-1S	11/9/06 9:15 AM	1.8	J	1.8	10	
RFI-MW28	11/8/06 8:35 AM	1.9	J+	1.9	11	
WHI2-3S	8/15/06 2:30 PM	2	J	2	12	
RFI-MW24	11/8/06 9:15 AM	2.1	J	2.1	13	
BG-MW-1	8/15/06 4:10 PM	2.2	J	2.2	14	
RFI-MW24	5/7/07 10:30 AM	2.3	J-	2.3	15	
RFI-MW24	8/23/06 3:40 PM	4.6	J	4.6	16	
P35N	8/17/06 5:45 PM	5.5	J+	5.5	17	
WHI3-1S	8/15/06 11:38 AM	8.1	J	8.1	18	
WHI4-2S	8/15/06 9:40 AM	50	U	-		Not used, half DL > max value
WHI3-3S	8/15/06 10:55 AM	50	U	-		Not used, half DL > max value
WHI3-3S	11/7/06 9:35 AM	50	U	-		Not used, half DL > max value
P35NR	11/7/06 2:50 PM	50	U	-		Not used, half DL > max value
BG-MW-1	11/9/06 10:10 AM	50	U	-		Not used, half DL > max value
WHI4-2S	11/9/06 11:15 AM	50	U	-		Not used, half DL > max value
RFI-MW28	2/13/07 12:25 PM	50	U	-		Not used, half DL > max value
WHI4-2S	2/15/07 9:45 AM	50	U	-		Not used, half DL > max value
BG-MW-1	2/16/07 9:40 AM	50	U	-		Not used, half DL > max value
P35NR	2/16/07 11:20 AM	50	U	-		Not used, half DL > max value
WHI2-3S	5/5/07 10:15 AM	50	U	-		Not used, half DL > max value
P35NR	5/5/07 12:40 PM	50	UJ	-		Not used, half DL > max value
WHI4-2S	5/5/07 1:50 PM	50	UJ	-		Not used, half DL > max value
WHI3-3S	5/5/07 2:20 PM	50/50	UJ/UJ	-		Not used, half DL > max value

STATISTICAL DATA SET		
Minimum	1.2	
Maximum	8.1	
2nd Maximum	5.5	
Mean	2.433333333	
Median	1.775	
Standard Deviation	1.81148298	
No. of samples used for statistics	18	*Rank Place*
90P	5.76	*17.1*
95P	8.1	*18.05*

RAW DATA SET		
Maximum (all data)	8.1J	Includes FD
Minimum	50U	Includes FD
No. of detects	20	
No. of samples used for statistics	18	OK
No. of total samples	38	Includes FD
Percent Detects	52.63%	

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sys_sample_code	task_code	sys_loc_code	matrix_code	sample_date	sample_type_code	chemical_name	result_numeric	interpreted_qualifiers	detect_flag	reportable_result	result_unit	analytic_method	loc_name	validated_yn
WHI3-1S-G-1203-S 12/9/2003	LD	WHI3-1S	WG	12/9/03 12:00 AM	N	COBALT	0.05	U	N	Yes	mg/l	6010B	Background-Biddle Ave.	N
WHI-4-2S	2006-3Q	WHI4-2S	WG	8/15/06 9:40 AM	N	COBALT	50	U	N	YES	ug/l	SW6010B	Background	Y
WHI-3-3S	2006-3Q	WHI3-3S	WG	8/15/06 10:55 AM	N	COBALT	50	U	N	YES	ug/l	SW6010B	Background	Y
WHI-3-1S	2006-3Q	WHI3-1S	WG	8/15/06 11:38 AM	N	COBALT	8.1	J	Y	YES	ug/l	SW6010B	Background-Biddle Ave.	Y
WHI-2-3S	2006-3Q	WHI2-3S	WG	8/15/06 2:30 PM	N	COBALT	2	J	Y	YES	ug/l	SW6010B	Background	Y
BG-MW-1	2006-3Q	BG-MW-1	WG	8/15/06 4:10 PM	N	COBALT	2.2	J	Y	YES	ug/l	SW6010B	Background - Off Site on Alk	Y
P35N-G-0806-S	2006-3Q	P35N	WG	8/17/06 5:45 PM	N	COBALT	5.5	J+	Y	YES	ug/l	SW6010B	Background-Hospital	Y
RFI-MW-28-G-0806-D	2006-3Q	RFI-MW28	WG	8/23/06 2:30 PM	FD	COBALT	1.9	J	Y	YES	ug/l	SW6010B	Background	Y
RFI-MW-28-G-0806-S	2006-3Q	RFI-MW28	WG	8/23/06 2:30 PM	N	COBALT	1.6	J	Y	YES	ug/l	SW6010B	Background	Y
RFI-MW-24-G-0806-S	2006-3Q	RFI-MW24	WG	8/23/06 3:40 PM	N	COBALT	4.6	J	Y	YES	ug/l	SW6010B	Background	Y
WHI3-3S-G-1106-S	2006-4Q	WHI3-3S	WG	11/7/06 9:35 AM	N	COBALT	50	U	N	YES	ug/l	SW6010B	Background	Y
P35NR-G-1106-S	2006-4Q	P35NR	WG	11/7/06 2:50 PM	N	COBALT	50	U	N	YES	ug/l	SW6010B		Y
RFI-MW28-G-1106-S	2006-4Q	RFI-MW28	WG	11/8/06 8:35 AM	N	COBALT	1.9	J+	Y	YES	ug/l	SW6010B	Background	Y
RFI-MW24-G-1106-S	2006-4Q	RFI-MW24	WG	11/8/06 9:15 AM	N	COBALT	2.1	J	Y	YES	ug/l	SW6010B	Background	Y
WHI2-3S-G-1106-D	2006-4Q	WHI2-3S	WG	11/8/06 9:25 AM	FD	COBALT	1.7	J	Y	YES	ug/l	SW6010B	Background	Y
WHI2-3S-G-1106-S	2006-4Q	WHI2-3S	WG	11/8/06 9:25 AM	N	COBALT	50	U	N	YES	ug/l	SW6010B	Background	Y
WHI3-1S-G-1106-S	2006-4Q	WHI3-1S	WG	11/9/06 9:15 AM	N	COBALT	1.8	J	Y	YES	ug/l	SW6010B	Background-Biddle Ave.	Y
BG-MW-1-G-1106-S	2006-4Q	BG-MW-1	WG	11/9/06 10:10 AM	N	COBALT	50	U	N	YES	ug/l	SW6010B	Background - Off Site on Alk	Y
WHI4-2S-G-1106-S	2006-4Q	WHI4-2S	WG	11/9/06 11:15 AM	N	COBALT	50	U	N	YES	ug/l	SW6010B	Background	Y
WHI3-3S-G-0207-S	2007-1Q	WHI3-3S	WG	2/12/07 4:40 PM	N	COBALT	1.6	J	Y	YES	ug/l	SW6010B	Background	Y
RFI-MW28-G-0207-S	2007-1Q	RFI-MW28	WG	2/13/07 12:25 PM	N	COBALT	50	U	N	YES	ug/l	SW6010B	Background	Y
WHI2-3S-G-0207-S	2007-1Q	WHI2-3S	WG	2/13/07 3:20 PM	N	COBALT	1.2	J	Y	YES	ug/l	SW6010B	Background	Y

RFI-MW24-G-0207-S	2007-1Q	RFI-MW24	WG	2/13/07 4:30 PM	N	COBALT	1.3	J	Y	YES	ug/l	SW6010B	Background	Y
WHI3-1S-G-0207-D	2007-1Q	WHI3-1S	WG	2/14/07 4:40 PM	FD	COBALT	1.4	J	Y	YES	ug/l	SW6010B	Background-Biddle Ave.	Y
WHI3-1S-G-0207-S	2007-1Q	WHI3-1S	WG	2/14/07 4:40 PM	N	COBALT	50	U	N	YES	ug/l	SW6010B	Background-Biddle Ave.	Y
WHI4-2S-G-0207-S	2007-1Q	WHI4-2S	WG	2/15/07 9:45 AM	N	COBALT	50	U	N	YES	ug/l	SW6010B	Background	Y
BG-MW-1-G-0207-S	2007-1Q	BG-MW-1	WG	2/16/07 9:40 AM	N	COBALT	50	U	N	YES	ug/l	SW6010B	Background - Off Site on Alk	Y
P35NR-G-0207-S	2007-1Q	P35NR	WG	2/16/07 11:20 AM	N	COBALT	50	U	N	YES	ug/l	SW6010B		Y
WHI2-3S-G-0507-S	2007-2Q	WHI2-3S	WG	5/5/07 10:15 AM	N	COBALT	50	U	N	Yes	ug/l	SW6010B	Background	Y
P35NR-G-0507-S	2007-2Q	P35NR	WG	5/5/07 12:40 PM	N	COBALT	50	UJ	N	YES	ug/l	SW6010B		Y
BG-MW-1-G-0507-D	2007-2Q	BG-MW-1	WG	5/5/07 1:00 PM	FD	COBALT	1.4	J	Y	YES	ug/l	SW6010B	Background - Off Site on Alk	Y
BG-MW-1-G-0507-S	2007-2Q	BG-MW-1	WG	5/5/07 1:00 PM	N	COBALT	1.5	J	Y	YES	ug/l	SW6010B	Background - Off Site on Alk	Y
WHI4-2S-G-0507-S	2007-2Q	WHI4-2S	WG	5/5/07 1:50 PM	N	COBALT	50	UJ	N	YES	ug/l	SW6010B	Background	Y
WHI3-3S-G-0507-D	2007-2Q	WHI3-3S	WG	5/5/07 2:20 PM	FD	COBALT	50	UJ	N	YES	ug/l	SW6010B	Background	Y
WHI3-3S-G-0507-S	2007-2Q	WHI3-3S	WG	5/5/07 2:20 PM	N	COBALT	50	UJ	N	YES	ug/l	SW6010B	Background	Y
WHI3-1S-G-0507-S	2007-2Q	WHI3-1S	WG	5/5/07 2:45 PM	N	COBALT	1.6	J	Y	YES	ug/l	SW6010B	Background-Biddle Ave.	Y
RFI-MW28-G-0507-D	2007-2Q	RFI-MW28	WG	5/7/07 9:20 AM	FD	COBALT	50	UJ	N	YES	ug/l	SW6010B	Background	Y
RFI-MW28-G-0507-S	2007-2Q	RFI-MW28	WG	5/7/07 9:20 AM	N	COBALT	1.3	J-	Y	YES	ug/l	SW6010B	Background	Y
RFI-MW24-G-0507-S	2007-2Q	RFI-MW24	WG	5/7/07 10:30 AM	N	COBALT	2.3	J-	Y	YES	ug/l	SW6010B	Background	Y

Older data excluded from background statistics.
Parent and duplicate samples.

COPPER

Well ID	Sample Date	Concentration (µg/L)	Qualifier	Concentration Used for Statistics(µg/L)	Rank	Comments
WHI4-2S	11/9/06 11:15 AM	1.9	J	1.9	1	
WHI4-2S	5/5/07 1:50 PM	2	J-	2	2	
WHI3-3S	5/5/07 2:20 PM	25/2.1	UJ/J-	2.1	3	Used dup value.
P35NR	2/16/07 11:20 AM	2.4	J	2.4	4	
RFI-MW28	8/23/06 2:30 PM	2.3/2.8	J/J	2.55	5	Averaged with Duplicate Sample
RFI-MW28	2/13/07 12:25 PM	2.9	J-	2.9	6	
RFI-MW24	2/13/07 4:30 PM	2.9	J-	2.9	7	
WHI3-1S	11/9/06 9:15 AM	3.2	J	3.2	8	
WHI2-3S	2/13/07 3:20 PM	3.8	J-	3.8	9	
RFI-MW24	5/7/07 10:30 AM	4.2	J-	4.2	10	
BG-MW-1	2/16/07 9:40 AM	4.7	J	4.7	11	
WHI3-1S	5/5/07 2:45 PM	6.6	J	6.6	12	
WHI3-3S	2/12/07 4:40 PM	7.4	J	7.4	13	
BG-MW-1	5/5/07 1:00 PM	11.6/5	J/J	8.3	14	Averaged with Duplicate Sample
P35NR	11/7/06 2:50 PM	10.5	J	10.5	15	
WHI4-2S	2/15/07 9:45 AM	11.3	J	11.3	16	
WHI4-2S	8/15/06 9:40 AM	25	U	12.5	17	
WHI3-3S	8/15/06 10:55 AM	25	U	12.5	18	
WHI2-3S	8/15/06 2:30 PM	25	U	12.5	19	
BG-MW-1	8/15/06 4:10 PM	25	U	12.5	20	
P35N	8/17/06 5:45 PM	25	U	12.5	21	
WHI3-3S	11/7/06 9:35 AM	25	U	12.5	22	
RFI-MW28	11/8/06 8:35 AM	25	U	12.5	23	
RFI-MW24	11/8/06 9:15 AM	25	U	12.5	24	
WHI2-3S	11/8/06 9:25 AM	25/25	U/U	12.5	25	Averaged with Duplicate Sample
BG-MW-1	11/9/06 10:10 AM	25	U	12.5	26	
WHI3-1S	2/14/07 4:40 PM	25/25	U/U	12.5	27	Averaged with Duplicate Sample
WHI2-3S	5/5/07 10:15 AM	25	U	12.5	28	
P35NR	5/5/07 12:40 PM	25	UJ	12.5	29	
RFI-MW28	5/7/07 9:20 AM	25/25	UJ/UJ	12.5	30	Averaged with Duplicate Sample
RFI-MW24	8/23/06 3:40 PM	21.7	J-	21.7	31	
WHI3-1S	8/15/06 11:38 AM	27.5		27.5	32	

STATISTICAL DATA SET		
Minimum	1.9	
Maximum	27.5	
2nd Maximum	21.7	
Mean	9.4046875	
Median	11.9	
Standard Deviation	5.943176616	
No. of samples used for statistics	32	*Rank Place*
90P	12.5	*29.7*
95P	23.73	*31.35*

RAW DATA SET		
Maximum (all data)	27.5	Includes FD
Minimum	25U	Includes FD
No. of detects	20	
No. of samples used for statistics	32	OK
No. of total samples	38	Includes FD
Percent Detects	52.63%	

