Health Consultation
CMC Heartland Partners: Lite Yard Site

Minneapolis, Hennepin County, Minnesota

December 1, 2000

Prepared by

The Minnesota Department of Health
Under Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

Foreword

This document summarizes potential public health concerns at a hazardous waste site in Minnesota. It is based on a formal site evaluation prepared by the Minnesota Department of Health (MDH). A number of steps are necessary to do such an evaluation:

Evaluating exposure: MDH scientists begin by reviewing available information about environmental conditions at the site. The first task is to find out how much contamination is present, where it's found on the site, and how people might be exposed to it. Usually, MDH does not collect its own environmental sampling data. We rely on information provided by the Minnesota Pollution Control Agency (MPCA), U.S. Environmental Protection Agency (EPA), and other government agencies, businesses, and the general public.

Evaluating health effects: If there is evidence that people are being exposed—or could be exposed—to hazardous substances, MDH scientists will take steps to determine whether that exposure could be harmful to human health. The report focuses on public health—the health impact on the community as a whole—and is based on existing scientific information.

Developing recommendations: In the evaluation report, MDH outlines its conclusions regarding any potential health threat posed by a site, and offers recommendations for reducing or eliminating human exposure to contaminants. The role of MDH in dealing with hazardous waste sites is primarily advisory. For that reason, the evaluation report will typically recommend actions to be taken by other agencies—including EPA and MPCA. However, if there is an immediate health threat, MDH will issue a public health advisory warning people of the danger, and will work to resolve the problem.

Soliciting community input: The evaluation process is interactive. MDH starts by soliciting and evaluating information from various government agencies, the organizations responsible for cleaning up the site, and the community surrounding the site. Any conclusions about the site are shared with the groups and organizations that provided the information. Once an evaluation report has been prepared, MDH seeks feedback from the public. *If you have questions or comments about this report, we encourage you to contact us*.

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Introduction

The Minnesota Department of Agriculture (MDA) requested technical assistance from the Minnesota Department of Health (MDH) on public health implications related to arsenic contamination at the CMC Heartland Partners (CMC) Lite Yard site in the City of Minneapolis, Hennepin County, Minnesota. This health consultation will address the off-site migration of arsenic in soil and groundwater from the CMC site, cleanup up goal calculations for leaching of arsenic from soil into groundwater, and residual arsenic in surface soil.

Information reviewed for this document include communications between MDA Project Manager, Terri McDill, MDA hydrologist Michael Loughran, and Daniel Peña of MDH, as well as numerous environmental reports pertaining to various construction projects occurring around the site. Reports from the Minnesota Department of Agriculture, Hennepin County Regional Railroad Authority, Minnesota Department of Transportation, and the Green Institute were reviewed.

Site Background

The site is a 7.7 acre triangular piece of land in south Minneapolis, and is situated between 28th Street (South), Hiawatha Avenue (East), railroad tracks and the Mattaini Warehouse (West), and the city of Minneapolis Asphalt Plant which is immediately north of the Mattaini Warehouse (see Figure 1). The site was previously leased by Reade Manufacturing, who produced arsenic and/or lead arsenate-based grasshopper pesticide. There is a small building standing on the site which postdates the use of the site for pesticide manufacturing or packaging. The property was also used as a bulk petroleum storage facility. Two petroleum releases on the site have been reported to the MPCA. MPCA has investigated and issued file closure statements (MPCA Site File ID#s LEAK 00009035, and 00001583) on these releases. The site is currently rented and used by Bituminous Roadways for the stock piling of aggregate materials. The site has partially restricted access with a chain link fence on the southern boundary and a snow fence along the railroad track boundary to the west/northwest, and along Hiawatha Avenue to the east. The snow fence along Hiawatha Avenue is poorly installed and falling down in several locations. The snow fence does not have any “No Trespassing” signs. The only “No Trespassing” sign is located at the driveway entrance gate on 28th Street. There are indications of regular trespassing on this site.

The site is located within an industrial corridor which includes numerous railroad tracks and switching areas, warehouses, streets with high volumes of traffic, and retail commercial businesses. Two large retail and grocery shopping areas are within one-half mile of the site to the south and southeast. The residential properties closest to the site are approximately one and a half blocks west and northwest of the site on Longfellow Avenue (Figure 7). This residential area is along the edge of the Phillips neighborhood which includes some high density housing and apartments to the west-northwest within one-quarter mile of the site.

Chemicals of Concern

Arsenic (As), a metal found in many different compounds on-site, is the primary chemical of concern due to its presence in soil and groundwater at very high concentrations (up to 18,000 mg/Kg and 320,000 µg/L, respectively). MDH is concerned about acute exposures to these high

levels of arsenic on-site. Workers involved in the cleanup, unsuspecting construction workers on the adjacent Hiawatha corridor, or other individuals could be accidentally exposed to high levels of arsenic in materials which are superficially covered on-site. Drinking water containing 60,000 ppb (60 mg/L) arsenic could be lethal. The minimum lethal dose of arsenic has been calculated to be about 1-3 mg/Kg (mg arsenic / kg body weight). Therefore, ingestion of about 0.2 liters water containing 320,000 ppb arsenic or about 3 grams of soil containing 18,000 mg/Kg arsenic (maximal concentrations found on the CMC site) could be lethal. Further discussion of arsenic toxicity is found in the January 1998 MDH Health Consultation (MDH 1998a), as well as an August 1998 memo from MDH to MDA (MDH 1998b).

There are no known drinking water wells in the area of the site. Residences to the west of the site are likely to be connected to the Minneapolis municipal water system. Issues concerning groundwater migration and exposure to groundwater will be discussed in this health consultation.
MDH is concerned about chronic exposures associated with this site. While the site was an operating pesticide facility, extensive arsenic surface soil contamination accumulated on site. For many years after the pesticide operation had ceased, heavy equipment operation and wind aided off site migration of contaminated soil.

Currently, contamination on the site is supposed to be covered by 1 foot of dirt (Class 5 gravel). The site is used as a staging area for an asphalt plant. Constant heavy equipment activity occurs on the site which generates considerable dust. This activity may make the cap ineffective, chronically expose workers to arsenic, and aid in the off-site migration of arsenic-laden dust.

The estimated volume of soil found on-site contaminated at greater than 250 mg/Kg arsenic is 28,480 cubic yards (yds^3); the estimated volume contaminated at greater than 3,000 mg/Kg arsenic is 9,620 yds^3 (Peer 1997a). CMC's arsenic soil concentrations are compared to the Minnesota Pollution Control Agency Soil Reference Values. The Soil Reference Values (SRV) are determined using standard risk assessment methods, which utilize various exposure assumptions depending on the expected land use. SRVs for residential land use are more conservative to be protective of children, whereas industrial SRVs are less restrictive. The Residential (unrestricted land use) SRV is 12 mg /Kg. The Industrial Soil Reference Value (SRV) for arsenic is 25 mg/Kg.

Arsenic at the CMC site is not found in one specific compound but is a mixture of weathered arsenic pesticide products. Initial speciation showed a large portion (of a single core sample) to be calcium arsenate, which was assumed to be an end product manufactured or packaged at the site. The other predominant arsenic species found on site, iron oxide arsenate, is thought to be a raw material, a by-product of production, or a product of weathering.

Arsenic Soil Contamination on CMC Property
The Minnesota Department of Transportation (DOT) has an easement on the eastside of CMC property to complete road construction along Hiawatha Avenue (Highway 55). This may include the construction of a mass transit station, a bus corridor, or a light-rail station.

Contaminated soil in the area of the easement has been identified and has been treated according to applicable federal and state regulations. Numerous chemical release sites along the Highway 55 corridor have been identified. The ones associated with CMC include Areas 1A, 1B, 2A, 2B, 3A, and 3B which are all located at Site b (see Figures 2, and 3). Table 1 lists the arsenic soil concentrations for these areas at various sample depths. Surface soil arsenic concentrations ranged from non-detectable to 3500 mg/Kg. The soil column from 1 to 8 feet had arsenic concentrations ranging from 4-27 mg/Kg. The contaminated soil was used as fill in two locations next to the CMC site in the right- of-way (see Figure 1). All together, approximately 5,263 cubic yards of contaminated soil were used, not all of it originating from CMC property. It is estimated that 4,951 cubic yards of soil were excavated from areas depicted in Figure 3 and used as non-petroleum contaminated fill (see figure 1)(13). Most of the contaminated soil was used as fill between two layers of clean fill above the storm drain soil along the right-of-way.

The right-of-way was used as a temporary road while highway 55 was reconstructed. Although the right-of-way is no longer being used for traffic re-routing, it is still being used for construction traffic and is scheduled for future mass transit purposes.

Approximately 48 cubic yards of excavated soil from Site b (areas 1A, 1B, 2A, 2B, 3A, and 3B, see Figures 2 and 3) which contained lead at hazardous concentrations were disposed of at the AETS Facility in Menominee Falls Wisconsin (13). See Tables 1 and 2 for total arsenic and lead soil concentrations in these areas. Table 2 lists arsenic and lead soil concentration results collected from stock piled soils removed from Site b excavations. Stockpile arsenic soil concentrations ranged from 8 to 550 mg/Kg, and lead concentrations ranged from 47- 16000 mg/Kg. Note that both non-petroleum and petroleum contaminated soils were stockpiled separately, and each pile may have contained material from other source areas along Highway 55 which may not be related to the CMC site. Excavated materials were placed on 10 mil nylon-reinforced polyethylene. The top of the stockpile was covered with overlapping 10 mil polyethylene that was weighted down to keep the cover in place (13). Area 1A was excavated 1ft. below ground surface (bgs); Area 1B, 3 ft. bgs; Area 2A, 8 ft. bgs; Area 2B, 3 ft. bgs; Area 3A, 2 ft. bgs; and Area 3A, 2 ft. bgs. For these areas, the soil samples were collected at the bottom of the excavation. All together approximately 4951 cubic yards of soil from Site b were deposited over the storm sewer and were sandwiched between two layers of clean fill (13).