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sys_sample_code	task_code	sys_loc_code	matrix_code	sample_date	sample_type_code	chemical_name	result_numeric	interpreted_qualifiers	detect_flag	reportable_result	result_unit	analytic_method	loc_name	validated_yn
WHI3-1S-G-1203-S 12/9/2003	LD	WHI3-1S	WG	12/9/03 12:00 AM	N	COPPER	0.011		Y	Yes	mg/l	6010B	Background-Biddle Ave.	N
WHI-4-2S	2006-3Q	WHI4-2S	WG	8/15/06 9:40 AM	N	COPPER	25	U	N	YES	ug/l	SW6010B	Background	Y
WHI-3-3S	2006-3Q	WHI3-3S	WG	8/15/06 10:55 AM	N	COPPER	25	U	N	YES	ug/l	SW6010B	Background	Y
WHI-3-1S	2006-3Q	WHI3-1S	WG	8/15/06 11:38 AM	N	COPPER	27.5		Y	YES	ug/l	SW6010B	Background-Biddle Ave.	Y
WHI-2-3S	2006-3Q	WHI2-3S	WG	8/15/06 2:30 PM	N	COPPER	25	U	N	YES	ug/l	SW6010B	Background	Y
BG-MW-1	2006-3Q	BG-MW-1	WG	8/15/06 4:10 PM	N	COPPER	25	U	N	YES	ug/l	SW6010B	Background - Off Site on Alk	Y
P35N-G-0806-S	2006-3Q	P35N	WG	8/17/06 5:45 PM	N	COPPER	25	U	N	YES	ug/l	SW6010B	Background-Hospital	Y
RFI-MW-28-G-0806-D	2006-3Q	RFI-MW28	WG	8/23/06 2:30 PM	FD	COPPER	2.8	J-	Y	YES	ug/l	SW6010B	Background	Y
RFI-MW-28-G-0806-S	2006-3Q	RFI-MW28	WG	8/23/06 2:30 PM	N	COPPER	2.3	J-	Y	YES	ug/l	SW6010B	Background	Y
RFI-MW-24-G-0806-S	2006-3Q	RFI-MW24	WG	8/23/06 3:40 PM	N	COPPER	21.7	J-	Y	YES	ug/l	SW6010B	Background	Y
WHI3-3S-G-1106-S	2006-4Q	WHI3-3S	WG	11/7/06 9:35 AM	N	COPPER	25	U	N	YES	ug/l	SW6010B	Background	Y
P35NR-G-1106-S	2006-4Q	P35NR	WG	11/7/06 2:50 PM	N	COPPER	10.5	J	Y	YES	ug/l	SW6010B		Y
RFI-MW28-G-1106-S	2006-4Q	RFI-MW28	WG	11/8/06 8:35 AM	N	COPPER	25	U	N	YES	ug/l	SW6010B	Background	Y
RFI-MW24-G-1106-S	2006-4Q	RFI-MW24	WG	11/8/06 9:15 AM	N	COPPER	25	U	N	YES	ug/l	SW6010B	Background	Y
WHI2-3S-G-1106-D	2006-4Q	WHI2-3S	WG	11/8/06 9:25 AM	FD	COPPER	25	U	N	YES	ug/l	SW6010B	Background	Y
WHI2-3S-G-1106-S	2006-4Q	WHI2-3S	WG	11/8/06 9:25 AM	N	COPPER	25	U	N	YES	ug/l	SW6010B	Background	Y
WHI3-1S-G-1106-S	2006-4Q	WHI3-1S	WG	11/9/06 9:15 AM	N	COPPER	3.2	J	Y	YES	ug/l	SW6010B	Background-Biddle Ave.	Y
BG-MW-1-G-1106-S	2006-4Q	BG-MW-1	WG	11/9/06 10:10 AM	N	COPPER	25	U	N	YES	ug/l	SW6010B	Background - Off Site on Alk	Y
WHI4-2S-G-1106-S	2006-4Q	WHI4-2S	WG	11/9/06 11:15 AM	N	COPPER	1.9	J	Y	YES	ug/l	SW6010B	Background	Y
WHI3-3S-G-0207-S	2007-1Q	WHI3-3S	WG	2/12/07 4:40 PM	N	COPPER	7.4	J	Y	YES	ug/l	SW6010B	Background	Y
RFI-MW28-G-0207-S	2007-1Q	RFI-MW28	WG	2/13/07 12:25 PM	N	COPPER	2.9	J-	Y	YES	ug/l	SW6010B	Background	Y
WHI2-3S-G-0207-S	2007-1Q	WHI2-3S	WG	2/13/07 3:20 PM	N	COPPER	3.8	J-	Y	YES	ug/l	SW6010B	Background	Y
RFI-MW24-G-0207-S	2007-1Q	RFI-MW24	WG	2/13/07 4:30 PM	N	COPPER	2.9	J-	Y	YES	ug/l	SW6010B	Background	Y

WHI3-1S-G-0207-D	2007-1Q	WHI3-1S	WG	2/14/07 4:40 PM	FD	COPPER	25	U	N	YES	ug/l	SW6010B	Background-Biddle Ave.	Y
WHI3-1S-G-0207-S	2007-1Q	WHI3-1S	WG	2/14/07 4:40 PM	N	COPPER	25	U	N	YES	ug/l	SW6010B	Background-Biddle Ave.	Y
WHI4-2S-G-0207-S	2007-1Q	WHI4-2S	WG	2/15/07 9:45 AM	N	COPPER	11.3	J	Y	YES	ug/l	SW6010B	Background	Y
BG-MW-1-G-0207-S	2007-1Q	BG-MW-1	WG	2/16/07 9:40 AM	N	COPPER	4.7	J	Y	YES	ug/l	SW6010B	Background - Off Site on Alk	Y
P35NR-G-0207-S	2007-1Q	P35NR	WG	2/16/07 11:20 AM	N	COPPER	2.4	J	Y	YES	ug/l	SW6010B		Y
WHI2-3S-G-0507-S	2007-2Q	WHI2-3S	WG	5/5/07 10:15 AM	N	COPPER	25	U	N	Yes	ug/l	SW6010B	Background	Y
P35NR-G-0507-S	2007-2Q	P35NR	WG	5/5/07 12:40 PM	N	COPPER	25	UJ	N	YES	ug/l	SW6010B		Y
BG-MW-1-G-0507-D	2007-2Q	BG-MW-1	WG	5/5/07 1:00 PM	FD	COPPER	5	J	Y	YES	ug/l	SW6010B	Background - Off Site on Alk	Y
BG-MW-1-G-0507-S	2007-2Q	BG-MW-1	WG	5/5/07 1:00 PM	N	COPPER	11.6	J	Y	YES	ug/l	SW6010B	Background - Off Site on Alk	Y
WHI4-2S-G-0507-S	2007-2Q	WHI4-2S	WG	5/5/07 1:50 PM	N	COPPER	2	J-	Y	YES	ug/l	SW6010B	Background	Y
WHI3-3S-G-0507-D	2007-2Q	WHI3-3S	WG	5/5/07 2:20 PM	FD	COPPER	2.1	J-	Y	YES	ug/l	SW6010B	Background	Y
WHI3-3S-G-0507-S	2007-2Q	WHI3-3S	WG	5/5/07 2:20 PM	N	COPPER	25	UJ	N	YES	ug/l	SW6010B	Background	Y
WHI3-1S-G-0507-S	2007-2Q	WHI3-1S	WG	5/5/07 2:45 PM	N	COPPER	6.6	J	Y	YES	ug/l	SW6010B	Background-Biddle Ave.	Y
RFI-MW28-G-0507-D	2007-2Q	RFI-MW28	WG	5/7/07 9:20 AM	FD	COPPER	25	UJ	N	YES	ug/l	SW6010B	Background	Y
RFI-MW28-G-0507-S	2007-2Q	RFI-MW28	WG	5/7/07 9:20 AM	N	COPPER	25	UJ	N	YES	ug/l	SW6010B	Background	Y
RFI-MW24-G-0507-S	2007-2Q	RFI-MW24	WG	5/7/07 10:30 AM	N	COPPER	4.2	J-	Y	YES	ug/l	SW6010B	Background	Y

Older data excluded from background statistics.
Parent and duplicate samples.

LEAD

Well ID	Sample Date	Concentration (µg/L)	Qualifier	Concentration Used for Statistics(µg/L)	Rank	Comments
WHI3-3S	8/15/06 10:55 AM	3	U	1.5	1	
WHI2-3S	8/15/06 2:30 PM	3	U	1.5	2	
BG-MW-1	8/15/06 4:10 PM	3	U	1.5	3	
RFI-MW28	8/23/06 2:30 PM	3/3	U/U	1.5	4	Averaged with Duplicate Sample
RFI-MW24	8/23/06 3:40 PM	3	U	1.5	5	
WHI3-3S	11/7/06 9:35 AM	3	U	1.5	6	
RFI-MW28	11/8/06 8:35 AM	3	UJ	1.5	7	
RFI-MW24	11/8/06 9:15 AM	3	U	1.5	8	
WHI2-3S	11/8/06 9:25 AM	3/3	U/U	1.5	9	Averaged with Duplicate Sample
BG-MW-1	11/9/06 10:10 AM	3	U	1.5	10	
RFI-MW28	2/13/07 12:25 PM	3	U	1.5	11	
WHI2-3S	2/13/07 3:20 PM	3	U	1.5	12	
RFI-MW24	2/13/07 4:30 PM	3	U	1.5	13	
BG-MW-1	2/16/07 9:40 AM	3	U	1.5	14	
P35NR	2/16/07 11:20 AM	3	U	1.5	15	
WHI2-3S	5/5/07 10:15 AM	3	U	1.5	16	
P35NR	5/5/07 12:40 PM	3	UJ	1.5	17	
WHI3-3S	5/5/07 2:20 PM	3/3	U/U	1.5	18	Averaged with Duplicate Sample
RFI-MW28	5/7/07 9:20 AM	3/3	UJ/UJ	1.5	19	Averaged with Duplicate Sample
RFI-MW24	5/7/07 10:30 AM	3	U	1.5	20	
WHI4-2S	11/9/06 11:15 AM	1.8	J	1.8	21	
P35NR	11/7/06 2:50 PM	2	J	2	22	
WHI3-3S	2/12/07 4:40 PM	2.4	J	2.4	23	
BG-MW-1	5/5/07 1:00 PM	3.7/3	/U	3.35	24	Averaged with Duplicate Sample
WHI4-2S	8/15/06 9:40 AM	3.5		3.5	25	
WHI3-1S	2/14/07 4:40 PM	2.8/5.1	J/	3.95	26	Averaged with Duplicate Sample
WHI3-1S	11/9/06 9:15 AM	8.2		8.2	27	
WHI4-2S	5/5/07 1:50 PM	13.7		13.7	28	
WHI3-1S	5/5/07 2:45 PM	14.9		14.9	29	
WHI3-1S	8/15/06 11:38 AM	42.5		42.5	30	
WHI4-2S	2/15/07 9:45 AM	56.1		56.1	31	
P35N	8/17/06 5:45 PM	65.2		65.2	32	

STATISTICAL DATA SET		
Minimum	1.5	
Maximum	65.2	
2nd Maximum	56.1	
Mean	7.7375	
Median	1.5	
Standard Deviation	15.92594758	
No. of samples used for statistics	32	*Rank Place*
90P	34.22	*29.7*
95P	59.285	*31.35*

RAW DATA SET		
Maximum (all data)	65.2	Includes FD
Minimum	3U	Includes FD
No. of detects	14	
No. of samples used for statistics	32	OK
No. of total samples	38	Includes FD
Percent Detects	36.84%	

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sys_sample_code	task_code	sys_loc_code	matrix_code	sample_date	sample_type_code	chemical_name	result_numeric	interpreted_qualifiers	detect_flag	reportable_result	result_unit	analytic_method	loc_name	validated_yn
WHI3-1S-G-1203-S 12/9/2003	LD	WHI3-1S	WG	12/9/03 12:00 AM	N	LEAD	0.023		Y	Yes	mg/l	6010B	Background-Biddle Ave.	N
BGMW-1-G-0905-S	2005-3Q	BG-MW-1	WG	9/13/05 4:50 PM	N	LEAD	3	U	N	YES	ug/l	SW6010B	Background - Off Site on Alk	Y
WHI4-2S-G-0905-S	2005-3Q	WHI4-2S	WG	9/13/05 5:30 PM	N	LEAD	83.5		Y	YES	ug/l	SW6010B	Background	Y
WHI3-3S-G-0905-S	2005-3Q	WHI3-3S	WG	9/13/05 6:20 PM	N	LEAD	3	U	N	YES	ug/l	SW6010B	Background	Y
WHI3-1S-G-0905-S	2005-3Q	WHI2-3S	WG	9/14/05 7:30 AM	N	LEAD	13.6		Y	YES	ug/l	SW6010B	Background	Y
WHI2-3S-G-0905-S	2005-3Q	WHI2-3S	WG	9/14/05 8:30 AM	N	LEAD	3	U	N	YES	ug/l	SW6010B	Background	Y
RFIMW-24-G-0905-S	2005-3Q	RFI-MW24	WG	9/14/05 11:30 AM	N	LEAD	3	U	N	YES	ug/l	SW6010B	Background	Y
WHI-4-2S	2006-3Q	WHI4-2S	WG	8/15/06 9:40 AM	N	LEAD	3.5		Y	YES	ug/l	SW6010B	Background	Y
WHI-3-3S	2006-3Q	WHI3-3S	WG	8/15/06 10:55 AM	N	LEAD	3	U	N	YES	ug/l	SW6010B	Background	Y
WHI-3-1S	2006-3Q	WHI3-1S	WG	8/15/06 11:38 AM	N	LEAD	42.5		Y	YES	ug/l	SW6010B	Background-Biddle Ave.	Y
WHI-2-3S	2006-3Q	WHI2-3S	WG	8/15/06 2:30 PM	N	LEAD	3	U	N	YES	ug/l	SW6010B	Background	Y
BG-MW-1	2006-3Q	BG-MW-1	WG	8/15/06 4:10 PM	N	LEAD	3	U	N	YES	ug/l	SW6010B	Background - Off Site on Alk	Y
P35N-G-0806-S	2006-3Q	P35N	WG	8/17/06 5:45 PM	N	LEAD	65.2		Y	YES	ug/l	SW6010B	Background-Hospital	Y
RFI-MW-28-G-0806-D	2006-3Q	RFI-MW28	WG	8/23/06 2:30 PM	FD	LEAD	3	U	N	YES	ug/l	SW6010B	Background	Y
RFI-MW-28-G-0806-S	2006-3Q	RFI-MW28	WG	8/23/06 2:30 PM	N	LEAD	3	U	N	YES	ug/l	SW6010B	Background	Y
RFI-MW-24-G-0806-S	2006-3Q	RFI-MW24	WG	8/23/06 3:40 PM	N	LEAD	3	U	N	YES	ug/l	SW6010B	Background	Y
WHI3-3S-G-1106-S	2006-4Q	WHI3-3S	WG	11/7/06 9:35 AM	N	LEAD	3	U	N	YES	ug/l	SW6010B	Background	Y
P35NR-G-1106-S	2006-4Q	P35NR	WG	11/7/06 2:50 PM	N	LEAD	2	J	Y	YES	ug/l	SW6010B		Y
RFI-MW28-G-1106-S	2006-4Q	RFI-MW28	WG	11/8/06 8:35 AM	N	LEAD	3	UJ	N	YES	ug/l	SW6010B	Background	Y
RFI-MW24-G-1106-S	2006-4Q	RFI-MW24	WG	11/8/06 9:15 AM	N	LEAD	3	U	N	YES	ug/l	SW6010B	Background	Y
WHI2-3S-G-1106-D	2006-4Q	WHI2-3S	WG	11/8/06 9:25 AM	FD	LEAD	3	U	N	YES	ug/l	SW6010B	Background	Y
WHI2-3S-G-1106-S	2006-4Q	WHI2-3S	WG	11/8/06 9:25 AM	N	LEAD	3	U	N	YES	ug/l	SW6010B	Background	Y

WHI3-1S-G-1106-S	2006-4Q	WHI3-1S	WG	11/9/06 9:15 AM	N	LEAD	8.2		Y	YES	ug/l	SW6010B	Background-Biddle Ave.	Y
BG-MW-1-G-1106-S	2006-4Q	BG-MW-1	WG	11/9/06 10:10 AM	N	LEAD	3	U	N	YES	ug/l	SW6010B	Background - Off Site on Alk	Y
WHI4-2S-G-1106-S	2006-4Q	WHI4-2S	WG	11/9/06 11:15 AM	N	LEAD	1.8	J	Y	YES	ug/l	SW6010B	Background	Y
WHI3-3S-G-0207-S	2007-1Q	WHI3-3S	WG	2/12/07 4:40 PM	N	LEAD	2.4	J	Y	YES	ug/l	SW6010B	Background	Y
RFI-MW28-G-0207-S	2007-1Q	RFI-MW28	WG	2/13/07 12:25 PM	N	LEAD	3	U	N	YES	ug/l	SW6010B	Background	Y
WHI2-3S-G-0207-S	2007-1Q	WHI2-3S	WG	2/13/07 3:20 PM	N	LEAD	3	U	N	YES	ug/l	SW6010B	Background	Y
RFI-MW24-G-0207-S	2007-1Q	RFI-MW24	WG	2/13/07 4:30 PM	N	LEAD	3	U	N	YES	ug/l	SW6010B	Background	Y
WHI3-1S-G-0207-D	2007-1Q	WHI3-1S	WG	2/14/07 4:40 PM	FD	LEAD	5.1		Y	Yes	ug/l	SW6010B	Background-Biddle Ave.	Y
WHI3-1S-G-0207-S	2007-1Q	WHI3-1S	WG	2/14/07 4:40 PM	N	LEAD	2.8	J	Y	YES	ug/l	SW6010B	Background-Biddle Ave.	Y
WHI4-2S-G-0207-S	2007-1Q	WHI4-2S	WG	2/15/07 9:45 AM	N	LEAD	56.1		Y	Yes	ug/l	SW6010B	Background	Y
BG-MW-1-G-0207-S	2007-1Q	BG-MW-1	WG	2/16/07 9:40 AM	N	LEAD	3	U	N	YES	ug/l	SW6010B	Background - Off Site on Alk	Y
P35NR-G-0207-S	2007-1Q	P35NR	WG	2/16/07 11:20 AM	N	LEAD	3	U	N	YES	ug/l	SW6010B		Y
WHI2-3S-G-0507-S	2007-2Q	WHI2-3S	WG	5/5/07 10:15 AM	N	LEAD	3	U	N	Yes	ug/l	SW6010B	Background	Y
P35NR-G-0507-S	2007-2Q	P35NR	WG	5/5/07 12:40 PM	N	LEAD	3	UJ	N	YES	ug/l	SW6010B		Y
BG-MW-1-G-0507-D	2007-2Q	BG-MW-1	WG	5/5/07 1:00 PM	FD	LEAD	3	U	N	Yes	ug/l	SW6010B	Background - Off Site on Alk	Y
BG-MW-1-G-0507-S	2007-2Q	BG-MW-1	WG	5/5/07 1:00 PM	N	LEAD	3.7		Y	Yes	ug/l	SW6010B	Background - Off Site on Alk	Y
WHI4-2S-G-0507-S	2007-2Q	WHI4-2S	WG	5/5/07 1:50 PM	N	LEAD	13.7		Y	Yes	ug/l	SW6010B	Background	Y
WHI3-3S-G-0507-D	2007-2Q	WHI3-3S	WG	5/5/07 2:20 PM	FD	LEAD	3	U	N	Yes	ug/l	SW6010B	Background	Y
WHI3-3S-G-0507-S	2007-2Q	WHI3-3S	WG	5/5/07 2:20 PM	N	LEAD	3	U	N	Yes	ug/l	SW6010B	Background	Y
WHI3-1S-G-0507-S	2007-2Q	WHI3-1S	WG	5/5/07 2:45 PM	N	LEAD	14.9		Y	Yes	ug/l	SW6010B	Background-Biddle Ave.	Y
RFI-MW28-G-0507-D	2007-2Q	RFI-MW28	WG	5/7/07 9:20 AM	FD	LEAD	3	UJ	N	YES	ug/l	SW6010B	Background	Y
RFI-MW28-G-0507-S	2007-2Q	RFI-MW28	WG	5/7/07 9:20 AM	N	LEAD	3	UJ	N	YES	ug/l	SW6010B	Background	Y
RFI-MW24-G-0507-S	2007-2Q	RFI-MW24	WG	5/7/07 10:30 AM	N	LEAD	3	U	N	Yes	ug/l	SW6010B	Background	Y

Older data excluded from background statistics.
Parent and duplicate samples.

MERCURY

Well ID	Sample Date	Concentration (µg/L)	Qualifier	Concentration Used for Statistics(µg/L)	Rank	Comments	Log Transform
WHI3-3S	8/28/06 6:18 PM	0.5	UJ	0.25	1	Averaged with Duplicate Sample	-1.38629
WHI3-3S	11/7/06 9:35 AM	0.74	U	0.37	2		-0.99425
RFI-MW28	8/29/06 11:17 AM	0.93	UJ	0.465	3		-0.76572
WHI2-3S	8/28/06 5:10 PM	1.1	UJ	0.55	4		-0.59784
RFI-MW24	8/29/06 9:25 AM	1.2	UJ	0.6	5		-0.51083
WHI3-3S	2/12/07 4:40 PM	0.62		0.62	6		-0.47804
P35NR	5/5/07 12:40 PM	1	J	1	7		0
RFI-MW24	11/8/06 9:15 AM	1.2		1.2	8		0.182322
WHI2-3S	2/13/07 3:20 PM	1.2		1.2	9		0.182322
RFI-MW28	2/13/07 12:25 PM	1.3		1.3	10		0.262364
WHI2-3S	5/5/07 10:15 AM	1.3	J	1.3	11		0.262364
WHI3-3S	5/5/07 2:20 PM	1.3/1.3		1.3	12	Averaged with Duplicate Sample	0.262364
RFI-MW28	11/8/06 8:35 AM	1.5	J-	1.5	13		0.405465
RFI-MW24	2/13/07 4:30 PM	1.6		1.6	14		0.470004
WHI2-3S	11/8/06 9:25 AM	1.9/1.8	J/J	1.85	15	Averaged with Duplicate Sample	0.615186
RFI-MW24	5/7/07 10:30 AM	2	J	2	16		0.693147
RFI-MW28	5/7/07 9:20 AM	1.6/2.6	J/J	2.1	17	Averaged with Duplicate Sample	0.741937
P35NR	2/16/07 11:20 AM	5.3	UJ	2.65	18		0.97456
BG-MW-1	11/9/06 10:10 AM	3.3	J-	3.3	19		1.193922
P35NR	11/7/06 2:50 PM	3.6		3.6	20		1.280934
WHI3-1S	5/5/07 2:45 PM	5.9	J	5.9	21		1.774952
BG-MW-1	8/29/06 4:35 PM	13.2	J	13.2	22		2.580217
BG-MW-1	5/5/07 1:00 PM	18.4/9.1	J/J	13.75	23	Averaged with Duplicate Sample	2.621039
BG-MW-1	2/16/07 9:40 AM	15.4	J	15.4	24		2.734368
WHI4-2S	5/5/07 1:50 PM	17.7	J	17.7	25		2.873565
WHI4-2S	11/9/06 11:15 AM	19.2	J-	19.2	26		2.95491
WHI3-1S	2/14/07 4:40 PM	40.2/12.2	J/J	26.2	27	Averaged with Duplicate Sample	3.265759
WHI3-1S	11/9/06 9:15 AM	31.9	J-	31.9	28		3.462606
WHI3-1S	8/29/06 1:30 PM	40.4	J	40.4	29		3.69883
WHI4-2S	8/29/06 3:30 PM	23.4/112	J/J	67.7	30	Averaged with Duplicate Sample	4.215086
WHI4-2S	2/15/07 9:45 AM	196	J	196	31		5.278115
							1.23398 mean
							1.696353 std dev
							6.323039 mean+3SD
							557.2637 back xform
BG-MW-1	5/5/07 10:35 AM	7.4	J	7.4	23	Hydrosleeve Sample, not used	
RFI-MW28	5/7/07 8:20 AM	8.8	J	8.8	24	Hydrosleeve Sample, not used	
RFI-MW24	5/7/07 10:00 AM	5	J	5	21	Hydrosleeve Sample, not used	

STATISTICAL DATA SET			
Minimum	0.25		
Maximum	196		
2nd Maximum	67.7		
Mean	15.35822581		
Median	2		
Standard Deviation	36.6962768		
No. of samples used for statistics	31	*Rank Place*	
90P	38.7	*28.8*	Matches EP spreadsheet
95P	119.02	*30.4*	Matches EP spreadsheet

RAW DATA SET		
Maximum (all data)	196J	Includes FD
Minimum	0.5UJ	Includes FD
No. of detects	34	
No. of samples used for statistics	31	OK
No. of total samples	40	Includes FD
Percent Detects	85.00%	

34:31:40

sys_sample_code	task_code	sys_loc_code	matrix_code	sample_date	sample_type_code	chemical_name	result_numeric	interpreted_qualifiers	detect_flag	reportable_result	result_unit	analytic_method	loc_name	validated_yn
RFIMW-28-G-1203-D 12/4/2003	LD	RFI-MW28	WG	12/4/03 12:00 AM	FD	MERCURY	3.13	J	Y	Yes	ng/l	FGS-069	Background	N
RFIMW-28-G-1203-S 12/4/2003	LD	RFI-MW28	WG	12/4/03 12:00 AM	N	MERCURY	4.31	J	Y	Yes	ng/l	FGS-069	Background	N
WHI3-1S-G-1203-S 12/9/2003	LD	WHI3-1S	WG	12/9/03 12:00 AM	N	MERCURY	10.5	J	Y	Yes	ng/l	FGS-069	Background-Biddle Ave.	N
WHI4-2S-G-1203-S 12/9/2003	LD	WHI4-2S	WG	12/9/03 12:00 AM	N	MERCURY	767	J	Y	Yes	ng/l	FGS-069	Background	N
WHI-2-3S-G-0806R-S	2006-3Q	WHI2-3S	WG	8/28/06 5:10 PM	N	MERCURY	1.1	UJ	N	YES	ng/l	E1631	Background	Y
WHI-3-3S-G-0806R-S	2006-3Q	WHI3-3S	WG	8/28/06 6:18 PM	N	MERCURY	0.5	UJ	N	YES	ng/l	E1631	Background	Y
RFI-MW-24-G-0806R-S	2006-3Q	RFI-MW24	WG	8/29/06 9:25 AM	N	MERCURY	1.2	UJ	N	YES	ng/l	E1631	Background	Y
RFI-MW-28-G-0806R-S	2006-3Q	RFI-MW28	WG	8/29/06 11:17 AM	N	MERCURY	0.93	UJ	N	YES	ng/l	E1631	Background	Y
WHI-3-1S-G-0806R-S	2006-3Q	WHI3-1S	WG	8/29/06 1:30 PM	N	MERCURY	40.4	J	Y	YES	ng/l	E1631	Background-Biddle Ave.	Y
WHI-4-2S-G-0806R-D	2006-3Q	WHI4-2S	WG	8/29/06 3:30 PM	FD	MERCURY	112	J	Y	YES	ng/l	E1631	Background	Y
WHI-4-2S-G-0806R-S	2006-3Q	WHI4-2S	WG	8/29/06 3:30 PM	N	MERCURY	23.4	J	Y	YES	ng/l	E1631	Background	Y
BG-MW-1-G-0806R-S	2006-3Q	BG-MW-1	WG	8/29/06 4:35 PM	N	MERCURY	13.2	J	Y	YES	ng/l	E1631	Background - Off Site on Alk	Y
WHI3-3S-G-1106-S	2006-4Q	WHI3-3S	WG	11/7/06 9:35 AM	N	MERCURY	0.74	U	N	YES	ng/l	E1631	Background	Y
P35NR-G-1106-S	2006-4Q	P35NR	WG	11/7/06 2:50 PM	N	MERCURY	3.6		Y	YES	ng/l	E1631		Y
RFI-MW28-G-1106-S	2006-4Q	RFI-MW28	WG	11/8/06 8:35 AM	N	MERCURY	1.5	J-	Y	YES	ng/l	E1631	Background	Y
RFI-MW24-G-1106-S	2006-4Q	RFI-MW24	WG	11/8/06 9:15 AM	N	MERCURY	1.2		Y	YES	ng/l	E1631	Background	Y
WHI2-3S-G-1106-D	2006-4Q	WHI2-3S	WG	11/8/06 9:25 AM	FD	MERCURY	1.8	J-	Y	YES	ng/l	E1631	Background	Y
WHI2-3S-G-1106-S	2006-4Q	WHI2-3S	WG	11/8/06 9:25 AM	N	MERCURY	1.9	J-	Y	YES	ng/l	E1631	Background	Y
WHI3-1S-G-1106-S	2006-4Q	WHI3-1S	WG	11/9/06 9:15 AM	N	MERCURY	31.9	J-	Y	YES	ng/l	E1631	Background-Biddle Ave.	Y
BG-MW-1-G-1106-S	2006-4Q	BG-MW-1	WG	11/9/06 10:10 AM	N	MERCURY	3.3	J-	Y	YES	ng/l	E1631	Background - Off Site on Alk	Y
WHI4-2S-G-1106-S	2006-4Q	WHI4-2S	WG	11/9/06 11:15 AM	N	MERCURY	19.2	J-	Y	YES	ng/l	E1631	Background	Y
WHI3-3S-G-0207-S	2007-1Q	WHI3-3S	WG	2/12/07 4:40 PM	N	MERCURY	0.62		Y	Yes	ng/l	E1631	Background	Y
RFI-MW28-G-0207-S	2007-1Q	RFI-MW28	WG	2/13/07 12:25 PM	N	MERCURY	1.3		Y	Yes	ng/l	E1631	Background	Y

WHI2-3S-G-0207-S	2007-1Q	WHI2-3S	WG	2/13/07 3:20 PM	N	MERCURY	1.2		Y	Yes	ng/l	E1631	Background	Y
RFI-MW24-G-0207-S	2007-1Q	RFI-MW24	WG	2/13/07 4:30 PM	N	MERCURY	1.6		Y	Yes	ng/l	E1631	Background	Y
WHI3-1S-G-0207-D	2007-1Q	WHI3-1S	WG	2/14/07 4:40 PM	FD	MERCURY	12.2	J	Y	YES	ng/l	E1631	Background-Biddle Ave.	Y
WHI3-1S-G-0207-S	2007-1Q	WHI3-1S	WG	2/14/07 4:40 PM	N	MERCURY	40.2	J	Y	YES	ng/l	E1631	Background-Biddle Ave.	Y
WHI4-2S-G-0207-S	2007-1Q	WHI4-2S	WG	2/15/07 9:45 AM	N	MERCURY	196	J	Y	YES	ng/l	E1631	Background	Y
BG-MW-1-G-0207-S	2007-1Q	BG-MW-1	WG	2/16/07 9:40 AM	N	MERCURY	15.4	J	Y	YES	ng/l	E1631	Background - Off Site on Alk	Y
P35NR-G-0207-S	2007-1Q	P35NR	WG	2/16/07 11:20 AM	N	MERCURY	5.3	UJ	N	YES	ng/l	E1631		Y
WHI2-3S-G-0507-S	2007-2Q	WHI2-3S	WG	5/5/07 10:15 AM	N	MERCURY	1.3	J	Y	YES	ng/l	E1631	Background	Y
BG-MW-1-G-0507-HS	2007-2Q	BG-MW-1	WG	5/5/07 10:35 AM	N	MERCURY	7.4	J	Y	YES	ng/l	E1631	Background - Off Site on Alk	Y
P35NR-G-0507-S	2007-2Q	P35NR	WG	5/5/07 12:40 PM	N	MERCURY	1	J	Y	YES	ng/l	E1631		Y
BG-MW-1-G-0507-D	2007-2Q	BG-MW-1	WG	5/5/07 1:00 PM	FD	MERCURY	9.1	J	Y	YES	ng/l	E1631	Background - Off Site on Alk	Y
BG-MW-1-G-0507-S	2007-2Q	BG-MW-1	WG	5/5/07 1:00 PM	N	MERCURY	18.4	J	Y	YES	ng/l	E1631	Background - Off Site on Alk	Y
WHI4-2S-G-0507-S	2007-2Q	WHI4-2S	WG	5/5/07 1:50 PM	N	MERCURY	17.7	J	Y	YES	ng/l	E1631	Background	Y
WHI3-3S-G-0507-D	2007-2Q	WHI3-3S	WG	5/5/07 2:20 PM	FD	MERCURY	1.3		Y	Yes	ng/l	E1631	Background	Y
WHI3-3S-G-0507-S	2007-2Q	WHI3-3S	WG	5/5/07 2:20 PM	N	MERCURY	1.3		Y	Yes	ng/l	E1631	Background	Y
WHI3-1S-G-0507-S	2007-2Q	WHI3-1S	WG	5/5/07 2:45 PM	N	MERCURY	5.9	J	Y	YES	ng/l	E1631	Background-Biddle Ave.	Y
RFI-MW28-G-0507-HS	2007-2Q	RFI-MW28	WG	5/7/07 8:20 AM	N	MERCURY	8.8	J	Y	YES	ng/l	E1631	Background	Y
RFI-MW28-G-0507-D	2007-2Q	RFI-MW28	WG	5/7/07 9:20 AM	FD	MERCURY	2.6	J	Y	YES	ng/l	E1631	Background	Y
RFI-MW28-G-0507-S	2007-2Q	RFI-MW28	WG	5/7/07 9:20 AM	N	MERCURY	1.6	J	Y	YES	ng/l	E1631	Background	Y
RFI-MW24-G-0507-HS	2007-2Q	RFI-MW24	WG	5/7/07 10:00 AM	N	MERCURY	5	J	Y	YES	ng/l	E1631	Background	Y
RFI-MW24-G-0507-S	2007-2Q	RFI-MW24	WG	5/7/07 10:30 AM	N	MERCURY	2	J	Y	YES	ng/l	E1631	Background	Y

Hydrosleeve sample or older data, not used in stats.
Parent and duplicate samples.