Two samples were collected at the bottom of the berm that was present along Highway 55 right-of-way before road construction began in Area 3C (see Figure 2). The 2 samples were collected at the natural grade level of the CMC site. Samples 3C-1 and 3C-2 contained 520 mg/Kg, and 80 mg/Kg arsenic respectively. Twenty feet of soil underneath the removed berm was excavated for the placement of the water main and storm sewer drain. The immediate area surrounding Area 3C was not sampled further for arsenic and may have contained elevated levels of arsenic similar to samples 3C-1 and 3C-2. The soil surrounding Area 3C was used as clean fill underneath the bypass road surface grade. The surface grade consists of approximately 6 inches of recycled

crushed concrete along the 100-foot easement between the eastern boundary of CMC (red line) to the western boundary of the new road construction (green line)(See Figure 2).

Figures 4, 5, and 6 illustrate the soil arsenic iso-concentration contours for soil depths 0-0.5, 1-3, and 5-6 ft respectively. Tables 3, 4, and 5 list the soil arsenic concentration data used to draw the iso-concentration contours. Note that the surface soil immediately inside the curb of 28th Street along the southern portion of CMC has some very high arsenic concentrations ranging from 28 - 4600 mg/Kg (see figure 4). A sidewalk would normally be located inside the curb, but instead the area has highly contaminated exposed soil, containing foot prints from foot traffic. Road construction resulted in removal of some of the contaminated soil along the curb on the north side of 28th Street (See Figure 2 (green line)). Contaminated soil along the curb area was removed from the corner of Highway 55 and 28th Street to the west side of soil sample SS-7 (see Figure 2). Soils inside the curb from sample SS-6 (arsenic surface soil concentration = 4600 mg/Kg) all the way to the west corner of the CMC property is exposed. The soil along this strip is very sandy and not compacted, allowing it to be easily blown off site (16). The only place along the strip that is covered with clean fill is the drive way (just west of the only building on site) used by Bituminous Roadway's heavy equipment throughout the work day (17). The piles of aggregate material are constantly being deposited and removed on most of the CMC property. The Minnesota Department of Agriculture has requested that Bituminous Roadways Inc. cover all drive, dump, and load areas with a foot of gravel. It is also requested that piles of aggregate are not to be scraped clean by the front loaders. In other words, the aggregate piles must contain at least 1 foot of material above ground surface at all times (17).

Figures 5 and 6 illustrate the locations of soil samples collected on the site that exceed the Industrial Lead SRV of 700 mg/Kg. The following samples were above the industrial lead SRV:

P-39 (2300 mg/Kg) sampled at 1-3 ft
P-52 (1900 mg/Kg) sampled at 1-3 ft
P-73 (860 mg/Kg) sampled at 1-3 ft
P-9 (3900 mg/Kg) sampled at 2-4 ft
P-40 (4500 mg/Kg) sampled at 2-4 ft

Arsenic Soil Conditions East of CMC Property Boundary

On the eastside of CMC, across highway 55, there was a large railyard but all the tracks have been removed. The property is still owned by Canadian Pacific Rail Systems (5). The rail yard property had been in use for approximately 60 years and included a round house at one time(5). The site is currently covered by with grass (see Figure 1). Excavated and stockpiled soils from the Canadian Pacific Rail System property correspond to Areas 4A,4B, and Areas 5A and 5B located within Sample Area aa. (See Figure 2). These soils were placed in the Hiawatha/Cedar Avenue bridge approach two blocks south of the site. Table 6 lists the elevated arsenic soil concentrations found in Sample Area aa with soil arsenic concentrations ranging from 15 - 432 mg/Kg.

Arsenic Soil Conditions South of CMC Property

Directly to the south of the site, across from 28th Street, the Green Institute has a new building. Construction of this building involved moving 21st Avenue to the west side of the Green Institute property (See Figure 7). Figure 8 illustrates the locations of all the known arsenic soil samples collected south of the CMC site. Samples HAB-2, OP-2, OP-5, OP-7, ST-19, and ST-E1 exceeded the arsenic industrial Soil Reference Value of 25 mg/Kg. The arsenic soil concentrations in these samples ranged from 25 to 86 mg/Kg. Table 7 lists the soil arsenic

concentrations for samples collected south of the CMC property.

All the samples were collected at depth intervals from 0-0.5 ft and 0-3 ft which are not good indication of surface soil deposition resulting from wind erosion, heavy equipment operation and other factors. The top 3 inches of soil is an appropriate depth to sample for surface soil concentrations to which people are most likely to be exposed.

At one time the land south of CMC was used for numerous purposes including a gas station, scrap metal yard, and tank farm. Currently there are three businesses directly south of CMC property: Jadco Supply, Dalsin Roofing, and the Green Institute. In general, most of the land south of 28th Street has been completely disrupted during the removal of prior businesses and the new construction of the Green Institute (see Figure 7). Six inches of soil between the green line and the railroad tracks in Figure 8 was excavated and managed as hazardous material. The northern portion of Green Institute property is now a paved parking lot, and most of the southern portion is occupied by a new building.

It should be noted that all the soil samples collected south of the CMC property were collected south of the tracks except soil sample MW -16 which contained 24 mg/Kg arsenic. The property directly across the street from the surface soil arsenic hot spots has not been characterized and represents a data gap. Future land uses contemplated for this area includes a bike route and park area.

Arsenic Soil Conditions West of the CMC Property

The railroad tracks have been removed between Mattaini Warehouse and the CMC site. The Hennepin County Regional Railroad Authority (HCRRA) has done some preliminary environmental site assessment work along the former right of way known as the 29th Street Corridor. Tables 8 and 9 list the soil arsenic concentrations for samples collected off site along the western edge of the CMC property. See Figure 7 for soil sample locations.

Soil arsenic samples (SB series) were collected along the railroad tracks west of CMC, but most of the samples were collected 2-4 feet below the surface (see Table 9). These samples are not useful for describing off site soil migration from CMC because they are not surface samples. In other words, if arsenic contaminated soil was deposited on the surface above these sample locations, it would not be evident from the sample results or the arsenic concentration would be greatly diluted.

The property between the Mattaini Warehouse and CMC (former tracks) has been fenced off and is being used as storage for roofing materials as part of a lease agreement between the Roof Depot (current Mattaini occupant) and the Regional Railroad Authority (See Figure 7). This area has not been throughly characterized and may contain elevated arsenic concentrations similar to OP-4, PB-1, and PB-2. Arsenic concentrations for these soil samples ranged from 89 to 1800 mg/Kg which exceeded the Arsenic Industrial Soil Reference Value (SRV) of 25 mg/Kg. An exposure hazard exists in this area because there is evidence that the highly contaminated soil is being disrupted by site activities. Future land use for his section of land has not been determined. Proposed land uses for the railroad corridor include a bike route, or a light rail route.

Samples OP-6, OP-8, OP-9, and OP-10 do not sufficiently address the potential off site migration of arsenic-laden dust into the residential areas on the west side of Mattaini Warehouse (currently occupied by Roof Depot) on Longfellow Avenue between 28th and 26th Streets. Samples OP-6 and OP-9 are the samples collected closest to this residential area. The two samples were collected under the parking lot at Roof Depot, and it is not clear that the soil underneath the parking lot had not been disturbed by grading before it was paved. If the soil was disturbed, the soil arsenic concentrations may not be representative of what may be across the street in the residential area.

Arsenic in Groundwater

Figure 9 illustrates the estimated extent of the arsenic groundwater plume for arsenic greater than 50 µg/L (the current U. S. Environmental Protection Agency Maximum Contaminant Level). The plume is moving west-southwest from the site into a residential area. MDH believes that the new Maximum Contaminant Level (MCL) for arsenic will be lowered from 50 µg/L to as low as 3 to 5µg/L. Due to high levels of dissolved arsenic in the groundwater, a thorough well receptor survey should be conducted down gradient of the site where groundwater arsenic concentrations are equal to, or greater than 5µg/L. A thorough well receptor survey includes, but is not limited to: a door to door survey; questionnaire mailing to land owners in the impacted area; comparison of building permit dates to municipal water supply installation; and, a review of data bases such as the County Well Index.

The CMC monitoring well network consists of 19 shallow wells (surficial aquifer) and 3 deep wells (St. Peter aquifer). The three St. Peter wells are MW-18D, MW-22, and recently drilled MW-24. See Attachment A for details on the monitoring wells. Table 10 lists groundwater data for both dissolved and total arsenic concentrations for the monitoring well network. An updated monitoring well report is forth coming in summer 2000 that will include more recent data. The forthcoming report will provide important information on water quality in the deeper aquifer (St. Peter). Preliminary information suggests that the St. Peter aquifer has not been impacted by arsenic from CMC. However, more investigation is warranted.

In general, the total arsenic concentrations found in groundwater samples are greater than the dissolved arsenic concentrations in the same samples because the total arsenic water samples are not filtered. Arsenic can sorb to particulates suspended in the water column, and some of the particulate is removed during filtration. For this reason, MDH uses the total arsenic water concentration as the potential exposure concentration if well is used for drinking water. However, dissolved arsenic concentrations are appropriate for assessing monitoring well data.

The last groundwater sampling event reviewed for this report was March 5, 1999. On this date 9 monitoring wells were sampled. The results from this sampling event are as follows:

On Site Wells	Total Arsenic (µg/L)	Dissolved Arsenic (µg/L)
MW-4	11000	13000
MW-4A	5.0	9.0
MW-22	4.4	0.95

Off Site Wells	Total Arsenic (µg/L)	Dissolved Arsenic (µg/L)
HC/MW-3	1000	1200
MW-18	1700	2000
MW-18D	2.7	0.69
MW-19	1.4	0.88
MW-20	2.2	0.87
MW-23	4.4	0.95

Wells MW-18 and HC/MW-3 are the farthest off site wells sampled. Monitoring well 18 is located west of CMC and is at the edge of a dense residential area (see Figure 9). Note that the groundwater plume has extended past all monitoring wells to the south. For this reason, the extent of plume migration to the south is not well defined.

Well Receptor Survey

CMC's contractor, Peer, has identified 38 wells within approximately one mile radius of the site (see Figure 10 for well locations) (3). Table 11 lists details of the wells identified in Peer's well receptor survey. The following summarizes the uses and depths of the wells identified in the survey:

Well Type	Depth (ft)
• 12 wells- public supply use (well #s 1,6,7,8,9,15,16,17, 26,29,30,31)	150-472
• 7 wells- commercial use (wells #s 10,11,19,20,21,27,28)	150-481
• 3 wells- industrial use (well #s 12,13,14)	427-995
• 15 wells- monitor (well#s 2-4,22-25,32-39)	19-69
• 2 test wells (well #s 17,18)	199-200

(adapted from reference 3)

Note that Boring Log Records, prepared by the well driller, describe the intended use of a well when the well was drilled (well type). These records are submitted to MDH where they are added to the County Well Index data base. But, as properties are redeveloped, well water use may change, and often these changes are not reflected in the County Well Index records.