NICKEL

Well ID	Sample Date	Concentration (µg/L)	Qualifier	Concentration Used for Statistics(µg/L)	Rank	Comments
WHI3-3S	8/15/06 10:55 AM	1.7	J	1.7	1	
WHI3-3S	11/7/06 9:35 AM	2.1	J	2.1	2	
WHI4-2S	5/5/07 1:50 PM	2.1	J	2.1	3	
WHI2-3S	5/5/07 10:15 AM	2.9	J	2.9	4	
WHI3-3S	5/5/07 2:20 PM	2.1/3.7	J/J	2.9	5	Averaged with Duplicate Sample
WHI4-2S	8/15/06 9:40 AM	3.1	J	3.1	6	
RFI-MW28	5/7/07 9:20 AM	4/2.2	J/J	3.1	7	Averaged with Duplicate Sample
WHI4-2S	11/9/06 11:15 AM	3.4	J	3.4	8	
RFI-MW28	11/8/06 8:35 AM	4.2	J+	4.2	9	
WHI3-1S	2/14/07 4:40 PM	3.8/4.9	J/J	4.35	10	Averaged with Duplicate Sample
WHI2-3S	2/13/07 3:20 PM	4.5	J	4.5	11	
WHI2-3S	11/8/06 9:25 AM	3.9/5.5	J/J	4.7	12	Averaged with Duplicate Sample
WHI2-3S	8/15/06 2:30 PM	4.8	J	4.8	13	
WHI3-3S	2/12/07 4:40 PM	5.6	J	5.6	14	
WHI3-1S	11/9/06 9:15 AM	7.1	J	7.1	15	
WHI3-1S	5/5/07 2:45 PM	7.9	J	7.9	16	
BG-MW-1	11/9/06 10:10 AM	8.2	J	8.2	17	
P35NR	5/5/07 12:40 PM	9.5	J+	9.5	18	
RFI-MW28	8/23/06 2:30 PM	2.6/18.6	J/J	10.6	19	Averaged with Duplicate Sample
RFI-MW28	2/13/07 12:25 PM	10.9	J	10.9	20	
BG-MW-1	8/15/06 4:10 PM	12	J	12	21	
BG-MW-1	5/5/07 1:00 PM	16.9/8	J/J	12.45	22	Averaged with Duplicate Sample
RFI-MW24	2/13/07 4:30 PM	18.4	J	18.4	23	
WHI4-2S	2/15/07 9:45 AM	40	U	20	24	
BG-MW-1	2/16/07 9:40 AM	40	U	20	25	
P35NR	2/16/07 11:20 AM	40	U	20	26	
P35NR	11/7/06 2:50 PM	23.3	J	23.3	27	
WHI3-1S	8/15/06 11:38 AM	26.4	J	26.4	28	
P35N	8/17/06 5:45 PM	32.5	J+	32.5	29	
RFI-MW24	11/8/06 9:15 AM	48.4		48.4	30	
RFI-MW24	5/7/07 10:30 AM	55.1		55.1	31	
RFI-MW24	8/23/06 3:40 PM	162	J	162	32	

STATISTICAL DATA SET		
Minimum	1.7	
Maximum	162	
2nd Maximum	55.1	
Mean	17.31875	
Median	8.05	
Standard Deviation	29.4313163	
No. of samples used for statistics	32	*Rank Place*
90P	43.63	*29.7*
95P	92.515	*31.35*

RAW DATA SET		
Maximum (all data)	162J	Includes FD
Minimum	40U/1.7J	Includes FD
No. of detects	35	
No. of samples used for statistics	32	OK
No. of total samples	38	Includes FD
Percent Detects	92.11%	

35:32:38

sys_sample_code	task_code	sys_loc_code	matrix_code	sample_date	sample_type_code	chemical_name	result_numeric	interpreted_qualifiers	detect_flag	reportable_result	result_unit	analytic_method	loc_name	validated_yn
WHI3-1S-G-1203-S 12/9/2003	LD	WHI3-1S	WG	12/9/03 12:00 AM	N	NICKEL	0.0092	J	Y	Yes	mg/l	6010B	Background-Biddle Ave.	N
BGMW-1-G-0905-S	2005-3Q	BG-MW-1	WG	9/13/05 4:50 PM	N	NICKEL	11.7	J+	Y	YES	ug/l	SW6010B	Background - Off Site on Alk	Y
WHI4-2S-G-0905-S	2005-3Q	WHI4-2S	WG	9/13/05 5:30 PM	N	NICKEL	5.7	U	N	YES	ug/l	SW6010B	Background	Y
WHI3-3S-G-0905-S	2005-3Q	WHI3-3S	WG	9/13/05 6:20 PM	N	NICKEL	2.9	U	N	YES	ug/l	SW6010B	Background	Y
WHI3-1S-G-0905-S	2005-3Q	WHI2-3S	WG	9/14/05 7:30 AM	N	NICKEL	6.9	U	N	YES	ug/l	SW6010B	Background	Y
WHI2-3S-G-0905-S	2005-3Q	WHI2-3S	WG	9/14/05 8:30 AM	N	NICKEL	5.1	U	N	YES	ug/l	SW6010B	Background	Y
RFIMW-24-G-0905-S	2005-3Q	RFI-MW24	WG	9/14/05 11:30 AM	N	NICKEL	112		Y	YES	ug/l	SW6010B	Background	Y
WHI-4-2S	2006-3Q	WHI4-2S	WG	8/15/06 9:40 AM	N	NICKEL	3.1	J	Y	YES	ug/l	SW6010B	Background	Y
WHI-3-3S	2006-3Q	WHI3-3S	WG	8/15/06 10:55 AM	N	NICKEL	1.7	J	Y	YES	ug/l	SW6010B	Background	Y
WHI-3-1S	2006-3Q	WHI3-1S	WG	8/15/06 11:38 AM	N	NICKEL	26.4	J	Y	YES	ug/l	SW6010B	Background-Biddle Ave.	Y
WHI-2-3S	2006-3Q	WHI2-3S	WG	8/15/06 2:30 PM	N	NICKEL	4.8	J	Y	YES	ug/l	SW6010B	Background	Y
BG-MW-1	2006-3Q	BG-MW-1	WG	8/15/06 4:10 PM	N	NICKEL	12	J	Y	YES	ug/l	SW6010B	Background - Off Site on Alk	Y
P35N-G-0806-S	2006-3Q	P35N	WG	8/17/06 5:45 PM	N	NICKEL	32.5	J+	Y	YES	ug/l	SW6010B	Background-Hospital	Y
RFI-MW-28-G-0806-D	2006-3Q	RFI-MW28	WG	8/23/06 2:30 PM	FD	NICKEL	18.6	J	Y	YES	ug/l	SW6010B	Background	Y
RFI-MW-28-G-0806-S	2006-3Q	RFI-MW28	WG	8/23/06 2:30 PM	N	NICKEL	2.6	J	Y	YES	ug/l	SW6010B	Background	Y
RFI-MW-24-G-0806-S	2006-3Q	RFI-MW24	WG	8/23/06 3:40 PM	N	NICKEL	162	J	Y	YES	ug/l	SW6010B	Background	Y
WHI3-3S-G-1106-S	2006-4Q	WHI3-3S	WG	11/7/06 9:35 AM	N	NICKEL	2.1	J	Y	YES	ug/l	SW6010B	Background	Y
P35NR-G-1106-S	2006-4Q	P35NR	WG	11/7/06 2:50 PM	N	NICKEL	23.3	J	Y	YES	ug/l	SW6010B		Y
RFI-MW28-G-1106-S	2006-4Q	RFI-MW28	WG	11/8/06 8:35 AM	N	NICKEL	4.2	J+	Y	YES	ug/l	SW6010B	Background	Y
RFI-MW24-G-1106-S	2006-4Q	RFI-MW24	WG	11/8/06 9:15 AM	N	NICKEL	48.4		Y	YES	ug/l	SW6010B	Background	Y
WHI2-3S-G-1106-D	2006-4Q	WHI2-3S	WG	11/8/06 9:25 AM	FD	NICKEL	5.5	J	Y	YES	ug/l	SW6010B	Background	Y
WHI2-3S-G-1106-S	2006-4Q	WHI2-3S	WG	11/8/06 9:25 AM	N	NICKEL	3.9	J	Y	YES	ug/l	SW6010B	Background	Y

WHI3-1S-G-1106-S	2006-4Q	WHI3-1S	WG	11/9/06 9:15 AM	N	NICKEL	7.1	J	Y	YES	ug/l	SW6010B	Background-Biddle Ave.	Y
BG-MW-1-G-1106-S	2006-4Q	BG-MW-1	WG	11/9/06 10:10 AM	N	NICKEL	8.2	J	Y	YES	ug/l	SW6010B	Background - Off Site on Alk	Y
WHI4-2S-G-1106-S	2006-4Q	WHI4-2S	WG	11/9/06 11:15 AM	N	NICKEL	3.4	J	Y	YES	ug/l	SW6010B	Background	Y
WHI3-3S-G-0207-S	2007-1Q	WHI3-3S	WG	2/12/07 4:40 PM	N	NICKEL	5.6	J	Y	YES	ug/l	SW6010B	Background	Y
RFI-MW28-G-0207-S	2007-1Q	RFI-MW28	WG	2/13/07 12:25 PM	N	NICKEL	10.9	J	Y	YES	ug/l	SW6010B	Background	Y
WHI2-3S-G-0207-S	2007-1Q	WHI2-3S	WG	2/13/07 3:20 PM	N	NICKEL	4.5	J	Y	YES	ug/l	SW6010B	Background	Y
RFI-MW24-G-0207-S	2007-1Q	RFI-MW24	WG	2/13/07 4:30 PM	N	NICKEL	18.4	J	Y	YES	ug/l	SW6010B	Background	Y
WHI3-1S-G-0207-D	2007-1Q	WHI3-1S	WG	2/14/07 4:40 PM	FD	NICKEL	4.9	J	Y	YES	ug/l	SW6010B	Background-Biddle Ave.	Y
WHI3-1S-G-0207-S	2007-1Q	WHI3-1S	WG	2/14/07 4:40 PM	N	NICKEL	3.8	J	Y	YES	ug/l	SW6010B	Background-Biddle Ave.	Y
WHI4-2S-G-0207-S	2007-1Q	WHI4-2S	WG	2/15/07 9:45 AM	N	NICKEL	40	U	N	YES	ug/l	SW6010B	Background	Y
BG-MW-1-G-0207-S	2007-1Q	BG-MW-1	WG	2/16/07 9:40 AM	N	NICKEL	40	U	N	YES	ug/l	SW6010B	Background - Off Site on Alk	Y
P35NR-G-0207-S	2007-1Q	P35NR	WG	2/16/07 11:20 AM	N	NICKEL	40	U	N	YES	ug/l	SW6010B		Y
WHI2-3S-G-0507-S	2007-2Q	WHI2-3S	WG	5/5/07 10:15 AM	N	NICKEL	2.9	J	Y	YES	ug/l	SW6010B	Background	Y
P35NR-G-0507-S	2007-2Q	P35NR	WG	5/5/07 12:40 PM	N	NICKEL	9.5	J+	Y	YES	ug/l	SW6010B		Y
BG-MW-1-G-0507-D	2007-2Q	BG-MW-1	WG	5/5/07 1:00 PM	FD	NICKEL	8	J	Y	YES	ug/l	SW6010B	Background - Off Site on Alk	Y
BG-MW-1-G-0507-S	2007-2Q	BG-MW-1	WG	5/5/07 1:00 PM	N	NICKEL	16.9	J	Y	YES	ug/l	SW6010B	Background - Off Site on Alk	Y
WHI4-2S-G-0507-S	2007-2Q	WHI4-2S	WG	5/5/07 1:50 PM	N	NICKEL	2.1	J	Y	YES	ug/l	SW6010B	Background	Y
WHI3-3S-G-0507-D	2007-2Q	WHI3-3S	WG	5/5/07 2:20 PM	FD	NICKEL	3.7	J	Y	YES	ug/l	SW6010B	Background	Y
WHI3-3S-G-0507-S	2007-2Q	WHI3-3S	WG	5/5/07 2:20 PM	N	NICKEL	2.1	J	Y	YES	ug/l	SW6010B	Background	Y
WHI3-1S-G-0507-S	2007-2Q	WHI3-1S	WG	5/5/07 2:45 PM	N	NICKEL	7.9	J	Y	YES	ug/l	SW6010B	Background-Biddle Ave.	Y
RFI-MW28-G-0507-D	2007-2Q	RFI-MW28	WG	5/7/07 9:20 AM	FD	NICKEL	2.2	J+	Y	YES	ug/l	SW6010B	Background	Y
RFI-MW28-G-0507-S	2007-2Q	RFI-MW28	WG	5/7/07 9:20 AM	N	NICKEL	4	J+	Y	YES	ug/l	SW6010B	Background	Y
RFI-MW24-G-0507-S	2007-2Q	RFI-MW24	WG	5/7/07 10:30 AM	N	NICKEL	55.1		Y	Yes	ug/l	SW6010B	Background	Y

Older data excluded from background statistics.
Parent and duplicate samples.

SELENIUM

Well ID	Sample Date	Concentration (µg/L)	Qualifier	Concentration Used for Statistics(µg/L)	Rank	Comments
WHI4-2S	8/15/06 9:40 AM	5	U	2.5	1	
BG-MW-1	8/15/06 4:10 PM	5	U	2.5	2	
P35N	8/17/06 5:45 PM	5	U	2.5	3	
RFI-MW24	8/23/06 3:40 PM	5	U	2.5	4	
WHI3-3S	11/7/06 9:35 AM	5	U	2.5	5	
P35NR	11/7/06 2:50 PM	5	U	2.5	6	
RFI-MW28	11/8/06 8:35 AM	5	U	2.5	7	
RFI-MW24	11/8/06 9:15 AM	5	U	2.5	8	
WHI2-3S	11/8/06 9:25 AM	5/5	U/U	2.5	9	Averaged with Duplicate Sample
BG-MW-1	11/9/06 10:10 AM	5	U	2.5	10	
WHI4-2S	11/9/06 11:15 AM	5	U	2.5	11	
RFI-MW28	2/13/07 12:25 PM	5	U	2.5	12	
WHI2-3S	2/13/07 3:20 PM	5	U	2.5	13	
RFI-MW24	2/13/07 4:30 PM	5	U	2.5	14	
WHI4-2S	2/15/07 9:45 AM	5	U	2.5	15	
BG-MW-1	2/16/07 9:40 AM	5	U	2.5	16	
P35NR	2/16/07 11:20 AM	5	U	2.5	17	
WHI2-3S	5/5/07 10:15 AM	5	U	2.5	18	
P35NR	5/5/07 12:40 PM	5	U	2.5	19	
BG-MW-1	5/5/07 1:00 PM	5/5	U/U	2.5	20	Averaged with Duplicate Sample
RFI-MW24	5/7/07 10:30 AM	5	U	2.5	21	
WHI2-3S	8/15/06 2:30 PM	2.9	J	2.9	22	
WHI4-2S	5/5/07 1:50 PM	2.9	J	2.9	23	
RFI-MW28	8/23/06 2:30 PM	7.4/6.4	U/U	3.45	24	Averaged with Duplicate Sample
WHI3-3S	8/15/06 10:55 AM	3.9	J	3.9	25	
RFI-MW28	5/7/07 9:20 AM	3.8/4.3	J/J	4.05	26	Averaged with Duplicate Sample
WHI3-1S	5/5/07 2:45 PM	4.3	J	4.3	27	
WHI3-3S	2/12/07 4:40 PM	10.2	U	5.1	28	
WHI3-3S	5/5/07 2:20 PM	5.3/8.1		6.7	29	Averaged with Duplicate Sample
WHI3-1S	8/15/06 11:38 AM	6.8		6.8	30	
WHI3-1S	2/14/07 4:40 PM	9/10.2		9.6	31	Averaged with Duplicate Sample
WHI3-1S	11/9/06 9:15 AM	11.6		11.6	32	