The four closest down gradient wells to southwest are Stenant School (well 11), Avalon Theater (well 10), Foo Chu Café (well 27), and Phillips Sewer Well (well 18). MDH was unsuccessful at reaching the school, theater and café by phone because a phone listing did not exist for these facilities. MDH does not have any records listing the current water use for these well or sealing records.

Although it appears that residential areas impacted by the groundwater arsenic plume down gradient of CMC will likely be connected to municipal water, there may be other private wells in the area. Such wells may not be included in the County Well Index or the Minnesota Department of Natural Resources records. Often these older wells are not used as primary domestic water sources. Instead, these wells are used for other purposes such as manufacturing and irrigation. Nevertheless, hazardous groundwater concentrations of arsenic found off site

warrant a more thorough well receptor survey.

Arsenic Soil Leaching Calculations

Since some contaminated soil will remain on site after cleanup, a soil leaching value was determined for arsenic using the MPCA Tier 2 Soil Leaching Value (SLV)Worksheet (7). The purpose of the soil leaching value is to assess potential future impacts to groundwater from soil arsenic leaching. A partitioning coefficient (Kd) is needed to calculate a SLV. A site-specific partitioning coefficient (Kd) was calculated from 6 soil borings sampled at various depth intervals resulting in 15 Kd values. The Kds ranged from 11.3 liters per kilogram (L/Kg) to 4,193.5 L/Kg (7). The Kds were log normally distributed and were transformed using a Log function, resulting in a site-specific Kd of 178 L/Kg. MDH believes that the Kd should be recalculated from the soils that will likely remain on site after the hot spots have been removed. The approximate soil boring locations used to calculate the Kds are illustrated in Figure 4 (99P sample series).

The SLV derived for the site is 47.1 mg/Kg. This value is believed to be protective of any further impacts to groundwater above the U.S. EPA Maximum Contaminant Level (MCL) of 50 µg/l for arsenic. MDH believes that this number should be recalculated using a value of 5 µg/l arsenic for the Risk Criteria Value in the Tier 2 SLV Worksheet, instead of the MCL of 50 µg/l for arsenic. MDH currently advises well owners to find an alternate water supply if their well contains arsenic levels greater than 20 µg/l; MDH informs all people with detectable arsenic above 2 µg/l that there may be health risks.

Human Health Cleanup Goal For Arsenic In Soil

The proposed future land use for the CMC site is mixed commercial or light industrial (6,7). The CMC consultant calculated a risk based cleanup goal for soil of 47.5 mg/Kg. The cleanup goal assumes long-term exposure (via ingestion, dermal contact, and inhalation of arsenic on soil particulate) of an industrial worker on Site. The Minnesota Pollution Control Agency Industrial Soil Reference Value (SRV) spread sheet was used to derive the cleanup goal of 47.5 mg/Kg using Peer's non-default parameter values. Table 12 lists the differences in the SRV parameters proposed by Peer (Consultant) and those used by the Minnesota Department of Agriculture (MDA). MDA proposes a cleanup goal of 30 mg/Kg for soil arsenic based on direct contact using an indoor/outdoor worker scenario(12). All the other parameters used to calculate the cleanup goal were the same. See Attachment B for details regarding the Risk Based Cleanup Goal Calculations and parameters proposed by the MDA.

MDH believes that the Soil Ingestion Rate (IRS) of 50 mg/day is within the range of acceptable values. The Minnesota Pollution Control Agency (MPCA) Draft Risk Based Guidance For the Soil - Human Health Pathway states that an IRS of 50 mg/day is appropriate for office workers and that 80-mg/day value is more reasonable for an industrial worker (9). Because future land use of mixed commercial or industrial is planned for the site, the 80-mg/day value is more appropriate value for a groundskeeper or utility worker.

The default Skin Surface Contact Area (SA) parameter used by the MPCA Soil Reference Value

Guidance Document utilizes an age adjusted skin surface contact area value of 3400 cm2/event. In other words, it is estimated that 20 percent of an adult body is exposed to the soil each time an exposure occurs. CMC's consultant, utilized a SA value of 5700 cm2/event, which is more skin contact area per exposure event.

The Soil Adherence Factor (AF) is dependent on numerous factors including but not limited to moisture content, particle size, body part in contact with the soil, and the type of physical activity associated with the soil contact(10). Appendix J in the Peer Round 11 Report, referenced an EPA document derivation of 0.08 for the Soil to Skin Adherence Factor (AF) as a default value (7). The MPCA Draft Risk Based Guidance For Soil lists 0.13 as the default soil adherence value. This default value is based on a residential gardening scenario which the MPCA believes is also appropriate for a groundskeeper, utility and industrial worker with a skin surface area consisting of lower arms, hands, and head. (10)

The Dermal Exposure Frequency (Efb) is the number of dermal exposure events that are assumed to occur within a year. The MPCA default Efb is 150 days, assumes that dermal exposure is seasonally related to the warmer days of the year in Minnesota.

MDH believes that the default parameters proposed by Peer are reasonable, but other scenarios like a groundskeeper and utility worker should be considered. These scenarios will change the parameters selected for the risk-based cleanup goal calculations.

Furthermore, it is not apparent to MDH what the remedial action plan is for the site, and how it will take into account future land use and institutional controls.

Conclusions

For the reasons listed below, MDH considers the CMC Heartland Partners: Lite Yard Site as a public health hazard.

- The snow fence along Hiawatha Avenue is poorly installed and falling down in several locations. There are indications of trespassing on site.

- Only the vehicle entrance has a "No Trespassing" sign. The rest of the property does not have any "No Trespassing" signs.

- A hundred-foot wide swath along the railroad tracks immediately south of the site along 28th Street has not been characterized for arsenic.

- Numerous arsenic release sites along the Highway 55 corridor have been identified. However, some of the areas associated with the 100-foot easement were not well characterized. Area 3C had high arsenic soil concentrations but only two samples were collected. Contaminated soil from this area was used as fill under the bypass road.

- Based on the most recent sampling round, off site arsenic groundwater concentrations

range from none detectable to 2000 µg/L. Well 17, another off site well, had 3500 µg/L in the December 15, 1997, sampling event. These concentrations are extremely hazardous.

- Preliminary data suggest the St. Peter aquifer has not been impacted by arsenic; however, more investigation is needed.

- The groundwater plume migration to the south is beyond the current monitoring network.

- It is not apparent from available data that a thorough well receptor survey has been conducted in the areas with elevated groundwater arsenic concentrations.

- Exposed surface soils immediately inside the curb of 28th Street along the southern portion of CMC have concentrations ranging from 28- 4600 mg/Kg. The soil along this strip is very sandy and loose allowing it to be easily blown off site. Other soils on site have extremely high concentrations of arsenic.

- Most of the soil samples collected off-site were at depth intervals from 0-0.5 to 0-3 ft which are not a good indication of surface soil deposition resulting from wind erosion, heavy equipment operation, and other factors. Also, these samples do not indicate possible exposures to surface soil.

- The railroad track area between the Mattaini Warehouse and CMC property has not been throughly characterized and may contain more elevated arsenic concentrations similar to OP-4, PB-1, and PB-2. Arsenic concentrations for these soil samples ranged from 89 to 1800 mg/Kg, exceeding the Arsenic Industrial SRV of 25 mg/Kg.

- The MCL of 50 µg/L was used as the Risk Criteria Value in the Tier 2 Soil Leaching Value Worksheet resulting in a soil arsenic cleanup goal of 47 mg/Kg. This soil cleanup value is believed to protect the groundwater exceeding the 50 µg/L level. However, the arsenic MCL is expected to be lowered by the end of 2000. MDH, already advises people not to drink water with arsenic above 20 µg/L, and warns anyone who drinks water containing detectable arsenic of health risks.

- MDA proposes a cleanup goal of 30 mg/Kg for soil arsenic based on direct contact using an indoor/outdoor worker scenario. MDH agrees with the parameters used to calculate the 30 mg/Kg cleanup goal.

Recommendations

- A more secure fence should be in place at the CMC site with “No Trespassing” signs posted at regular intervals.

- Both the railroad corridors to the west and to the south of CMC property need to be characterized for arsenic in the soil column.

- The soil in the storage area leased by Roof Depot from Hennepin County Railroad Authority should not be disturbed until it has been covered with clean fill and/or characterized for arsenic.

- All the exposed soil immediately north of the curb on 28th Street should be removed or covered if elevated soil arsenic concentrations are present. The first three inches should be used to determine surface soil contaminant concentrations.

- MDH believes that the Soil Leaching Value (SLV) should be recalculated using the expected MCL value for arsenic of 5 µg/L.

- MDH recommends that a thorough well receptor survey be conducted in the areas impacted with groundwater arsenic concentrations greater than 5 µg/L.

- Define the southern extent of the arsenic groundwater plume.

- Better characterization of potential arsenic impacts to the St. Peter aquifer is warranted.

- MDH recommends a deed restriction for industrial use unless residential cleanup criteria are implemented.

Public Health Action Plan

MDH s Public Health Action Plan for the site consists of continued consultation with MPCA staff on the soil and groundwater monitoring, any future proposed soil or groundwater remediation, and participation in any planned public outreach activities.

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Agency for Toxic Substances and Disease Registry

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Certification

This Health Consultation for the CMC Hartland Partners: Lite Yard site was prepared by the Minnesota Department of Health under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the Health Consultation was initiated.

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Agency for Toxic Substances and Disease Registry

The Division of Health Assessment and Consultation (DHAC), ATSDR, has reviewed this Health Consultation and concurs with its findings.

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Richard Gillig
Section Chief, SPS, SSAB, DHAC
Agency for Toxic Substances and Disease Registry

Tables

Table 1

CMC Lite Yard Soil Analytical Results - Summary Within **Site b** (Areas 1A, 1B, 2A, 2B, 3A,and 3B)					
Excavation Samples collected at bottom of excavation					
Sample ID (soil depth)	Consultant	Arsenic (mg/Kg)		Lead (mg/Kg)	
		Total	TCLP	Total	TCLP
1A-1 (1')	BRAUN	6.8	NA	7.4	NA
1A-2 (1')	BRAUN	9.5	NA	30	NA
1B-1 (3')	BRAUN	12	NA	10	NA
1B-2 (3')	BRAUN	13	NA	180	NA
2A-1 (8')	BRAUN	3.3	NA	2.8	NA
2A-2 (8')	BRAUN	2.6	NA	5.8	NA
2B (3')	BRAUN	27	NA	750	NA
3A-1 (2')	BRAUN	14	NA	18	NA
3A-2 (2')	BRAUN	21	NA	290	NA
3B-1 (2')	BRAUN	4.3	NA	9.1	NA
3B-2 (2')	BRAUN	5.4	NA	22	NA
Surface Soil 0-0.5 ft.					
Sample ID (sample area)	Consultant	Arsenic (mg/Kg)		Lead (mg/Kg)	
		Total	TCLP	Total	TCLP
ss-26 (1A)	Peer	170	NA	NA	NA
ss-25 (1A)	Peer	170	NA	NA	NA
ss-31 (1A)	Peer	ND	NA	NA	NA
ss-1 (2A)	Peer	28	NA	NA	NA
ss-7 (3A)	Peer	3500	NA	680	NA
ss-13 (3A)	Peer	360	NA	NA	NA
ss-27 (3A)	Peer	190	NA	NA	NA
ss-28 (3A)	Peer	78	NA	NA	NA

Shaded cells indicate an exceedance of the Industrial Arsenic SRV 25 mg/Kg and lead SRV 700mg/Kg

Adapted from Reference 13

Table 2

CMC Lite Yard
Stock Pile Soil Arsenic and Lead Analytical Results
Site b: Areas 1A, 1B, 2A, 3A, 3B

Sample	Consultant	Arsenic (mg/Kg)		Lead (mg/Kg)	
		Total	TCLP	Total	TCLP
SP-1(Stock Pile Sample)	BRAUN	140	NA	630	NA
SP-2(Stock Pile Sample)	BRAUN	82	NA	440	NA
SP-3(Stock Pile Sample)	BRAUN	120	NA	610	NA
SP-4(Stock Pile Sample)	BRAUN	66	NA	370	NA
SP-5(Stock Pile Sample)	BRAUN	28	NA	760	2000
SP-6(Stock Pile Sample)	BRAUN	64	NA	460	NA
SP-7(Stock Pile Sample)	BRAUN	140	NA	160	NA
SP-8(Stock Pile Sample)	BRAUN	410	NA	320	NA
SP-9(Stock Pile Sample)	BRAUN	73	NA	450	NA
SP-10(Stock Pile Sample)	BRAUN	12	NA	160	NA
SP-11(Stock Pile Sample)	BRAUN	20	NA	1500	2400
SP-12(Stock Pile Sample)	BRAUN	150	430	16000	170000
SP-13(Stock Pile Sample)	BRAUN	200	NA	5300	NA
SP-14(Stock Pile Sample)	BRAUN	19	NA	600	NA
SP-15(Stock Pile Sample)	BRAUN	22	NA	570	NA
SP-16(Stock Pile Sample)	BRAUN	100	NA	610	NA
SP-17(Stock Pile Sample)	BRAUN	520	NA	430	NA
SP-18(Stock Pile Sample)	BRAUN	120	NA	290	NA
SP-19(Stock Pile Sample)	BRAUN	22	NA	430	NA
SP-20(Stock Pile Sample)	BRAUN	14	NA	180	NA
SP-21(Stock Pile Sample)	BRAUN	23	NA	59	NA
SP-22(Stock Pile Sample)	BRAUN	12	NA	120	NA
SP-23(Stock Pile Sample)	BRAUN	20	NA	250	NA
SP-24(Stock Pile Sample)	BRAUN	180	NA	220	NA
SP-25(Stock Pile Sample)	BRAUN	30	NA	250	NA
SP-26(Stock Pile Sample)	BRAUN	170	NA	1200	2100
SP-27(Stock Pile Sample)	BRAUN	550	190	91	NA
SP-28(Stock Pile Sample)	BRAUN	42	NA	910	1200
SP-29(Stock Pile Sample)	BRAUN	83	NA	1200	1500
SP-30(Stock Pile Sample)	BRAUN	74	NA	680	NA
SP-31(Stock Pile Sample)	BRAUN	280	NA	520	NA
SP-32(Stock Pile Sample)	BRAUN	7	NA	83	NA
SP-33(Stock Pile Sample)	BRAUN	79	NA	540	NA
SP-34(Stock Pile Sample)	BRAUN	98	NA	280	NA
SP-35(Stock Pile Sample)	BRAUN	9	NA	57	NA
SP-36(Stock Pile Sample)	BRAUN	12	NA	120	NA
SP-37(Stock Pile Sample)	BRAUN	15	NA	110	NA
SP-38(Stock Pile Sample)	BRAUN	8	NA	59	NA
SP-39(Stock Pile Sample)	BRAUN	12	NA	52	NA
SP-40(Stock Pile Sample)	BRAUN	9	NA	47	NA
SP-41(Stock Pile Sample)	BRAUN	58	NA	420	NA
SP-42(Stock Pile Sample)	BRAUN	26	NA	220	NA
SP-43(Stock Pile Sample)	BRAUN	50	NA	370	NA
SP-44(Stock Pile Sample)	BRAUN	30	NA	190	NA
SP-45(Stock Pile Sample)	BRAUN	24	NA	150	NA
SP-46(Stock Pile Sample)	BRAUN	32	NA	220	NA
SP-47(Stock Pile Sample)	BRAUN	27	NA	73	NA
SP-48(Stock Pile Sample)	BRAUN	53	NA	120	NA
SP-49(Stock Pile Sample)	BRAUN	23	NA	120	NA

Shaded cells exceed the Industrial Arsenic SRV 25 mg/Kg or lead SRV 700mg/Kg
Adapted from Reference 13

Table 3

CMC Property Surface Soil Analytical Results Samples Collected at 0-0.5 ft Depth			
Sample	Consultant	Total Arsenic mg/Kg	Total Lead mg/Kg
SS-1	PEER	28	NA
SS-2	PEER	5200	290
SS-3	PEER	990	150
SS-3A	PEER	625	120
SS-4	PEER	1700	7.4
SS-5	PEER	ND(8)	NA
SS-6	PEER	4600	630
SS-7	PEER	3500	680
SS-8	PEER	33	47
SS-9	PEER	2000	740
SS-10	PEER	180	NA
SS10A	PEER	160	NA
SS-11	PEER	720	NA
SS-12	PEER	34	NA
SS-13	PEER	360	NA
SS-14	PEER	1000	400
SS-15	PEER	160	NA
SS-16	PEER	ND(8)	NA
SS-17	PEER	ND(8)	NA
SS-18	PEER	36	NA
SS-19	PEER	31	NA
SS-20	PEER	ND(8)	NA
SS-21	PEER	310	NA
SS-22	PEER	170	NA
SS-23	PEER	5500	220
SS-24	PEER	48	NA
SS-25	PEER	170	NA
SS-26	PEER	170	NA
SS-27	PEER	190	NA
SS-28	PEER	78	NA
SS-29	PEER	650	290
SS-30	PEER	140	NA
SS-31	PEER	ND(8)	NA
SS-32	PEER	ND(8)	NA
SS-33	PEER	38	NA
SS-34	PEER	ND(8)	NA
SS-35	PEER	ND(8)	NA
SS-36	PEER	110	450
SS-37	PEER	130	640
SS-38	PEER	180	500
PB-1	PEER	1800	340
PB-2	PEER	1000	690
MW-16	PEER	24	61

NOTES:

Shaded Cell = exceedance of Industrial Soil Reference Value (SRV)
Arsenic SRV= 25 mg/Kg; Lead SRV = 700mg/Kg

ND ( ) = Not detected at or above the concentration limit in parentheses.
NA = Not analyzed for this parameter. Adapted From Reference 8

Table 4

Total Arsenic Soil Analytical Results for Sample Probes Approximately 1-3 or 2-4ft Intervals

Sample	Consultant	Total Arsenic mg/Kg
GP-1	Peer	NA
GP-2	Peer	ND(8.0)
GP-3	Peer	260
P-1	Peer	430
P-2	Peer	320
P-2A	Peer	270
P-3	Peer	380
P-4	Peer	310
P-5	Peer	150
P-6	Peer	480
P-7	Peer	24
P-8	Peer	ND(8.0)
P-9	Peer	2700
P-10	Peer	ND(8.0)
P-11	Peer	ND(8.0)
P-12	Peer	ND(8.0)
P-13	Peer	940
P-14	Peer	350
P-15	Peer	52
P-16	Peer	ND(8.0)
P-17	Peer	1500
P-18	Peer	600
P-19	Peer	1900
P-20	Peer	210
P-21	Peer	200
P-22	Peer	800
P-23	Peer	23
P-24	Peer	350
P-25	Peer	ND(8.0)
P-26	Peer	ND(8.0)
P-27	Peer	220
P-28	Peer	ND(8.0)
P-29	Peer	240
P-29A	Peer	480
P-30	Peer	ND(8.0)
P-31	Peer	ND(8.0)
P-32	Peer	ND(8.0)
P-33	Peer	740
P-34	Peer	240
P-35	Peer	74
P-36	Peer	ND(8.0)
P-37	Peer	1100
P-38	Peer	ND(8.0)
P-39	Peer	520
P-40	Peer	540
P-41	Peer	ND(8.0)
P-42	Peer	93
P-43	Peer	ND(8.0)
P-44	Peer	15
P-45	Peer	510
P-46	Peer	1000
P-47	Peer	8000
P-48	Peer	5400
P-49	Peer	16
P-50	Peer	790
P-51	Peer	450
P-52	Peer	18000
P-53	Peer	16
P-54	Peer	ND(8)
P-55	Peer	ND(8)
P-56	Peer	21
P-57	Peer	11
P-58	Peer	NA
P-59	Peer	NA
P-60	Peer	NA
P-61	Peer	NA
P-62	Peer	4100
P-63	Peer	770
P-64	Peer	62
P-65	Peer	ND(8)
P-66	Peer	51
P-67	Peer	520
P-68	Peer	260
P-69	Peer	1600
P-70	Peer	1400
P-71	Peer	9700
P-72	Peer	ND(8)
P-73	Peer	12000
P-74	Peer	7300
P-75	Peer	350
P-76	Peer	ND(8)
P-77	Peer	110
P-78	Peer	NA
P-79	Peer	ND(8)
P-80	Peer	ND(8)
P-81	Peer	ND(8)
P-82	Peer	ND(8)
P-83	Peer	110
P-84	Peer	540
P-85	Peer	17
P-86	Peer	28
PB-1	Peer	440
PB-2	Peer	20
MW-16	Peer	ND(9)

NOTES:

Shaded Cell = exceedance of Industrial Soil Reference Value (SRV)

Arsenic SRV= 25 mg/Kg

Total results in milligrams per kilogram (mg/kg).