STATISTICAL DATA SET		
Minimum	2.5	
Maximum	11.6	
2nd Maximum	9.6	
Mean	3.55625	
Median	2.5	
Standard Deviation	2.194081114	
No. of samples used for statistics	32	*Rank Place*
90P	6.77	*29.7*
95P	10.3	*31.35*

RAW DATA SET		
Maximum (all data)	11.6	Includes FD
Minimum	5U	Includes FD
No. of detects	12	
No. of samples used for statistics	32	OK
No. of total samples	38	Includes FD
Percent Detects	31.58%	

12:32:38

sys_sample_code	task_code	sys_loc_code	matrix_code	sample_date	sample_type_code	chemical_name	result_numeric	interpreted_qualifiers	detect_flag	reportable_result	result_unit	analytic_method	loc_name	validated_yn
WHI3-1S-G-1203-S 12/9/2003	LD	WHI3-1S	WG	12/9/03 12:00 AM	N	SELENIUM	0.005	U	N	Yes	mg/l	6010B	Background-Biddle Ave.	N
BGMW-1-G-0905-S	2005-3Q	BG-MW-1	WG	9/13/05 4:50 PM	N	SELENIUM	3.5	U	N	YES	ug/l	SW6010B	Background - Off Site on Alk	Y
WHI4-2S-G-0905-S	2005-3Q	WHI4-2S	WG	9/13/05 5:30 PM	N	SELENIUM	2.9	U	N	YES	ug/l	SW6010B	Background	Y
WHI3-3S-G-0905-S	2005-3Q	WHI3-3S	WG	9/13/05 6:20 PM	N	SELENIUM	3.3	U	N	YES	ug/l	SW6010B	Background	Y
WHI3-1S-G-0905-S	2005-3Q	WHI2-3S	WG	9/14/05 7:30 AM	N	SELENIUM	3.2	U	N	YES	ug/l	SW6010B	Background	Y
WHI2-3S-G-0905-S	2005-3Q	WHI2-3S	WG	9/14/05 8:30 AM	N	SELENIUM	5	U	N	YES	ug/l	SW6010B	Background	Y
RFIMW-24-G-0905-S	2005-3Q	RFI-MW24	WG	9/14/05 11:30 AM	N	SELENIUM	3	U	N	YES	ug/l	SW6010B	Background	Y
WHI-4-2S	2006-3Q	WHI4-2S	WG	8/15/06 9:40 AM	N	SELENIUM	5	U	N	YES	ug/l	SW6010B	Background	Y
WHI-3-3S	2006-3Q	WHI3-3S	WG	8/15/06 10:55 AM	N	SELENIUM	3.9	J	Y	YES	ug/l	SW6010B	Background	Y
WHI-3-1S	2006-3Q	WHI3-1S	WG	8/15/06 11:38 AM	N	SELENIUM	6.8		Y	YES	ug/l	SW6010B	Background-Biddle Ave.	Y
WHI-2-3S	2006-3Q	WHI2-3S	WG	8/15/06 2:30 PM	N	SELENIUM	2.9	J	Y	YES	ug/l	SW6010B	Background	Y
BG-MW-1	2006-3Q	BG-MW-1	WG	8/15/06 4:10 PM	N	SELENIUM	5	U	N	YES	ug/l	SW6010B	Background - Off Site on Alk	Y
P35N-G-0806-S	2006-3Q	P35N	WG	8/17/06 5:45 PM	N	SELENIUM	5	U	N	YES	ug/l	SW6010B	Background-Hospital	Y
RFI-MW-28-G-0806-D	2006-3Q	RFI-MW28	WG	8/23/06 2:30 PM	FD	SELENIUM	6.4	U	N	YES	ug/l	SW6010B	Background	Y
RFI-MW-28-G-0806-S	2006-3Q	RFI-MW28	WG	8/23/06 2:30 PM	N	SELENIUM	7.4	U	N	YES	ug/l	SW6010B	Background	Y
RFI-MW-24-G-0806-S	2006-3Q	RFI-MW24	WG	8/23/06 3:40 PM	N	SELENIUM	5	U	N	YES	ug/l	SW6010B	Background	Y
WHI3-3S-G-1106-S	2006-4Q	WHI3-3S	WG	11/7/06 9:35 AM	N	SELENIUM	5	U	N	YES	ug/l	SW6010B	Background	Y
P35NR-G-1106-S	2006-4Q	P35NR	WG	11/7/06 2:50 PM	N	SELENIUM	5	U	N	YES	ug/l	SW6010B		Y
RFI-MW28-G-1106-S	2006-4Q	RFI-MW28	WG	11/8/06 8:35 AM	N	SELENIUM	5	U	N	YES	ug/l	SW6010B	Background	Y
RFI-MW24-G-1106-S	2006-4Q	RFI-MW24	WG	11/8/06 9:15 AM	N	SELENIUM	5	U	N	YES	ug/l	SW6010B	Background	Y
WHI2-3S-G-1106-D	2006-4Q	WHI2-3S	WG	11/8/06 9:25 AM	FD	SELENIUM	5	U	N	YES	ug/l	SW6010B	Background	Y
WHI2-3S-G-1106-S	2006-4Q	WHI2-3S	WG	11/8/06 9:25 AM	N	SELENIUM	5	U	N	YES	ug/l	SW6010B	Background	Y

WHI3-1S-G-1106-S	2006-4Q	WHI3-1S	WG	11/9/06 9:15 AM	N	SELENIUM	11.6		Y	YES	ug/l	SW6010B	Background-Biddle Ave.	Y
BG-MW-1-G-1106-S	2006-4Q	BG-MW-1	WG	11/9/06 10:10 AM	N	SELENIUM	5	U	N	YES	ug/l	SW6010B	Background - Off Site on Alk	Y
WHI4-2S-G-1106-S	2006-4Q	WHI4-2S	WG	11/9/06 11:15 AM	N	SELENIUM	5	U	N	YES	ug/l	SW6010B	Background	Y
WHI3-3S-G-0207-S	2007-1Q	WHI3-3S	WG	2/12/07 4:40 PM	N	SELENIUM	10.2	U	N	YES	ug/l	SW6010B	Background	Y
RFI-MW28-G-0207-S	2007-1Q	RFI-MW28	WG	2/13/07 12:25 PM	N	SELENIUM	5	U	N	YES	ug/l	SW6010B	Background	Y
WHI2-3S-G-0207-S	2007-1Q	WHI2-3S	WG	2/13/07 3:20 PM	N	SELENIUM	5	U	N	YES	ug/l	SW6010B	Background	Y
RFI-MW24-G-0207-S	2007-1Q	RFI-MW24	WG	2/13/07 4:30 PM	N	SELENIUM	5	U	N	YES	ug/l	SW6010B	Background	Y
WHI3-1S-G-0207-D	2007-1Q	WHI3-1S	WG	2/14/07 4:40 PM	FD	SELENIUM	10.2		Y	Yes	ug/l	SW6010B	Background-Biddle Ave.	Y
WHI3-1S-G-0207-S	2007-1Q	WHI3-1S	WG	2/14/07 4:40 PM	N	SELENIUM	9		Y	Yes	ug/l	SW6010B	Background-Biddle Ave.	Y
WHI4-2S-G-0207-S	2007-1Q	WHI4-2S	WG	2/15/07 9:45 AM	N	SELENIUM	5	U	N	YES	ug/l	SW6010B	Background	Y
BG-MW-1-G-0207-S	2007-1Q	BG-MW-1	WG	2/16/07 9:40 AM	N	SELENIUM	5	U	N	YES	ug/l	SW6010B	Background - Off Site on Alk	Y
P35NR-G-0207-S	2007-1Q	P35NR	WG	2/16/07 11:20 AM	N	SELENIUM	5	U	N	YES	ug/l	SW6010B		Y
WHI2-3S-G-0507-S	2007-2Q	WHI2-3S	WG	5/5/07 10:15 AM	N	SELENIUM	5	U	N	Yes	ug/l	SW6010B	Background	Y
P35NR-G-0507-S	2007-2Q	P35NR	WG	5/5/07 12:40 PM	N	SELENIUM	5	U	N	Yes	ug/l	SW6010B		Y
BG-MW-1-G-0507-D	2007-2Q	BG-MW-1	WG	5/5/07 1:00 PM	FD	SELENIUM	5	U	N	YES	ug/l	SW6010B	Background - Off Site on Alk	Y
BG-MW-1-G-0507-S	2007-2Q	BG-MW-1	WG	5/5/07 1:00 PM	N	SELENIUM	5	U	N	Yes	ug/l	SW6010B	Background - Off Site on Alk	Y
WHI4-2S-G-0507-S	2007-2Q	WHI4-2S	WG	5/5/07 1:50 PM	N	SELENIUM	2.9	J	Y	YES	ug/l	SW6010B	Background	Y
WHI3-3S-G-0507-D	2007-2Q	WHI3-3S	WG	5/5/07 2:20 PM	FD	SELENIUM	8.1		Y	Yes	ug/l	SW6010B	Background	Y
WHI3-3S-G-0507-S	2007-2Q	WHI3-3S	WG	5/5/07 2:20 PM	N	SELENIUM	5.3		Y	Yes	ug/l	SW6010B	Background	Y
WHI3-1S-G-0507-S	2007-2Q	WHI3-1S	WG	5/5/07 2:45 PM	N	SELENIUM	4.3	J	Y	YES	ug/l	SW6010B	Background-Biddle Ave.	Y
RFI-MW28-G-0507-D	2007-2Q	RFI-MW28	WG	5/7/07 9:20 AM	FD	SELENIUM	4.3	J-	Y	YES	ug/l	SW6010B	Background	Y
RFI-MW28-G-0507-S	2007-2Q	RFI-MW28	WG	5/7/07 9:20 AM	N	SELENIUM	3.8	J-	Y	YES	ug/l	SW6010B	Background	Y
RFI-MW24-G-0507-S	2007-2Q	RFI-MW24	WG	5/7/07 10:30 AM	N	SELENIUM	5	U	N	Yes	ug/l	SW6010B	Background	Y

Older data excluded from background statistics.
Parent and duplicate samples.

SILVER

Stats NA as never detected. Not sampled during September 2005 sampling event

Well ID	Sample Date	Concentration (µg/L)	Qualifier	Concentration Used for Statistics(µg/L)	Rank
					1

STATISTICAL DATA SET		
Minimum	0	
Maximum	0	
2nd Maximum		
Mean	#DIV/0!	
Median	#NUM!	
Standard Deviation	#DIV/0!	
No. of samples used for statistics	0	Rank Place
90P		0.9
95P		0.95

RAW DATA SET		
Maximum (all data)	10U	Includes FD
Minimum	10U	Includes FD
No. of detects	0	
No. of samples used for statistics	0	OK
No. of total samples	38	Includes FD
Percent Detects	0.00%	

0:0:38

sys_sample_code	task_code	sys_loc_code	matrix_code	sample_date	sample_type_code	chemical_name	result_numeric	interpreted_qualifiers	detect_flag	reportable_result	result_unit	analytic_method	loc_name	validated_yn
WHI3-1S-G-1203-S 12/9/2003	LD	WHI3-1S	WG	12/9/03 12:00 AM	N	SILVER	0.01	U	N	Yes	mg/l	6010B	Background-Biddle Ave.	N
WHI-4-2S	2006-3Q	WHI4-2S	WG	8/15/06 9:40 AM	N	SILVER	10	U	N	YES	ug/l	SW6010B	Background	Y
WHI-3-3S	2006-3Q	WHI3-3S	WG	8/15/06 10:55 AM	N	SILVER	10	U	N	YES	ug/l	SW6010B	Background	Y
WHI-3-1S	2006-3Q	WHI3-1S	WG	8/15/06 11:38 AM	N	SILVER	10	U	N	YES	ug/l	SW6010B	Background-Biddle Ave.	Y
WHI-2-3S	2006-3Q	WHI2-3S	WG	8/15/06 2:30 PM	N	SILVER	10	U	N	YES	ug/l	SW6010B	Background	Y
BG-MW-1	2006-3Q	BG-MW-1	WG	8/15/06 4:10 PM	N	SILVER	10	U	N	YES	ug/l	SW6010B	Background - Off Site on Alk	Y
P35N-G-0806-S	2006-3Q	P35N	WG	8/17/06 5:45 PM	N	SILVER	10	U	N	YES	ug/l	SW6010B	Background-Hospital	Y
RFI-MW-28-G-0806-D	2006-3Q	RFI-MW28	WG	8/23/06 2:30 PM	FD	SILVER	10	UJ	N	YES	ug/l	SW6010B	Background	Y
RFI-MW-28-G-0806-S	2006-3Q	RFI-MW28	WG	8/23/06 2:30 PM	N	SILVER	10	UJ	N	YES	ug/l	SW6010B	Background	Y
RFI-MW-24-G-0806-S	2006-3Q	RFI-MW24	WG	8/23/06 3:40 PM	N	SILVER	10	UJ	N	YES	ug/l	SW6010B	Background	Y
WHI3-3S-G-1106-S	2006-4Q	WHI3-3S	WG	11/7/06 9:35 AM	N	SILVER	10	U	N	YES	ug/l	SW6010B	Background	Y
P35NR-G-1106-S	2006-4Q	P35NR	WG	11/7/06 2:50 PM	N	SILVER	10	U	N	YES	ug/l	SW6010B		Y
RFI-MW28-G-1106-S	2006-4Q	RFI-MW28	WG	11/8/06 8:35 AM	N	SILVER	10	U	N	YES	ug/l	SW6010B	Background	Y
RFI-MW24-G-1106-S	2006-4Q	RFI-MW24	WG	11/8/06 9:15 AM	N	SILVER	10	U	N	YES	ug/l	SW6010B	Background	Y