ND ( ) = Not detected at or above the concentration limit in parentheses.

NA = Not analyzed for this parameter.

Adapted From Reference 8

Table 5

Total Arsenic Soil Analytical Results for Sample Probes Approximately 5-6 or 6-7ft Depth

Sample	Consultant	Total Arsenic mg/Kg
GP-1	Peer	ND(8.0)
GP-2	Peer	NA
GP-3	Peer	NA
P-1	Peer	66
P-2	Peer	52
P-2A	Peer	NA
P-3	Peer	130
P-4	Peer	ND(8.0)
P-5	Peer	150
P-6	Peer	44
P-7	Peer	ND(8.0)
P-8	Peer	ND(8.0)
P-9	Peer	ND(8.0)
P-10	Peer	ND(8.0)
P-11	Peer	ND(8.0)
P-12	Peer	ND(8.0)
P-13	Peer	ND(8.0)
P-14	Peer	900
P-15	Peer	ND(8.0)
P-16	Peer	ND(8.0)
P-17	Peer	520
P-18	Peer	320
P-19	Peer	2200
P-20	Peer	120
P-21	Peer	490
P-22	Peer	21
P-23	Peer	10
P-24	Peer	ND(8.0)
P-25	Peer	ND(8.0)
P-26	Peer	ND(8.0)
P-27	Peer	ND(8.0)
P-28	Peer	ND(8.0)
P-29	Peer	190
P-29A	Peer	NA
P-30	Peer	ND(8.0)
P-31	Peer	ND(8.0)
P-32	Peer	ND(8.0)
P-33	Peer	ND(8.0)
P-34	Peer	350
P-35	Peer	ND(8.0)
P-36	Peer	ND(8.0)
P-37	Peer	520
P-38	Peer	ND(8.0)
P-39	Peer	ND(8.0)
P-40	Peer	ND(8.0)
P-41	Peer	ND(8.0)
P-42	Peer	ND(8.0)

Sample	Consultant	Total Arsenic mg/Kg
P-43	Peer	ND(8.0)
P-44	Peer	ND(8.0)
P-45	Peer	17
P-46	Peer	1600
P-47	Peer	6200
P-48	Peer	5300
P-49	Peer	ND(8.0)
P-50	Peer	540
P-51	Peer	76
P-52	Peer	2500
P-53	Peer	ND(8)
P-54	Peer	ND(8)
P-55	Peer	ND(8)
P-56	Peer	ND(8)
P-57	Peer	ND(8)
P-58	Peer	NA
P-59	Peer	NA
P-60	Peer	NA
P-61	Peer	NA
P-62	Peer	1200
P-63	Peer	370
P-64	Peer	ND(8)
P-65	Peer	ND(8)
P-66	Peer	270
P-67	Peer	250
P-68	Peer	ND(8)
P-69	Peer	550
P-70	Peer	ND(8)
P-71	Peer	2400
P-72	Peer	ND(8)
P-73	Peer	17000
P-74	Peer	7000
P-75	Peer	ND(8)
P-76	Peer	ND(8)
P-77	Peer	ND(8)
P-78	Peer	NA
P-79	Peer	ND(8)
P-80	Peer	ND(8)
P-81	Peer	ND(8)
P-82	Peer	ND(8)
P-83	Peer	64
P-84	Peer	40
P-85	Peer	ND(8)
P-86	Peer	ND(8)
PB-1	Peer	ND(9)
PB-2	Peer	ND(9)
MW-16	Peer	ND(9)

NOTES:

Shaded Cell = exceedance of Industrial Soil Reference Value (SRV)

Arsenic SRV= 25 mg/Kg

Total results in milligrams per kilogram (mg/kg).

ND ( ) = Not detected at or above the concentration limit in parentheses.

NA = Not analyzed for this parameter.

Table 6

Arsenic In Soil East of the CMC Lite Yard					
Site aa (eastside of HWY55) including Areas 4A, 4B, 4C, 5A, 5B					
Sample	Consultant	Arsenic (mg/Kg)		Lead (mg/Kg)	
		Total	TCLP	Total	TCLP
SP-1(Stock Pile Sample)	BRAUN	44	NA	450	NA
SP-2(Stock Pile Sample)	BRAUN	24	NA	210	NA
SP-3(Stock Pile Sample)	BRAUN	17	NA	160	NA
SP-4(Stock Pile Sample)	BRAUN	19	NA	170	NA
SP-5(Stock Pile Sample)	BRAUN	35	NA	360	2000
SP-6(Stock Pile Sample)	BRAUN	19	NA	170	NA
SP-7(Stock Pile Sample)	BRAUN	32	NA	260	NA
SP-8(Stock Pile Sample)	BRAUN	42	NA	330	NA
SP-9(Stock Pile Sample)	BRAUN	40	NA	260	NA
BS-03S (0-4ft.)	CDM	16.6	NA	NA	NA
BC-06S (0-4ft.)	CDM	23.8	NA	NA	NA
BC-16S (0-4ft.)	CDM	53.2	NA	NA	NA
BC-20S (0-4ft.)	CDM	24.9	NA	NA	NA
BC-22S (0-4ft.)	CDM	432	NA	NA	NA
BC-25S (0-4ft.)	CDM	16	NA	NA	NA
BC-31S (0-4ft.)	CDM	23.6	NA	NA	NA
BC-32S (0-4ft.)	CDM	15.5	NA	NA	NA
BC-35S (0-4ft.)	CDM	15.2	NA	NA	NA

Shaded cells indicate exceedance of the Industrial Arsenic SRV 25 mg/Kg or lead SRV 700mg/Kg

Adopted from References 13, and 5

Table 7

Soil Arsenic South of the CMC Property		
Samples	Contractor	Total Arsenic (mg/Kg) Depth (0-1ft)
HAB-2	Braun	25
HAB-3	Braun	5.7
HAB-4	Braun	<2
HAB-5	Braun	20
HAB-6	Braun	3.2
OP-2	Peer	28*
OP-5	Peer	54*
OP-7	Peer	29*
ST-1	Braun	11
ST- 2	Braun	14
ST- 3	Braun	3.2
ST- 4	Braun	15
ST-11	Braun	3
ST- 12	Braun	17
ST- 13	Braun	2.4
ST- 14	Braun	8.3
ST-15	Braun	<2
ST- 16	Braun	<2
ST- 18	Braun	24
ST- 19	Braun	86*
ST- 20	Braun	9.7
ST- 21	Braun	20
ST- 22	Braun	2.6
ST- 23	Braun	11
ST- A	Braun	6 (0-1.5)
ST- B	Braun	14 (0-1.5)
ST- C	Braun	6.6 (0-1.5)
ST- D	Braun	23 (0-1.5)
ST-E1	Braun	30 (0-1.5)*
ST-F	Braun	4.8 (?)

Adapted for Reference 9; * = exceedance of industrial arsenic Soil Reference Value of 25 mg/Kg
ND= not detectable (detection limit mg/Kg); (--) = not analyzed

Table 8

Off Site Soil Arsenic Concentrations West of the CMC Property			
Sample Location	Contractor	Total Arsenic (mg/Kg)	
		Depth Interval (0-0.5 Feet)	Depth Interval (1-3 Feet)
OP-10 (north of Mattaini Warehouse)	Peer	--	ND (2.5)
OP-11(north of Mattaini Warehouse)	Peer	--	8.3
OP-4 (tracks north of CMC)	Peer	89*	Data not located
PB-1 (tracks west of CMC)	Peer	1800*	--
PB-2 (tracks west of CMC)	Peer	1000*	--
OP-3 (tracks west of CMC)	Peer	20	Data not located
P-87 (southwest corner of CMC)	Peer	15	Data not located
OP-1 (tracks southwest of CMC)	Peer	3.0	Data not located
OP-1A (Duplicate)	Peer	3.3	--
OP-6 (west of Mattaini Warehouse)	Peer	--	ND (2.5)
OP-8 (west of Mattaini Warehouse))	Peer	--	ND (2.5)
OP-9 (west of Mattaini Warehouse)	Peer	--	ND (2.5)

Adapted for Reference 9
ND= not detectable (detection limit mg/Kg)
* = exceedance of industrial arsenic Soil Reference Value of 25 mg/Kg
(--) = not analyzed

Table 9

Off Site Soil Borings Along the Rail Tracts West the CMC Property			
Sample ID	Depth Interval (ft)	Arsenic mg/Kg	Lead mg/Kg
SB-1	2-4	1.2	4.0
SB-2	2-4	2.3	2.7
SB-3	2-4	2.3	3.3
SB-4	2-4	Data Not Located	Data Not Located
SB-5	2-4	Data Not Located	Data Not Located
SB-6	2-4	2.6	2.6
SB-7	2-4	3.9	3.9
SB-8	2-4	2.9	2.9
SB-9	2-4	1.6	6.0
SB-10	4-6	1.2	1.9
SB-11	2-4	1.9	2.7
SB-12	0-2	4.1	35.2

Adapted from Reference 5

Table 10

Ground Water Analytical Results
Dissolved And Total Arsenic Concentrations
CMC Lite Yard
Minneapolis, Minnesota

On Site Wells

Well/Sample Identifer	Dissolved Arsenic Concentration (ug/l)										Total Arsenic Concentration (ug/l)								
	5/13/96	8/23/96	11/27/96	6/16/97	7/7/97	12/15/97	12/29/97	5/8/98	5/27/98	3/5/99	05/13/96	11/27/96	6/16/97	7/7/97	12/15/97	12/29/97	5/8/98	5/27/98	3/5/99
MW-1	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
MW-2	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
MW-3	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
MW-4	6,700	---	---	24,000	---	---	---	---	10,000	13,000	---	---	---	---	---	---	---	12,000	11,000
Dup (Duplicate of MW-4)	---	---	---	32,000	---	---	---	---	---	12,000	---	---	---	---	---	---	---	10,000	12,000
MW-4A (Deep well)	ND (5)	---	---	ND (20)	---	---	---	---	19	9.0	---	---	---	---	---	---	---	20	5.0
MW-4D (Duplicate of MW-4)	---	---	---	32,000	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
MW-6	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
MW-7	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
MW-8	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
MW-9	220,000	320,000	---	250,000	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
MW-10	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
MW-11	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
MW-12	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
MW-15	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
MW-22	---	---	---	---	---	---	---	ND (5)	ND (5)	1.0	---	---	---	---	---	---	5.8	16	3.0

Off Site Wells

Well/Sample Identifer	Dissolved Arsenic Concentration (ug/l)										Total Arsenic Concentration (ug/l)								
	5/13/96	8/23/96	11/27/96	6/16/97	7/7/97	12/15/97	12/29/97	5/8/98	5/27/98	3/5/99	05/13/96	11/27/96	6/16/97	7/7/97	12/15/97	12/29/97	5/8/98	5/27/98	3/5/99
HC/MW-1	---	4,000	5,500	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
HC/MW-1B (Duplicate)	---	4,200	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
HC/MW-2 (sealed 11/16/98)	---	6,000	9,200	7,200	---	---	---	---	---	---	---	8,000	---	---	---	---	---	---	---
HC/MW-3	---	1,600	1,700	1,700	---	820	---	---	1,000	1,000	---	---	---	---	---	---	---	1,700	1,200
MW-13	2600	3300	1,100	3500	---	2000	---	---	---	---	3600	---	---	---	---	---	---	---	---
MW-14	94	---	---	---	---	---	---	---	200	---	---	---	---	---	---	---	---	420	---
MW-16	6,600	9,400	8,200	2,300	---	1,900	---	---	2,000	---	---	---	---	---	---	---	---	2,400	---
MW-17	---	---	---	3,900	2,700	3,500	---	---	---	---	---	---	2,800	2,500	---	---	---	---	---
MW-17A (Deep well)	---	---	---	220	230	---	---	---	---	---	---	---	---	320	---	---	---	---	---
MW-17AD (Duplicate of MW-17A)	---	---	---	---	210	---	---	---	---	---	---	---	---	390	---	---	---	---	---
MW-18	---	---	---	750	300	310	450	---	600	2,000	---	---	---	240	470	450	---	1,400	1,700
MW-18D	---	---	---	---	---	---	---	ND (5)	ND (5)	0.69	---	---	---	---	---	---	ND (5)	[1500]	2.7
MW-19	---	---	---	ND (20)	ND (20)	7	ND (5)	---	ND (5)	0.88	---	---	3,100	ND (20)	84	ND (5)	---	5.2	1.4
MW-19D (Duplicate of MW-19)	---	---	---	---	---	---	ND (5)	---	---	---	---	---	---	---	---	---	---	---	---
MW-20	---	---	---	---	---	ND (5)	ND (5)	ND (5)	ND (5)	0.87	---	---	---	---	18	7.3	ND (5)	ND (5)	2.2
MW-21	---	---	---	---	---	ND (5)	ND (5)	ND (5)	ND (5)	---	---	---	---	---	8.3	7.5	ND (5)	ND (5)	---
MW-23	---	---	---	---	---	---	---	ND (5)	ND (5)	0.95	---	---	---	---	---	---	ND (5)	8.3	4.4
Dup-1 (Duplicate of MW-23)	---	---	---	---	---	---	---	ND (5)	---	---	---	---	---	---	---	---	---	---	---
MCL	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50

NOTES:

All results reported in micrograms per liter (ug/L), unless indicated otherwise.

--- = No sample collected.

ND ( ) = Not detected at or above detection limit in parentheses.

MCL = Maximum Contaminant Level as specified in 40 CFR 141.

Shaded Values Exceed the Arsenic MCL= 50ug/L

Adopted From Reference 7

Table 11

Well Receptor Survey					
Name	Unique ID #	Use	Depth (ft)	Aquifer	Figure 10 Well Location #
Abbott-Northwestern	112248	domestic	486	Jordan	1
ST-39/MW-6	194847	monitoring	30	surficial	2
ST-25/MW-3	194848	monitoring	29	surficial	3
ST-27/MW-4	194849	monitoring	29	surficial	4
ST-38/MW-5	194850	monitoring	29	surficial	5
Murphy Square	200598	Public Supply	250	St.Peter	6
Stentant School	200600	Public Supply	150	St.Peter	7
Northwestern Hosp.	201082	Public Supply	472	Jordan	8
Northwestern Hosp.	201083	Public Supply	469	Jordan	9
Avalon Theater	201084	Commercial	150	St.Peter	10
Seward School	201085	Commercial	390	Jordan	11
C.M. St.Paul and P.RR. Co.	201086	Industrial	700	Multiple	12
C.M. St.Paul and P.RR. Co.	201087	Industrial	995	Multiple	13
MPLS Moline	201088	Industrial	427	Multiple	14
Longfellow Field	225897	Public Supply	247	Multiple	15
Normandale Triangle	225900	Public Supply	246	Multiple	16
Phillips Tunnel Well	233134	Public Supply	199	Multiple	17
Phillips Sewer Well	233173	Test/Monitoring	200	St. Peter	18
Flour City Architectural	235735	Commercial	384	Jordan	19
Mr.Nibs Bar	242823	Commercial	308	Multiple	20
MPLS Children Hosp.	433286	Air Conditioning	481	Jordan	21
Minneapolis PMW-3	464278	monitoring	16	surficial	22
Sears Robuck & Co.	468064	monitoring	64	surficial	23
Lawrence, Mr. James MW-1	501087	monitoring	22	surficial	24
Lawrence, Mr. James MW-2	501088	monitoring	21	surficial	25
Powderhorn Park	171078	Public Supply	236	St. Peter	26
Foo Chu Café	200532	Commercial	345	Multiple	27
Rialto	200533	Commercial	425	Multiple	28
Powderhorn Park No. 3	200652	Public Supply	302	Jordan	29
Powderhorn Park No. 2	200653	Public Supply	261	Multiple	30
Ceder Ave. Triangle	200599	Public Supply	313	Jordan	31
Clark Oil & Refining	461701	monitoring	62	surficial	32
Carlson Pirie Scott	458669	monitoring	24	surficial	33
Gassen Trust/R. Gassen	472195	monitoring	24	surficial	34
Gassen Trust/R. Gassen	472196	monitoring	24	surficial	35
Gassen Trust/R. Gassen	472197	monitoring	23	surficial	36
Clark Oil & Refining	506321	monitoring	71	surficial	37
Clark Oil & Refining	506322	monitoring	61	surficial	38
Clark Oil & Refining	506323	monitoring	70	surficial	39

Shaded Cells are the nearest down gradient wells

Adopted From Reference 3

Table 12

Parameters Proposed By MDA and Peer In The Derivation Of A Risk Based Remedial Goal For An Industrial Worker Soil Ingestion Exposure Scenario					
Variable	Description	Units	MDA Indoor Worker Only	MDA Indoor/Outdoor Worker Only	Peer Proposed Value
IRS	Ingestion Rate	mg/Kg	50	80	50
SA	Skin Surface Contact Area	cm2/event	3400	3400	5700
AF	Soil to Skin Adherence Factor	mg/cm2	0.13	0.13	0.08
Efb	Dermal Exposure Frequency	unitless	150	150	90