WHI2-3S-G-1106-D	2006-4Q	WHI2-3S	WG	11/8/06 9:25 AM	FD	SILVER	10	U	N	YES	ug/l	SW6010B	Background	Y
WHI2-3S-G-1106-S	2006-4Q	WHI2-3S	WG	11/8/06 9:25 AM	N	SILVER	10	U	N	YES	ug/l	SW6010B	Background	Y
WHI3-1S-G-1106-S	2006-4Q	WHI3-1S	WG	11/9/06 9:15 AM	N	SILVER	10	U	N	YES	ug/l	SW6010B	Background-Biddle Ave.	Y
BG-MW-1-G-1106-S	2006-4Q	BG-MW-1	WG	11/9/06 10:10 AM	N	SILVER	10	U	N	YES	ug/l	SW6010B	Background - Off Site on Alk	Y
WHI4-2S-G-1106-S	2006-4Q	WHI4-2S	WG	11/9/06 11:15 AM	N	SILVER	10	U	N	YES	ug/l	SW6010B	Background	Y
WHI3-3S-G-0207-S	2007-1Q	WHI3-3S	WG	2/12/07 4:40 PM	N	SILVER	10	U	N	YES	ug/l	SW6010B	Background	Y
RFI-MW28-G-0207-S	2007-1Q	RFI-MW28	WG	2/13/07 12:25 PM	N	SILVER	10	U	N	YES	ug/l	SW6010B	Background	Y
WHI2-3S-G-0207-S	2007-1Q	WHI2-3S	WG	2/13/07 3:20 PM	N	SILVER	10	U	N	YES	ug/l	SW6010B	Background	Y
RFI-MW24-G-0207-S	2007-1Q	RFI-MW24	WG	2/13/07 4:30 PM	N	SILVER	10	U	N	YES	ug/l	SW6010B	Background	Y
WHI3-1S-G-0207-D	2007-1Q	WHI3-1S	WG	2/14/07 4:40 PM	FD	SILVER	10	U	N	YES	ug/l	SW6010B	Background-Biddle Ave.	Y
WHI3-1S-G-0207-S	2007-1Q	WHI3-1S	WG	2/14/07 4:40 PM	N	SILVER	10	U	N	YES	ug/l	SW6010B	Background-Biddle Ave.	Y
WHI4-2S-G-0207-S	2007-1Q	WHI4-2S	WG	2/15/07 9:45 AM	N	SILVER	10	U	N	YES	ug/l	SW6010B	Background	Y
BG-MW-1-G-0207-S	2007-1Q	BG-MW-1	WG	2/16/07 9:40 AM	N	SILVER	10	U	N	YES	ug/l	SW6010B	Background - Off Site on Alk	Y
P35NR-G-0207-S	2007-1Q	P35NR	WG	2/16/07 11:20 AM	N	SILVER	10	U	N	YES	ug/l	SW6010B		Y
WHI2-3S-G-0507-S	2007-2Q	WHI2-3S	WG	5/5/07 10:15 AM	N	SILVER	10	U	N	Yes	ug/l	SW6010B	Background	Y
P35NR-G-0507-S	2007-2Q	P35NR	WG	5/5/07 12:40 PM	N	SILVER	10	U	N	Yes	ug/l	SW6010B		Y
BG-MW-1-G-0507-D	2007-2Q	BG-MW-1	WG	5/5/07 1:00 PM	FD	SILVER	10	U	N	Yes	ug/l	SW6010B	Background - Off Site on Alk	Y
BG-MW-1-G-0507-S	2007-2Q	BG-MW-1	WG	5/5/07 1:00 PM	N	SILVER	10	U	N	Yes	ug/l	SW6010B	Background - Off Site on Alk	Y
WHI4-2S-G-0507-S	2007-2Q	WHI4-2S	WG	5/5/07 1:50 PM	N	SILVER	10	U	N	Yes	ug/l	SW6010B	Background	Y
WHI3-3S-G-0507-D	2007-2Q	WHI3-3S	WG	5/5/07 2:20 PM	FD	SILVER	10	U	N	Yes	ug/l	SW6010B	Background	Y
WHI3-3S-G-0507-S	2007-2Q	WHI3-3S	WG	5/5/07 2:20 PM	N	SILVER	10	U	N	Yes	ug/l	SW6010B	Background	Y
WHI3-1S-G-0507-S	2007-2Q	WHI3-1S	WG	5/5/07 2:45 PM	N	SILVER	10	U	N	Yes	ug/l	SW6010B	Background-Biddle Ave.	Y
RFI-MW28-G-0507-D	2007-2Q	RFI-MW28	WG	5/7/07 9:20 AM	FD	SILVER	10	U	N	Yes	ug/l	SW6010B	Background	Y
RFI-MW28-G-0507-S	2007-2Q	RFI-MW28	WG	5/7/07 9:20 AM	N	SILVER	10	U	N	Yes	ug/l	SW6010B	Background	Y
RFI-MW24-G-0507-S	2007-2Q	RFI-MW24	WG	5/7/07 10:30 AM	N	SILVER	10	U	N	Yes	ug/l	SW6010B	Background	Y

Older data excluded from background statistics.
Parent and duplicate samples.

THALLIUM

Well ID	Sample Date	Concentration (µg/L)	Qualifier	Concentration Used for Statistics(µg/L)	Rank	Comments
WHI3-3S	11/7/06 9:35 AM	5.8	J	2.9	1	
WHI4-2S	8/15/06 9:40 AM	10	U	5	2	
WHI3-3S	8/15/06 10:55 AM	10	U	5	3	
WHI3-1S	8/15/06 11:38 AM	10	U	5	4	
WHI2-3S	8/15/06 2:30 PM	10	U	5	5	
BG-MW-1	8/15/06 4:10 PM	10	U	5	6	
RFI-MW24	8/23/06 3:40 PM	10	UJ	5	7	
P35NR	11/7/06 2:50 PM	10	U	5	8	
RFI-MW24	11/8/06 9:15 AM	10	U	5	9	
WHI3-1S	11/9/06 9:15 AM	10	U	5	10	
BG-MW-1	11/9/06 10:10 AM	10	U	5	11	
WHI4-2S	11/9/06 11:15 AM	10	U	5	12	
WHI3-3S	2/12/07 4:40 PM	10	U	5	13	
WHI2-3S	2/13/07 3:20 PM	10	U	5	14	
RFI-MW24	2/13/07 4:30 PM	10	U	5	15	
WHI3-1S	2/14/07 4:40 PM	10/10	U/U	5	16	Averaged with Duplicate Sample
WHI4-2S	2/15/07 9:45 AM	10	U	5	17	
BG-MW-1	2/16/07 9:40 AM	10	U	5	18	
P35NR	2/16/07 11:20 AM	10	U	5	19	
WHI2-3S	5/5/07 10:15 AM	10	U	5	20	
P35NR	5/5/07 12:40 PM	10	U	5	21	
WHI4-2S	5/5/07 1:50 PM	10	U	5	22	
WHI3-3S	5/5/07 2:20 PM	10/10	U/U	5	23	Averaged with Duplicate Sample
WHI3-1S	5/5/07 2:45 PM	10	U	5	24	
RFI-MW24	5/7/07 10:30 AM	10	U	5	25	
BG-MW-1	5/5/07 1:00 PM	10/5.3	U/J	5.15	26	Averaged with Duplicate Sample
WHI2-3S	11/8/06 9:25 AM	10/6.6	U/J	5.8	27	Averaged with Duplicate Sample
P35N	8/17/06 5:45 PM	6.2	J	6.2	28	
RFI-MW28	8/23/06 2:30 PM	11.1/14.5	UJ/UJ	6.4	29	Averaged with Duplicate Sample
RFI-MW28	2/13/07 12:25 PM	9.1	J	9.1	30	
RFI-MW28	5/7/07 9:20 AM	13.8/10	J/U	9.4	31	Averaged with Duplicate Sample
RFI-MW28	11/8/06 8:35 AM	10.2		10.2	32	

STATISTICAL DATA SET		
Minimum	2.9	
Maximum	10.2	
2nd Maximum	9.4	
Mean	5.4734375	
Median	5	
Standard Deviation	1.442555102	
No. of samples used for statistics	32	*Rank Place*
90P	8.29	*29.7*
95P	9.68	*31.35*

RAW DATA SET		
Maximum (all data)	13.8J	Includes FD
Minimum	10U	Includes FD
No. of detects	7	
No. of samples used for statistics	32	OK
No. of total samples	38	Includes FD
Percent Detects	18.42%	

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sys_sample_code	task_code	sys_loc_code	matrix_code	sample_date	sample_type_code	chemical_name	result_numeric	interpreted_qualifiers	detect_flag	reportable_result	result_unit	analytic_method	loc_name	validated_yn
WHI3-1S-G-1203-S 12/9/2003	LD	WHI3-1S	WG	12/9/03 12:00 AM	N	THALLIUM	0.01	U	N	Yes	mg/l	6010B	Background-Biddle Ave.	N
BGMW-1-G-0905-S	2005-3Q	BG-MW-1	WG	9/13/05 4:50 PM	N	THALLIUM	1	U	N	YES	ug/l	SW6020	Background - Off Site on Alk	Y
WHI4-2S-G-0905-S	2005-3Q	WHI4-2S	WG	9/13/05 5:30 PM	N	THALLIUM	0.24	U	N	YES	ug/l	SW6020	Background	Y
WHI3-3S-G-0905-S	2005-3Q	WHI3-3S	WG	9/13/05 6:20 PM	N	THALLIUM	0.059	U	N	YES	ug/l	SW6020	Background	Y
WHI3-1S-G-0905-S	2005-3Q	WHI2-3S	WG	9/14/05 7:30 AM	N	THALLIUM	0.11	U	N	YES	ug/l	SW6020	Background	Y
WHI2-3S-G-0905-S	2005-3Q	WHI2-3S	WG	9/14/05 8:30 AM	N	THALLIUM	0.095	U	N	YES	ug/l	SW6020	Background	Y
RFIMW-24-G-0905-S	2005-3Q	RFI-MW24	WG	9/14/05 11:30 AM	N	THALLIUM	1	U	N	YES	ug/l	SW6020	Background	Y
WHI-4-2S	2006-3Q	WHI4-2S	WG	8/15/06 9:40 AM	N	THALLIUM	10	U	N	YES	ug/l	SW6010B	Background	Y
WHI-3-3S	2006-3Q	WHI3-3S	WG	8/15/06 10:55 AM	N	THALLIUM	10	U	N	YES	ug/l	SW6010B	Background	Y
WHI-3-1S	2006-3Q	WHI3-1S	WG	8/15/06 11:38 AM	N	THALLIUM	10	U	N	YES	ug/l	SW6010B	Background-Biddle Ave.	Y
WHI-2-3S	2006-3Q	WHI2-3S	WG	8/15/06 2:30 PM	N	THALLIUM	10	U	N	YES	ug/l	SW6010B	Background	Y
BG-MW-1	2006-3Q	BG-MW-1	WG	8/15/06 4:10 PM	N	THALLIUM	10	U	N	YES	ug/l	SW6010B	Background - Off Site on Alk	Y
P35N-G-0806-S	2006-3Q	P35N	WG	8/17/06 5:45 PM	N	THALLIUM	6.2	J	Y	YES	ug/l	SW6010B	Background-Hospital	Y
RFI-MW-28-G-0806-D	2006-3Q	RFI-MW28	WG	8/23/06 2:30 PM	FD	THALLIUM	14.5	UJ	N	YES	ug/l	SW6010B	Background	Y
RFI-MW-28-G-0806-S	2006-3Q	RFI-MW28	WG	8/23/06 2:30 PM	N	THALLIUM	11.1	UJ	N	YES	ug/l	SW6010B	Background	Y
RFI-MW-24-G-0806-S	2006-3Q	RFI-MW24	WG	8/23/06 3:40 PM	N	THALLIUM	10	UJ	N	YES	ug/l	SW6010B	Background	Y
WHI3-3S-G-1106-S	2006-4Q	WHI3-3S	WG	11/7/06 9:35 AM	N	THALLIUM	5.8	J	Y	YES	ug/l	SW6010B	Background	Y
P35NR-G-1106-S	2006-4Q	P35NR	WG	11/7/06 2:50 PM	N	THALLIUM	10	U	N	YES	ug/l	SW6010B		Y
RFI-MW28-G-1106-S	2006-4Q	RFI-MW28	WG	11/8/06 8:35 AM	N	THALLIUM	10.2		Y	YES	ug/l	SW6010B	Background	Y
RFI-MW24-G-1106-S	2006-4Q	RFI-MW24	WG	11/8/06 9:15 AM	N	THALLIUM	10	U	N	YES	ug/l	SW6010B	Background	Y
WHI2-3S-G-1106-D	2006-4Q	WHI2-3S	WG	11/8/06 9:25 AM	FD	THALLIUM	6.6	J	Y	YES	ug/l	SW6010B	Background	Y
WHI2-3S-G-1106-S	2006-4Q	WHI2-3S	WG	11/8/06 9:25 AM	N	THALLIUM	10	U	N	YES	ug/l	SW6010B	Background	Y

WHI3-1S-G-1106-S	2006-4Q	WHI3-1S	WG	11/9/06 9:15 AM	N	THALLIUM	10	U	N	YES	ug/l	SW6010B	Background-Biddle Ave.	Y
BG-MW-1-G-1106-S	2006-4Q	BG-MW-1	WG	11/9/06 10:10 AM	N	THALLIUM	10	U	N	YES	ug/l	SW6010B	Background - Off Site on Alk	Y
WHI4-2S-G-1106-S	2006-4Q	WHI4-2S	WG	11/9/06 11:15 AM	N	THALLIUM	10	U	N	YES	ug/l	SW6010B	Background	Y
WHI3-3S-G-0207-S	2007-1Q	WHI3-3S	WG	2/12/07 4:40 PM	N	THALLIUM	10	U	N	YES	ug/l	SW6010B	Background	Y
RFI-MW28-G-0207-S	2007-1Q	RFI-MW28	WG	2/13/07 12:25 PM	N	THALLIUM	9.1	J	Y	YES	ug/l	SW6010B	Background	Y
WHI2-3S-G-0207-S	2007-1Q	WHI2-3S	WG	2/13/07 3:20 PM	N	THALLIUM	10	U	N	YES	ug/l	SW6010B	Background	Y
RFI-MW24-G-0207-S	2007-1Q	RFI-MW24	WG	2/13/07 4:30 PM	N	THALLIUM	10	U	N	YES	ug/l	SW6010B	Background	Y
WHI3-1S-G-0207-D	2007-1Q	WHI3-1S	WG	2/14/07 4:40 PM	FD	THALLIUM	10	U	N	YES	ug/l	SW6010B	Background-Biddle Ave.	Y
WHI3-1S-G-0207-S	2007-1Q	WHI3-1S	WG	2/14/07 4:40 PM	N	THALLIUM	10	U	N	YES	ug/l	SW6010B	Background-Biddle Ave.	Y
WHI4-2S-G-0207-S	2007-1Q	WHI4-2S	WG	2/15/07 9:45 AM	N	THALLIUM	10	U	N	YES	ug/l	SW6010B	Background	Y
BG-MW-1-G-0207-S	2007-1Q	BG-MW-1	WG	2/16/07 9:40 AM	N	THALLIUM	10	U	N	YES	ug/l	SW6010B	Background - Off Site on Alk	Y
P35NR-G-0207-S	2007-1Q	P35NR	WG	2/16/07 11:20 AM	N	THALLIUM	10	U	N	YES	ug/l	SW6010B		Y
WHI2-3S-G-0507-S	2007-2Q	WHI2-3S	WG	5/5/07 10:15 AM	N	THALLIUM	10	U	N	Yes	ug/l	SW6010B	Background	Y
P35NR-G-0507-S	2007-2Q	P35NR	WG	5/5/07 12:40 PM	N	THALLIUM	10	U	N	YES	ug/l	SW6010B		Y
BG-MW-1-G-0507-D	2007-2Q	BG-MW-1	WG	5/5/07 1:00 PM	FD	THALLIUM	5.3	J	Y	YES	ug/l	SW6010B	Background - Off Site on Alk	Y
BG-MW-1-G-0507-S	2007-2Q	BG-MW-1	WG	5/5/07 1:00 PM	N	THALLIUM	10	U	N	YES	ug/l	SW6010B	Background - Off Site on Alk	Y
WHI4-2S-G-0507-S	2007-2Q	WHI4-2S	WG	5/5/07 1:50 PM	N	THALLIUM	10	U	N	YES	ug/l	SW6010B	Background	Y
WHI3-3S-G-0507-D	2007-2Q	WHI3-3S	WG	5/5/07 2:20 PM	FD	THALLIUM	10	U	N	YES	ug/l	SW6010B	Background	Y
WHI3-3S-G-0507-S	2007-2Q	WHI3-3S	WG	5/5/07 2:20 PM	N	THALLIUM	10	U	N	YES	ug/l	SW6010B	Background	Y
WHI3-1S-G-0507-S	2007-2Q	WHI3-1S	WG	5/5/07 2:45 PM	N	THALLIUM	10	U	N	YES	ug/l	SW6010B	Background-Biddle Ave.	Y
RFI-MW28-G-0507-D	2007-2Q	RFI-MW28	WG	5/7/07 9:20 AM	FD	THALLIUM	10	U	N	YES	ug/l	SW6010B	Background	Y
RFI-MW28-G-0507-S	2007-2Q	RFI-MW28	WG	5/7/07 9:20 AM	N	THALLIUM	13.8	J+	Y	YES	ug/l	SW6010B	Background	Y
RFI-MW24-G-0507-S	2007-2Q	RFI-MW24	WG	5/7/07 10:30 AM	N	THALLIUM	10	U	N	Yes	ug/l	SW6010B	Background	Y

Older data excluded from background statistics.
Parent and duplicate samples.