Figures

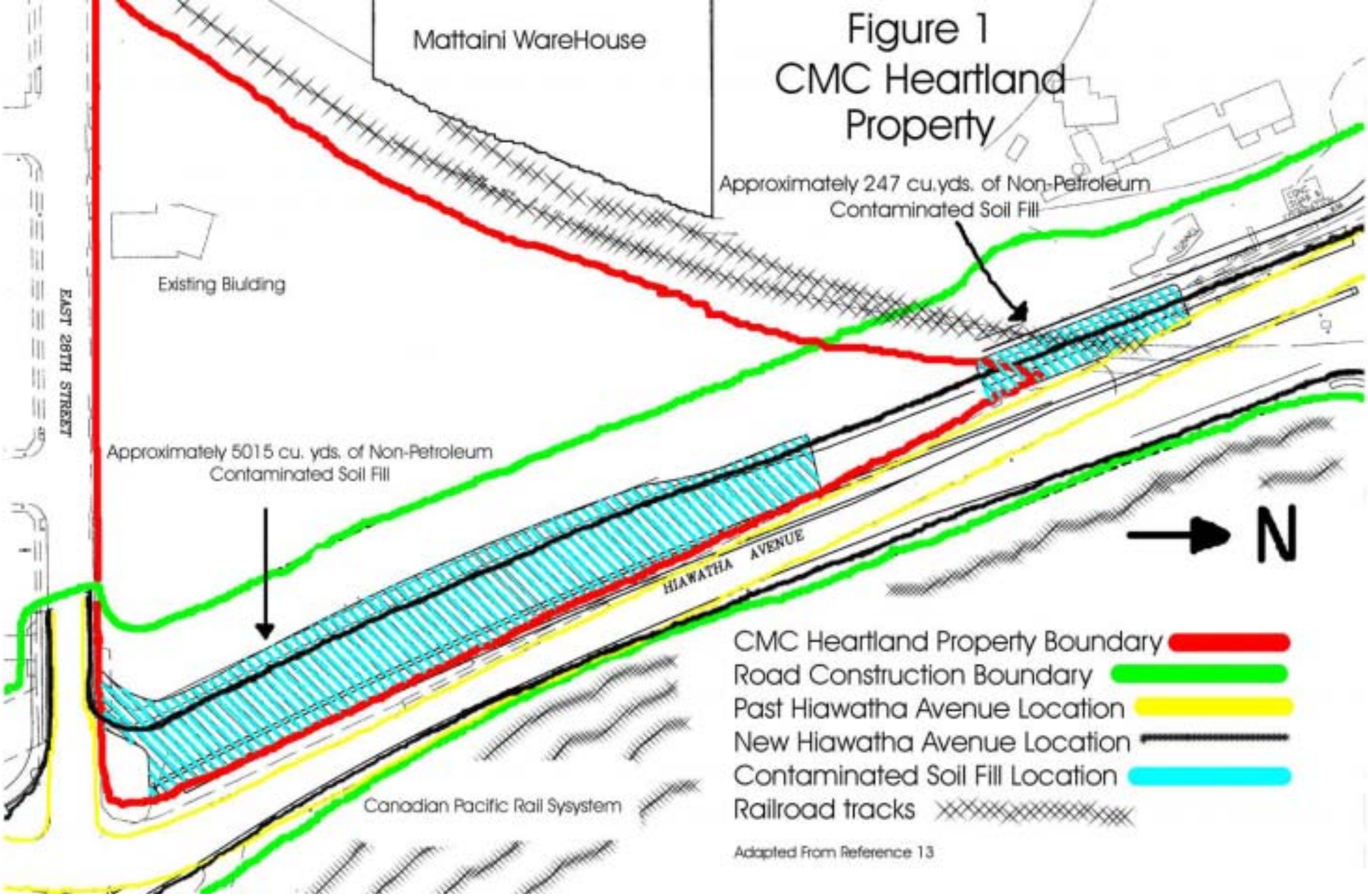


Figure 1
CMC Heartland Property

Figure 2

CMC Heartland

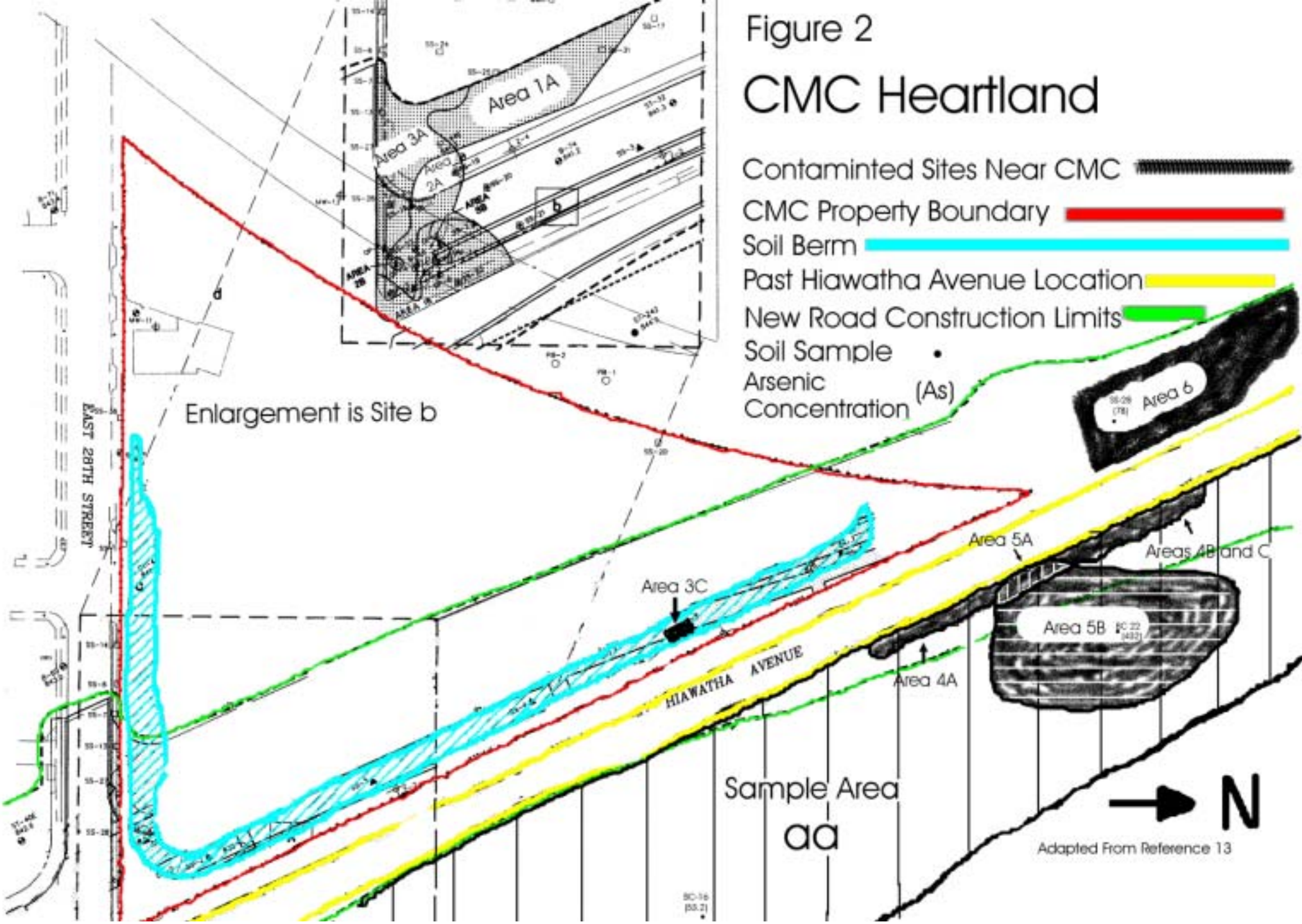
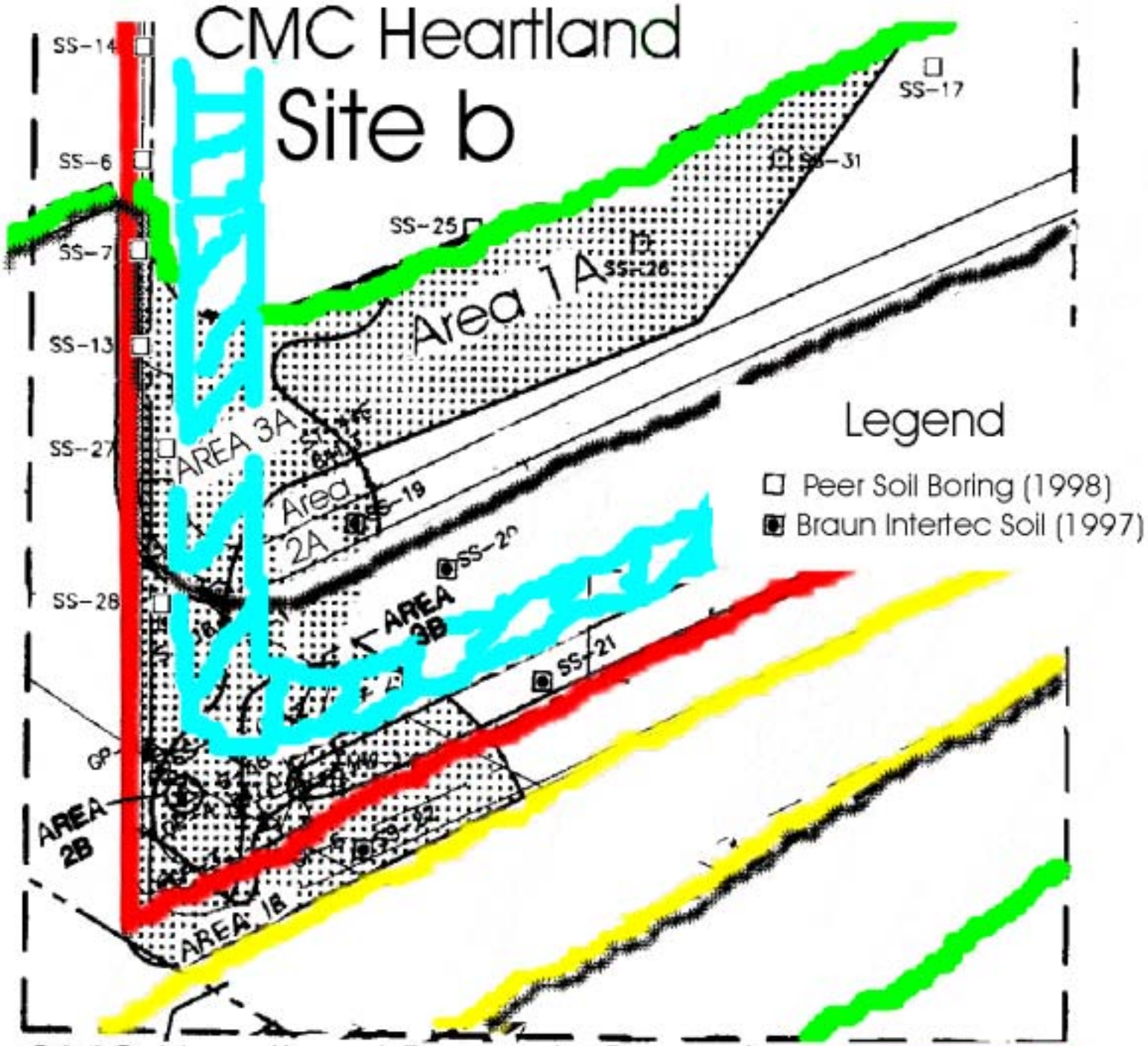


Figure 3
CMC Heartland
Site b



CMC Heartland Property Boundary

Road Construction Boundary

Past Hiawatha Avenue Location

New Hiawatha Avenue Location

Soil Berm Location

Adapted From Reference 13

Figure 4

CMC Soil Arsenic Iso-Concentration Contours (0-0.5 ft depth)