ZINC

Well ID	Sample Date	Concentration (µg/L)	Qualifier	Concentration Used for Statistics(µg/L)	Rank	Comments
P35NR	5/5/07 12:40 PM	7.2	J+	7.2	1	
RFI-MW28	8/23/06 2:30 PM	8.1/6.7	J/J	7.4	2	Averaged with Duplicate Sample
RFI-MW24	8/23/06 3:40 PM	8.6	J	8.6	3	
WHI2-3S	11/8/06 9:25 AM	9.4/9.4	J/J	9.4	4	Averaged with Duplicate Sample
BG-MW-1	5/5/07 1:00 PM	12.1/7	J/J	9.55	5	Averaged with Duplicate Sample
WHI3-3S	8/15/06 10:55 AM	20	U	10	6	
WHI2-3S	8/15/06 2:30 PM	20	U	10	7	
BG-MW-1	8/15/06 4:10 PM	20	U	10	8	
P35N	8/17/06 5:45 PM	20	U	10	9	
WHI3-3S	11/7/06 9:35 AM	20	U	10	10	
RFI-MW28	11/8/06 8:35 AM	20	U	10	11	
RFI-MW24	11/8/06 9:15 AM	20	U	10	12	
BG-MW-1	11/9/06 10:10 AM	20	U	10	13	
RFI-MW28	2/13/07 12:25 PM	20	U	10	14	
RFI-MW24	2/13/07 4:30 PM	20	U	10	15	
BG-MW-1	2/16/07 9:40 AM	20	UJ	10	16	
RFI-MW28	5/7/07 9:20 AM	20/20	U/U	10	17	Averaged with Duplicate Sample
WHI2-3S	2/13/07 3:20 PM	10.1	J	10.1	18	
P35NR	2/16/07 11:20 AM	10.7	J+	10.7	19	
WHI2-3S	5/5/07 10:15 AM	11.6	J	11.6	20	
WHI3-1S	11/9/06 9:15 AM	25.2	U	12.6	21	
RFI-MW24	5/7/07 10:30 AM	13.6	J	13.6	22	
WHI3-3S	5/5/07 2:20 PM	14.6/14.4	J/J	14.5	23	Averaged with Duplicate Sample
WHI4-2S	8/15/06 9:40 AM	29.6	U	14.8	24	
WHI3-1S	2/14/07 4:40 PM	11.5/19.5	J/J	15.5	25	Averaged with Duplicate Sample
WHI4-2S	11/9/06 11:15 AM	32	U	16	26	
WHI3-3S	2/12/07 4:40 PM	20		20	27	
WHI3-1S	5/5/07 2:45 PM	36.1		36.1	28	
P35NR	11/7/06 2:50 PM	46.2		46.2	29	
WHI4-2S	5/5/07 1:50 PM	99.8		99.8	30	
WHI4-2S	2/15/07 9:45 AM	105	J+	105	31	
WHI3-1S	8/15/06 11:38 AM	122		122	32	

STATISTICAL DATA SET		
Minimum	7.2	
Maximum	122	
2nd Maximum	105	
Mean	22.2078125	
Median	10	
Standard Deviation	29.56957381	
No. of samples used for statistics	32	*Rank Place*
90P	83.72	*29.7*
95P	110.95	*31.35*

RAW DATA SET		
Maximum (all data)	122	Includes FD
Minimum	20U	Includes FD
No. of detects	22	
No. of samples used for statistics	32	OK
No. of total samples	38	Includes FD
Percent Detects	57.89%	

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sys_sample_code	task_code	sys_loc_code	matrix_code	sample_date	sample_type_code	chemical_name	result_numeric	interpreted_qualifiers	detect_flag	reportable_result	result_unit	analytic_method	loc_name	validated_yn
WHI3-1S-G-1203-S 12/9/2003	LD	WHI3-1S	WG	12/9/03 12:00 AM	N	ZINC	0.046		Y	Yes	mg/l	6010B	Background-Biddle Ave.	N
WHI-4-2S	2006-3Q	WHI4-2S	WG	8/15/06 9:40 AM	N	ZINC	29.6	U	N	YES	ug/l	SW6010B	Background	Y
WHI-3-3S	2006-3Q	WHI3-3S	WG	8/15/06 10:55 AM	N	ZINC	20	U	N	YES	ug/l	SW6010B	Background	Y
WHI-3-1S	2006-3Q	WHI3-1S	WG	8/15/06 11:38 AM	N	ZINC	122		Y	YES	ug/l	SW6010B	Background-Biddle Ave.	Y
WHI-2-3S	2006-3Q	WHI2-3S	WG	8/15/06 2:30 PM	N	ZINC	20	U	N	YES	ug/l	SW6010B	Background	Y
BG-MW-1	2006-3Q	BG-MW-1	WG	8/15/06 4:10 PM	N	ZINC	20	U	N	YES	ug/l	SW6010B	Background - Off Site on Alk	Y
P35N-G-0806-S	2006-3Q	P35N	WG	8/17/06 5:45 PM	N	ZINC	20	U	N	YES	ug/l	SW6010B	Background-Hospital	Y
RFI-MW-28-G-0806-D	2006-3Q	RFI-MW28	WG	8/23/06 2:30 PM	FD	ZINC	6.7	J	Y	YES	ug/l	SW6010B	Background	Y
RFI-MW-28-G-0806-S	2006-3Q	RFI-MW28	WG	8/23/06 2:30 PM	N	ZINC	8.1	J	Y	YES	ug/l	SW6010B	Background	Y
RFI-MW-24-G-0806-S	2006-3Q	RFI-MW24	WG	8/23/06 3:40 PM	N	ZINC	8.6	J	Y	YES	ug/l	SW6010B	Background	Y
WHI3-3S-G-1106-S	2006-4Q	WHI3-3S	WG	11/7/06 9:35 AM	N	ZINC	20	U	N	YES	ug/l	SW6010B	Background	Y
P35NR-G-1106-S	2006-4Q	P35NR	WG	11/7/06 2:50 PM	N	ZINC	46.2		Y	YES	ug/l	SW6010B		Y
RFI-MW28-G-1106-S	2006-4Q	RFI-MW28	WG	11/8/06 8:35 AM	N	ZINC	20	U	N	YES	ug/l	SW6010B	Background	Y
RFI-MW24-G-1106-S	2006-4Q	RFI-MW24	WG	11/8/06 9:15 AM	N	ZINC	20	U	N	YES	ug/l	SW6010B	Background	Y
WHI2-3S-G-1106-D	2006-4Q	WHI2-3S	WG	11/8/06 9:25 AM	FD	ZINC	9.4	J	Y	YES	ug/l	SW6010B	Background	Y
WHI2-3S-G-1106-S	2006-4Q	WHI2-3S	WG	11/8/06 9:25 AM	N	ZINC	9.4	J	Y	YES	ug/l	SW6010B	Background	Y
WHI3-1S-G-1106-S	2006-4Q	WHI3-1S	WG	11/9/06 9:15 AM	N	ZINC	25.2	U	N	YES	ug/l	SW6010B	Background-Biddle Ave.	Y
BG-MW-1-G-1106-S	2006-4Q	BG-MW-1	WG	11/9/06 10:10 AM	N	ZINC	20	U	N	YES	ug/l	SW6010B	Background - Off Site on Alk	Y
WHI4-2S-G-1106-S	2006-4Q	WHI4-2S	WG	11/9/06 11:15 AM	N	ZINC	32	U	N	YES	ug/l	SW6010B	Background	Y
WHI3-3S-G-0207-S	2007-1Q	WHI3-3S	WG	2/12/07 4:40 PM	N	ZINC	20		Y	Yes	ug/l	SW6010B	Background	Y
RFI-MW28-G-0207-S	2007-1Q	RFI-MW28	WG	2/13/07 12:25 PM	N	ZINC	20	U	N	YES	ug/l	SW6010B	Background	Y
WHI2-3S-G-0207-S	2007-1Q	WHI2-3S	WG	2/13/07 3:20 PM	N	ZINC	10.1	J	Y	YES	ug/l	SW6010B	Background	Y

RFI-MW24-G-0207-S	2007-1Q	RFI-MW24	WG	2/13/07 4:30 PM	N	ZINC	20	U	N	YES	ug/l	SW6010B	Background	Y
WHI3-1S-G-0207-D	2007-1Q	WHI3-1S	WG	2/14/07 4:40 PM	FD	ZINC	19.5	J+	Y	YES	ug/l	SW6010B	Background-Biddle Ave.	Y
WHI3-1S-G-0207-S	2007-1Q	WHI3-1S	WG	2/14/07 4:40 PM	N	ZINC	11.5	J+	Y	YES	ug/l	SW6010B	Background-Biddle Ave.	Y
WHI4-2S-G-0207-S	2007-1Q	WHI4-2S	WG	2/15/07 9:45 AM	N	ZINC	105	J+	Y	YES	ug/l	SW6010B	Background	Y
BG-MW-1-G-0207-S	2007-1Q	BG-MW-1	WG	2/16/07 9:40 AM	N	ZINC	20	UJ	N	YES	ug/l	SW6010B	Background - Off Site on Alk	Y
P35NR-G-0207-S	2007-1Q	P35NR	WG	2/16/07 11:20 AM	N	ZINC	10.7	J+	Y	YES	ug/l	SW6010B		Y
WHI2-3S-G-0507-S	2007-2Q	WHI2-3S	WG	5/5/07 10:15 AM	N	ZINC	11.6	J	Y	YES	ug/l	SW6010B	Background	Y
P35NR-G-0507-S	2007-2Q	P35NR	WG	5/5/07 12:40 PM	N	ZINC	7.2	J+	Y	YES	ug/l	SW6010B		Y
BG-MW-1-G-0507-D	2007-2Q	BG-MW-1	WG	5/5/07 1:00 PM	FD	ZINC	7	J	Y	YES	ug/l	SW6010B	Background - Off Site on Alk	Y
BG-MW-1-G-0507-S	2007-2Q	BG-MW-1	WG	5/5/07 1:00 PM	N	ZINC	12.1	J	Y	YES	ug/l	SW6010B	Background - Off Site on Alk	Y
WHI4-2S-G-0507-S	2007-2Q	WHI4-2S	WG	5/5/07 1:50 PM	N	ZINC	99.8		Y	Yes	ug/l	SW6010B	Background	Y
WHI3-3S-G-0507-D	2007-2Q	WHI3-3S	WG	5/5/07 2:20 PM	FD	ZINC	14.4	J	Y	YES	ug/l	SW6010B	Background	Y
WHI3-3S-G-0507-S	2007-2Q	WHI3-3S	WG	5/5/07 2:20 PM	N	ZINC	14.6	J	Y	YES	ug/l	SW6010B	Background	Y
WHI3-1S-G-0507-S	2007-2Q	WHI3-1S	WG	5/5/07 2:45 PM	N	ZINC	36.1		Y	Yes	ug/l	SW6010B	Background-Biddle Ave.	Y
RFI-MW28-G-0507-D	2007-2Q	RFI-MW28	WG	5/7/07 9:20 AM	FD	ZINC	20	U	N	Yes	ug/l	SW6010B	Background	Y
RFI-MW28-G-0507-S	2007-2Q	RFI-MW28	WG	5/7/07 9:20 AM	N	ZINC	20	U	N	Yes	ug/l	SW6010B	Background	Y
RFI-MW24-G-0507-S	2007-2Q	RFI-MW24	WG	5/7/07 10:30 AM	N	ZINC	13.6	J	Y	YES	ug/l	SW6010B	Background	Y

Older data excluded from background statistics.
Parent and duplicate samples.

TIN

Stats NA as never detected. Not sampled during September 2005 sampling event

Well ID	Sample Date	Concentration (µg/L)	Qualifier	Concentration Used for Statistics(µg/L)	Rank
					1

STATISTICAL DATA SET		
Minimum	0	
Maximum	0	
2nd Maximum		
Mean	#DIV/0!	
Median	#NUM!	
Standard Deviation	#DIV/0!	
No. of samples used for statistics	0	Rank Place
90P		0.9
95P		0.95

RAW DATA SET		
Maximum (all data)	100U	Includes FD
Minimum	100U	Includes FD
No. of detects	0	
No. of samples used for statistics	0	OK
No. of total samples	38	Includes FD
Percent Detects	0.00%	

0:0:38

sys_sample_code	task_code	sys_loc_code	matrix_code	sample_date	sample_type_code	chemical_name	result_numeric	interpreted_qualifiers	detect_flag	reportable_result	result_unit	analytic_method	loc_name	validated_yn
WHI3-1S-G-1203-S 12/9/2003	LD	WHI3-1S	WG	12/9/03 12:00 AM	N	TIN	0.1	U	N	Yes	mg/l	6010B	Background-Biddle Ave.	N
WHI-4-2S	2006-3Q	WHI4-2S	WG	8/15/06 9:40 AM	N	TIN	100	U	N	YES	ug/l	SW6010B	Background	Y
WHI-3-3S	2006-3Q	WHI3-3S	WG	8/15/06 10:55 AM	N	TIN	100	U	N	YES	ug/l	SW6010B	Background	Y
WHI-3-1S	2006-3Q	WHI3-1S	WG	8/15/06 11:38 AM	N	TIN	100	U	N	YES	ug/l	SW6010B	Background-Biddle Ave.	Y
WHI-2-3S	2006-3Q	WHI2-3S	WG	8/15/06 2:30 PM	N	TIN	100	U	N	YES	ug/l	SW6010B	Background	Y
BG-MW-1	2006-3Q	BG-MW-1	WG	8/15/06 4:10 PM	N	TIN	100	U	N	YES	ug/l	SW6010B	Background - Off Site on Alk	Y
P35N-G-0806-S	2006-3Q	P35N	WG	8/17/06 5:45 PM	N	TIN	100	U	N	YES	ug/l	SW6010B	Background-Hospital	Y
RFI-MW-28-G-0806-D	2006-3Q	RFI-MW28	WG	8/23/06 2:30 PM	FD	TIN	100	U	N	YES	ug/l	SW6010B	Background	Y
RFI-MW-28-G-0806-S	2006-3Q	RFI-MW28	WG	8/23/06 2:30 PM	N	TIN	100	U	N	YES	ug/l	SW6010B	Background	Y
RFI-MW-24-G-0806-S	2006-3Q	RFI-MW24	WG	8/23/06 3:40 PM	N	TIN	100	U	N	YES	ug/l	SW6010B	Background	Y
WHI3-3S-G-1106-S	2006-4Q	WHI3-3S	WG	11/7/06 9:35 AM	N	TIN	100	U	N	YES	ug/l	SW6010B	Background	Y
P35NR-G-1106-S	2006-4Q	P35NR	WG	11/7/06 2:50 PM	N	TIN	100	U	N	YES	ug/l	SW6010B		Y

RFI-MW28-G-1106-S	2006-4Q	RFI-MW28	WG	11/8/06 8:35 AM	N	TIN	100	U	N	YES	ug/l	SW6010B	Background	Y
RFI-MW24-G-1106-S	2006-4Q	RFI-MW24	WG	11/8/06 9:15 AM	N	TIN	100	U	N	YES	ug/l	SW6010B	Background	Y
WHI2-3S-G-1106-D	2006-4Q	WHI2-3S	WG	11/8/06 9:25 AM	FD	TIN	100	U	N	YES	ug/l	SW6010B	Background	Y
WHI2-3S-G-1106-S	2006-4Q	WHI2-3S	WG	11/8/06 9:25 AM	N	TIN	100	U	N	YES	ug/l	SW6010B	Background	Y
WHI3-1S-G-1106-S	2006-4Q	WHI3-1S	WG	11/9/06 9:15 AM	N	TIN	100	U	N	YES	ug/l	SW6010B	Background-Biddle Ave.	Y
BG-MW-1-G-1106-S	2006-4Q	BG-MW-1	WG	11/9/06 10:10 AM	N	TIN	100	U	N	YES	ug/l	SW6010B	Background - Off Site on Alk	Y
WHI4-2S-G-1106-S	2006-4Q	WHI4-2S	WG	11/9/06 11:15 AM	N	TIN	100	U	N	YES	ug/l	SW6010B	Background	Y
WHI3-3S-G-0207-S	2007-1Q	WHI3-3S	WG	2/12/07 4:40 PM	N	TIN	100	U	N	YES	ug/l	SW6010B	Background	Y
RFI-MW28-G-0207-S	2007-1Q	RFI-MW28	WG	2/13/07 12:25 PM	N	TIN	100	U	N	YES	ug/l	SW6010B	Background	Y
WHI2-3S-G-0207-S	2007-1Q	WHI2-3S	WG	2/13/07 3:20 PM	N	TIN	100	U	N	YES	ug/l	SW6010B	Background	Y
RFI-MW24-G-0207-S	2007-1Q	RFI-MW24	WG	2/13/07 4:30 PM	N	TIN	100	U	N	YES	ug/l	SW6010B	Background	Y
WHI3-1S-G-0207-D	2007-1Q	WHI3-1S	WG	2/14/07 4:40 PM	FD	TIN	100	U	N	YES	ug/l	SW6010B	Background-Biddle Ave.	Y
WHI3-1S-G-0207-S	2007-1Q	WHI3-1S	WG	2/14/07 4:40 PM	N	TIN	100	U	N	YES	ug/l	SW6010B	Background-Biddle Ave.	Y
WHI4-2S-G-0207-S	2007-1Q	WHI4-2S	WG	2/15/07 9:45 AM	N	TIN	100	U	N	YES	ug/l	SW6010B	Background	Y
BG-MW-1-G-0207-S	2007-1Q	BG-MW-1	WG	2/16/07 9:40 AM	N	TIN	100	U	N	YES	ug/l	SW6010B	Background - Off Site on Alk	Y
P35NR-G-0207-S	2007-1Q	P35NR	WG	2/16/07 11:20 AM	N	TIN	100	U	N	YES	ug/l	SW6010B		Y
WHI2-3S-G-0507-S	2007-2Q	WHI2-3S	WG	5/5/07 10:15 AM	N	TIN	100	U	N	Yes	ug/l	SW6010B	Background	Y
P35NR-G-0507-S	2007-2Q	P35NR	WG	5/5/07 12:40 PM	N	TIN	100	U	N	Yes	ug/l	SW6010B		Y
BG-MW-1-G-0507-D	2007-2Q	BG-MW-1	WG	5/5/07 1:00 PM	FD	TIN	100	U	N	Yes	ug/l	SW6010B	Background - Off Site on Alk	Y
BG-MW-1-G-0507-S	2007-2Q	BG-MW-1	WG	5/5/07 1:00 PM	N	TIN	100	U	N	Yes	ug/l	SW6010B	Background - Off Site on Alk	Y
WHI4-2S-G-0507-S	2007-2Q	WHI4-2S	WG	5/5/07 1:50 PM	N	TIN	100	U	N	Yes	ug/l	SW6010B	Background	Y
WHI3-3S-G-0507-D	2007-2Q	WHI3-3S	WG	5/5/07 2:20 PM	FD	TIN	100	U	N	Yes	ug/l	SW6010B	Background	Y
WHI3-3S-G-0507-S	2007-2Q	WHI3-3S	WG	5/5/07 2:20 PM	N	TIN	100	U	N	Yes	ug/l	SW6010B	Background	Y
WHI3-1S-G-0507-S	2007-2Q	WHI3-1S	WG	5/5/07 2:45 PM	N	TIN	100	U	N	Yes	ug/l	SW6010B	Background-Biddle Ave.	Y
RFI-MW28-G-0507-D	2007-2Q	RFI-MW28	WG	5/7/07 9:20 AM	FD	TIN	100	U	N	Yes	ug/l	SW6010B	Background	Y
RFI-MW28-G-0507-S	2007-2Q	RFI-MW28	WG	5/7/07 9:20 AM	N	TIN	100	U	N	Yes	ug/l	SW6010B	Background	Y
RFI-MW24-G-0507-S	2007-2Q	RFI-MW24	WG	5/7/07 10:30 AM	N	TIN	100	U	N	Yes	ug/l	SW6010B	Background	Y

Older data excluded from background statistics.

VANADIUM

Well ID	Sample Date	Concentration (µg/L)	Qualifier	Concentration Used for Statistics(µg/L)	Rank	Comments
RFI-MW28	5/7/07 9:20 AM	50/2.1	U/J	2.1	1	Used dup value
RFI-MW28	2/13/07 12:25 PM	2.6	J	2.6	2	
RFI-MW28	8/23/06 2:30 PM	2.7/2.9	J/J	2.8	3	Averaged with Duplicate Sample
WHI3-3S	5/5/07 2:20 PM	2.2/3.5	J/J	2.85	4	Averaged with Duplicate Sample
WHI3-3S	8/15/06 10:55 AM	3	J	3	5	
RFI-MW24	8/23/06 3:40 PM	3.7	J	3.7	6	
WHI3-1S	2/14/07 4:40 PM	2.7/4.8	J/J	3.75	7	Averaged with Duplicate Sample
WHI3-3S	2/12/07 4:40 PM	6	J	6	8	
WHI4-2S	2/15/07 9:45 AM	6.2	J	6.2	9	
WHI3-1S	11/9/06 9:15 AM	6.5	J	6.5	10	
WHI3-1S	5/5/07 2:45 PM	10.9	J	10.9	11	
P35N	8/17/06 5:45 PM	15.2	J-	15.2	12	
WHI4-2S	8/15/06 9:40 AM	50	U	25	13	
WHI2-3S	8/15/06 2:30 PM	50	U	25	14	
BG-MW-1	8/15/06 4:10 PM	50	U	25	15	
WHI3-3S	11/7/06 9:35 AM	50	U	25	16	
P35NR	11/7/06 2:50 PM	50	U	25	17	
RFI-MW28	11/8/06 8:35 AM	50	UJ	25	18	
RFI-MW24	11/8/06 9:15 AM	50	U	25	19	
WHI2-3S	11/8/06 9:25 AM	50/50	U/U	25	20	Averaged with Duplicate Sample
BG-MW-1	11/9/06 10:10 AM	50	U	25	21	
WHI4-2S	11/9/06 11:15 AM	50	U	25	22	
WHI2-3S	2/13/07 3:20 PM	50	U	25	23	
RFI-MW24	2/13/07 4:30 PM	50	U	25	24	
BG-MW-1	2/16/07 9:40 AM	50	U	25	25	
P35NR	2/16/07 11:20 AM	50	U	25	26	
WHI2-3S	5/5/07 10:15 AM	50	U	25	27	
P35NR	5/5/07 12:40 PM	50	U	25	28	
BG-MW-1	5/5/07 1:00 PM	50/50	U/U	25	29	Averaged with Duplicate Sample
WHI4-2S	5/5/07 1:50 PM	50	U	25	30	
RFI-MW24	5/7/07 10:30 AM	50	U	25	31	
WHI3-1S	8/15/06 11:38 AM	39.6	J	39.6	32	

STATISTICAL DATA SET		
Minimum	2.1	
Maximum	39.6	
2nd Maximum	25	
Mean	18.13125	
Median	25	
Standard Deviation	10.55528266	
No. of samples used for statistics	32	*Rank Place*
90P	25	*29.7*
95P	30.11	*31.35*

RAW DATA SET		
Maximum (all data)	39.6J	Includes FD
Minimum	50U	Includes FD
No. of detects	16	
No. of samples used for statistics	32	OK
No. of total samples	38	Includes FD
Percent Detects	42.11%	

16:32:38

sys_sample_code	task_code	sys_loc_code	matrix_code	sample_date	sample_type_code	chemical_name	result_numeric	interpreted_qualifiers	detect_flag	reportable_result	result_unit	analytic_method	loc_name	validated_yn
WHI3-1S-G-1203-S 12/9/2003	LD	WHI3-1S	WG	12/9/03 12:00 AM	N	VANADIUM	0.017		Y	Yes	mg/l	6010B	Background-Biddle Ave.	N
BGMW-1-G-0905-S	2005-3Q	BG-MW-1	WG	9/13/05 4:50 PM	N	VANADIUM	4	U	N	YES	ug/l	SW6010B	Background - Off Site on Alk	Y
WHI4-2S-G-0905-S	2005-3Q	WHI4-2S	WG	9/13/05 5:30 PM	N	VANADIUM	7.9		Y	YES	ug/l	SW6010B	Background	Y
WHI3-3S-G-0905-S	2005-3Q	WHI3-3S	WG	9/13/05 6:20 PM	N	VANADIUM	4	U	N	YES	ug/l	SW6010B	Background	Y
WHI3-1S-G-0905-S	2005-3Q	WHI2-3S	WG	9/14/05 7:30 AM	N	VANADIUM	12.2		Y	YES	ug/l	SW6010B	Background	Y
WHI2-3S-G-0905-S	2005-3Q	WHI2-3S	WG	9/14/05 8:30 AM	N	VANADIUM	4	U	N	YES	ug/l	SW6010B	Background	Y
RFIMW-24-G-0905-S	2005-3Q	RFI-MW24	WG	9/14/05 11:30 AM	N	VANADIUM	3.6		Y	YES	ug/l	SW6010B	Background	Y
WHI-4-2S	2006-3Q	WHI4-2S	WG	8/15/06 9:40 AM	N	VANADIUM	50	U	N	YES	ug/l	SW6010B	Background	Y
WHI-3-3S	2006-3Q	WHI3-3S	WG	8/15/06 10:55 AM	N	VANADIUM	3	J	Y	YES	ug/l	SW6010B	Background	Y
WHI-3-1S	2006-3Q	WHI3-1S	WG	8/15/06 11:38 AM	N	VANADIUM	39.6	J	Y	YES	ug/l	SW6010B	Background-Biddle Ave.	Y
WHI-2-3S	2006-3Q	WHI2-3S	WG	8/15/06 2:30 PM	N	VANADIUM	50	U	N	YES	ug/l	SW6010B	Background	Y
BG-MW-1	2006-3Q	BG-MW-1	WG	8/15/06 4:10 PM	N	VANADIUM	50	U	N	YES	ug/l	SW6010B	Background - Off Site on Alk	Y
P35N-G-0806-S	2006-3Q	P35N	WG	8/17/06 5:45 PM	N	VANADIUM	15.2	J-	Y	YES	ug/l	SW6010B	Background-Hospital	Y
RFI-MW-28-G-0806-D	2006-3Q	RFI-MW28	WG	8/23/06 2:30 PM	FD	VANADIUM	2.9	J	Y	YES	ug/l	SW6010B	Background	Y
RFI-MW-28-G-0806-S	2006-3Q	RFI-MW28	WG	8/23/06 2:30 PM	N	VANADIUM	2.7	J	Y	YES	ug/l	SW6010B	Background	Y
RFI-MW-24-G-0806-S	2006-3Q	RFI-MW24	WG	8/23/06 3:40 PM	N	VANADIUM	3.7	J	Y	YES	ug/l	SW6010B	Background	Y
WHI3-3S-G-1106-S	2006-4Q	WHI3-3S	WG	11/7/06 9:35 AM	N	VANADIUM	50	U	N	YES	ug/l	SW6010B	Background	Y
P35NR-G-1106-S	2006-4Q	P35NR	WG	11/7/06 2:50 PM	N	VANADIUM	50	U	N	YES	ug/l	SW6010B		Y
RFI-MW28-G-1106-S	2006-4Q	RFI-MW28	WG	11/8/06 8:35 AM	N	VANADIUM	50	UJ	N	YES	ug/l	SW6010B	Background	Y
RFI-MW24-G-1106-S	2006-4Q	RFI-MW24	WG	11/8/06 9:15 AM	N	VANADIUM	50	U	N	YES	ug/l	SW6010B	Background	Y
WHI2-3S-G-1106-D	2006-4Q	WHI2-3S	WG	11/8/06 9:25 AM	FD	VANADIUM	50	U	N	YES	ug/l	SW6010B	Background	Y
WHI2-3S-G-1106-S	2006-4Q	WHI2-3S	WG	11/8/06 9:25 AM	N	VANADIUM	50	U	N	YES	ug/l	SW6010B	Background	Y

WHI3-1S-G-1106-S	2006-4Q	WHI3-1S	WG	11/9/06 9:15 AM	N	VANADIUM	6.5	J	Y	YES	ug/l	SW6010B	Background-Biddle Ave.	Y
BG-MW-1-G-1106-S	2006-4Q	BG-MW-1	WG	11/9/06 10:10 AM	N	VANADIUM	50	U	N	YES	ug/l	SW6010B	Background - Off Site on Alk	Y
WHI4-2S-G-1106-S	2006-4Q	WHI4-2S	WG	11/9/06 11:15 AM	N	VANADIUM	50	U	N	YES	ug/l	SW6010B	Background	Y
WHI3-3S-G-0207-S	2007-1Q	WHI3-3S	WG	2/12/07 4:40 PM	N	VANADIUM	6	J	Y	YES	ug/l	SW6010B	Background	Y
RFI-MW28-G-0207-S	2007-1Q	RFI-MW28	WG	2/13/07 12:25 PM	N	VANADIUM	2.6	J	Y	YES	ug/l	SW6010B	Background	Y
WHI2-3S-G-0207-S	2007-1Q	WHI2-3S	WG	2/13/07 3:20 PM	N	VANADIUM	50	U	N	YES	ug/l	SW6010B	Background	Y
RFI-MW24-G-0207-S	2007-1Q	RFI-MW24	WG	2/13/07 4:30 PM	N	VANADIUM	50	U	N	YES	ug/l	SW6010B	Background	Y
WHI3-1S-G-0207-D	2007-1Q	WHI3-1S	WG	2/14/07 4:40 PM	FD	VANADIUM	4.8	J	Y	YES	ug/l	SW6010B	Background-Biddle Ave.	Y
WHI3-1S-G-0207-S	2007-1Q	WHI3-1S	WG	2/14/07 4:40 PM	N	VANADIUM	2.7	J	Y	YES	ug/l	SW6010B	Background-Biddle Ave.	Y
WHI4-2S-G-0207-S	2007-1Q	WHI4-2S	WG	2/15/07 9:45 AM	N	VANADIUM	6.2	J	Y	YES	ug/l	SW6010B	Background	Y
BG-MW-1-G-0207-S	2007-1Q	BG-MW-1	WG	2/16/07 9:40 AM	N	VANADIUM	50	U	N	YES	ug/l	SW6010B	Background - Off Site on Alk	Y
P35NR-G-0207-S	2007-1Q	P35NR	WG	2/16/07 11:20 AM	N	VANADIUM	50	U	N	YES	ug/l	SW6010B		Y
WHI2-3S-G-0507-S	2007-2Q	WHI2-3S	WG	5/5/07 10:15 AM	N	VANADIUM	50	U	N	Yes	ug/l	SW6010B	Background	Y
P35NR-G-0507-S	2007-2Q	P35NR	WG	5/5/07 12:40 PM	N	VANADIUM	50	U	N	Yes	ug/l	SW6010B		Y
BG-MW-1-G-0507-D	2007-2Q	BG-MW-1	WG	5/5/07 1:00 PM	FD	VANADIUM	50	U	N	Yes	ug/l	SW6010B	Background - Off Site on Alk	Y
BG-MW-1-G-0507-S	2007-2Q	BG-MW-1	WG	5/5/07 1:00 PM	N	VANADIUM	50	U	N	Yes	ug/l	SW6010B	Background - Off Site on Alk	Y
WHI4-2S-G-0507-S	2007-2Q	WHI4-2S	WG	5/5/07 1:50 PM	N	VANADIUM	50	U	N	Yes	ug/l	SW6010B	Background	Y
WHI3-3S-G-0507-D	2007-2Q	WHI3-3S	WG	5/5/07 2:20 PM	FD	VANADIUM	3.5	J	Y	YES	ug/l	SW6010B	Background	Y
WHI3-3S-G-0507-S	2007-2Q	WHI3-3S	WG	5/5/07 2:20 PM	N	VANADIUM	2.2	J	Y	YES	ug/l	SW6010B	Background	Y
WHI3-1S-G-0507-S	2007-2Q	WHI3-1S	WG	5/5/07 2:45 PM	N	VANADIUM	10.9	J	Y	YES	ug/l	SW6010B	Background-Biddle Ave.	Y
RFI-MW28-G-0507-D	2007-2Q	RFI-MW28	WG	5/7/07 9:20 AM	FD	VANADIUM	2.1	J	Y	YES	ug/l	SW6010B	Background	Y
RFI-MW28-G-0507-S	2007-2Q	RFI-MW28	WG	5/7/07 9:20 AM	N	VANADIUM	50	U	N	Yes	ug/l	SW6010B	Background	Y
RFI-MW24-G-0507-S	2007-2Q	RFI-MW24	WG	5/7/07 10:30 AM	N	VANADIUM	50	U	N	Yes	ug/l	SW6010B	Background	Y

Older data excluded from background statistics.
Parent and duplicate samples.