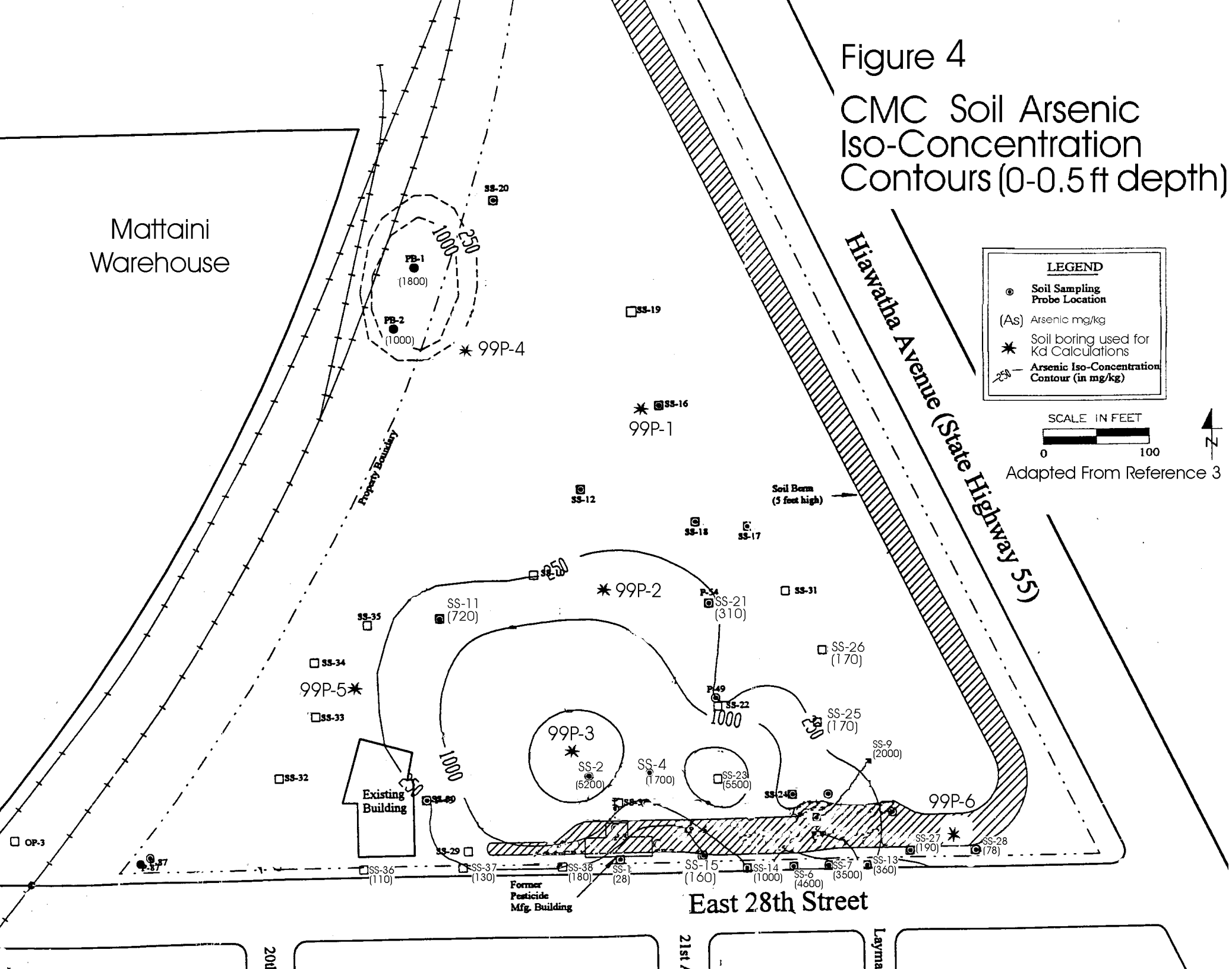


Figure 5
CMC Soil Arsenic Iso-Concentration Contours (1-3ft depth)

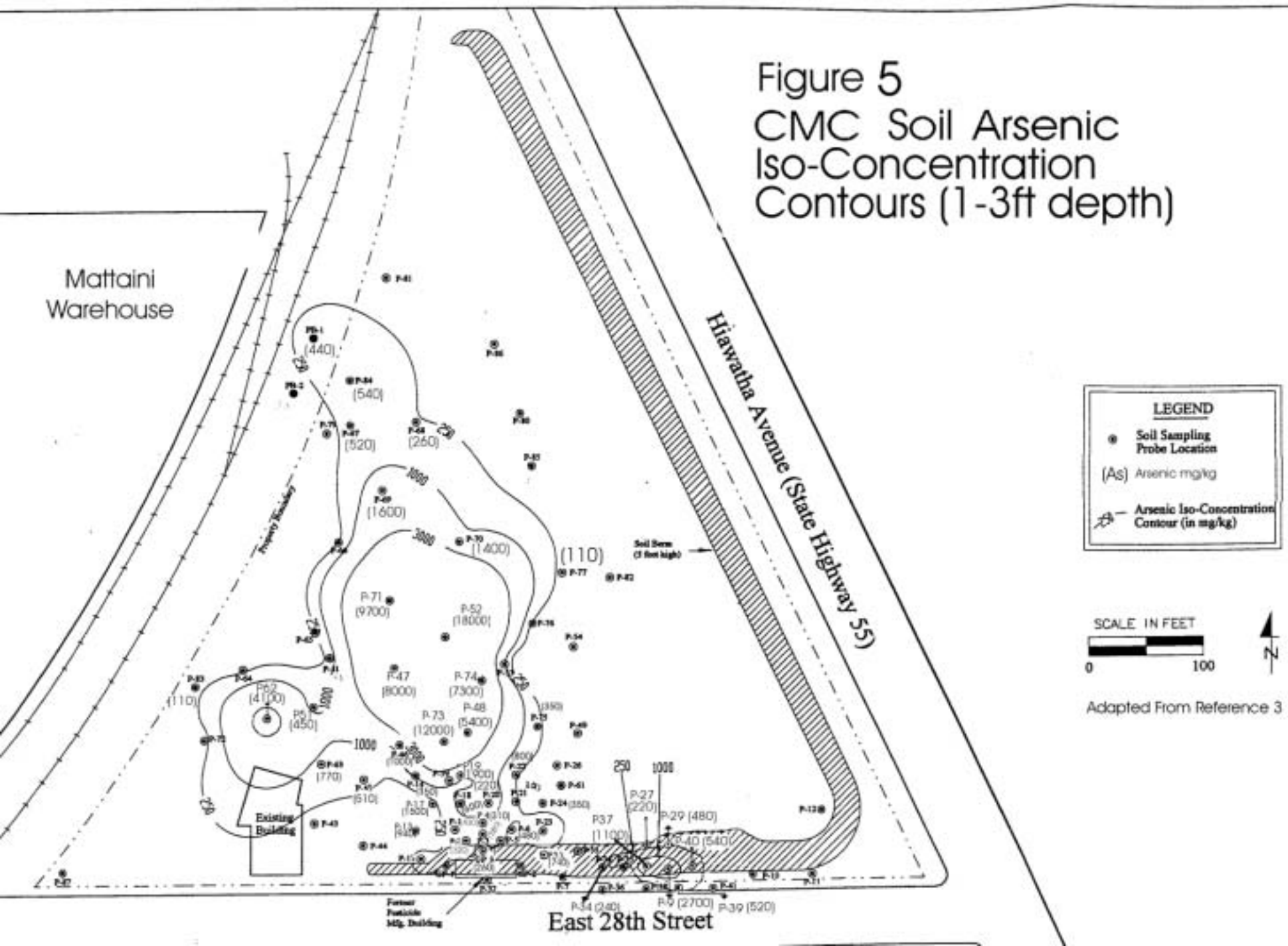
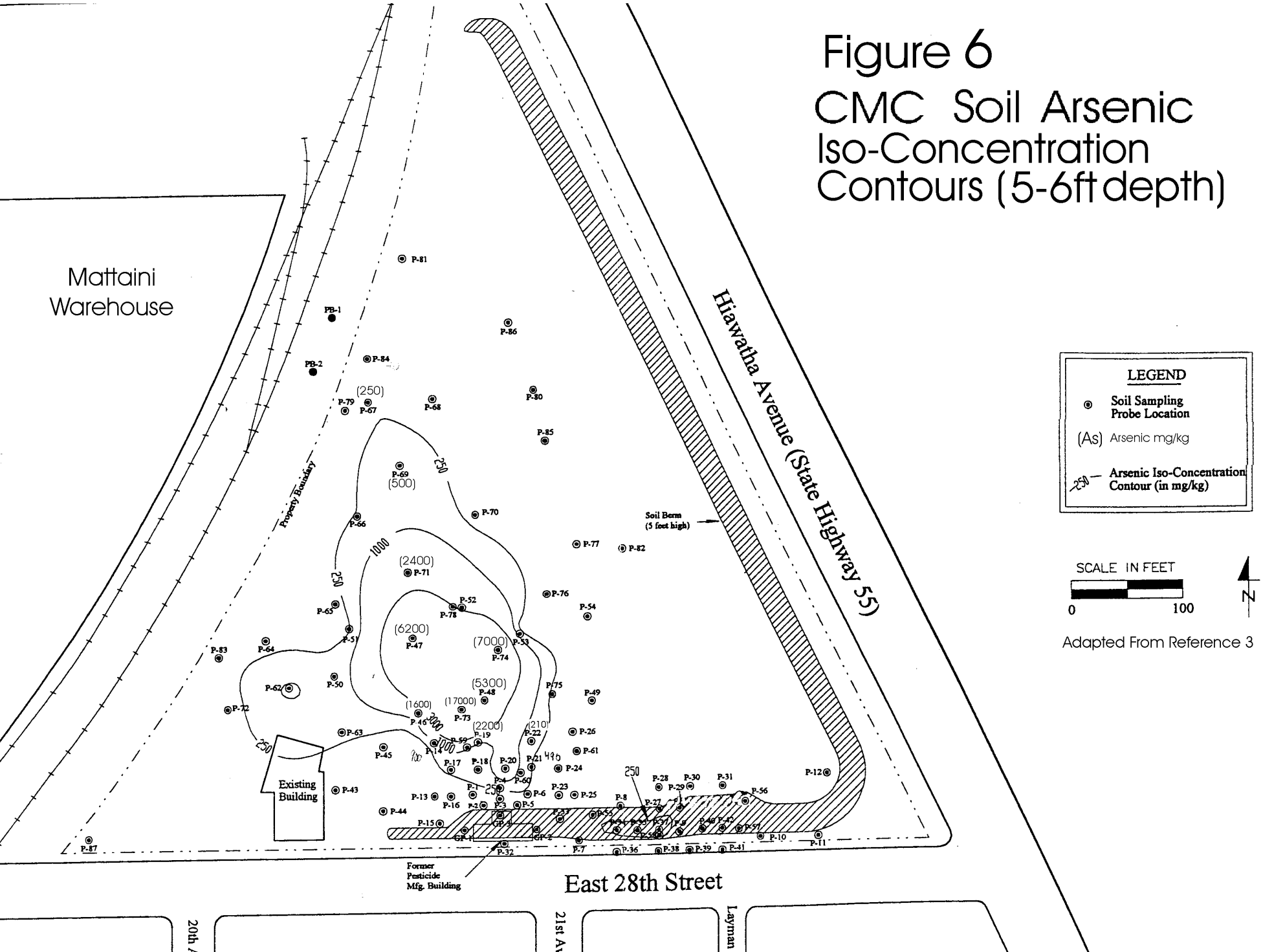


Figure 6
CMC Soil Arsenic Iso-Concentration Contours (5-6ft depth)



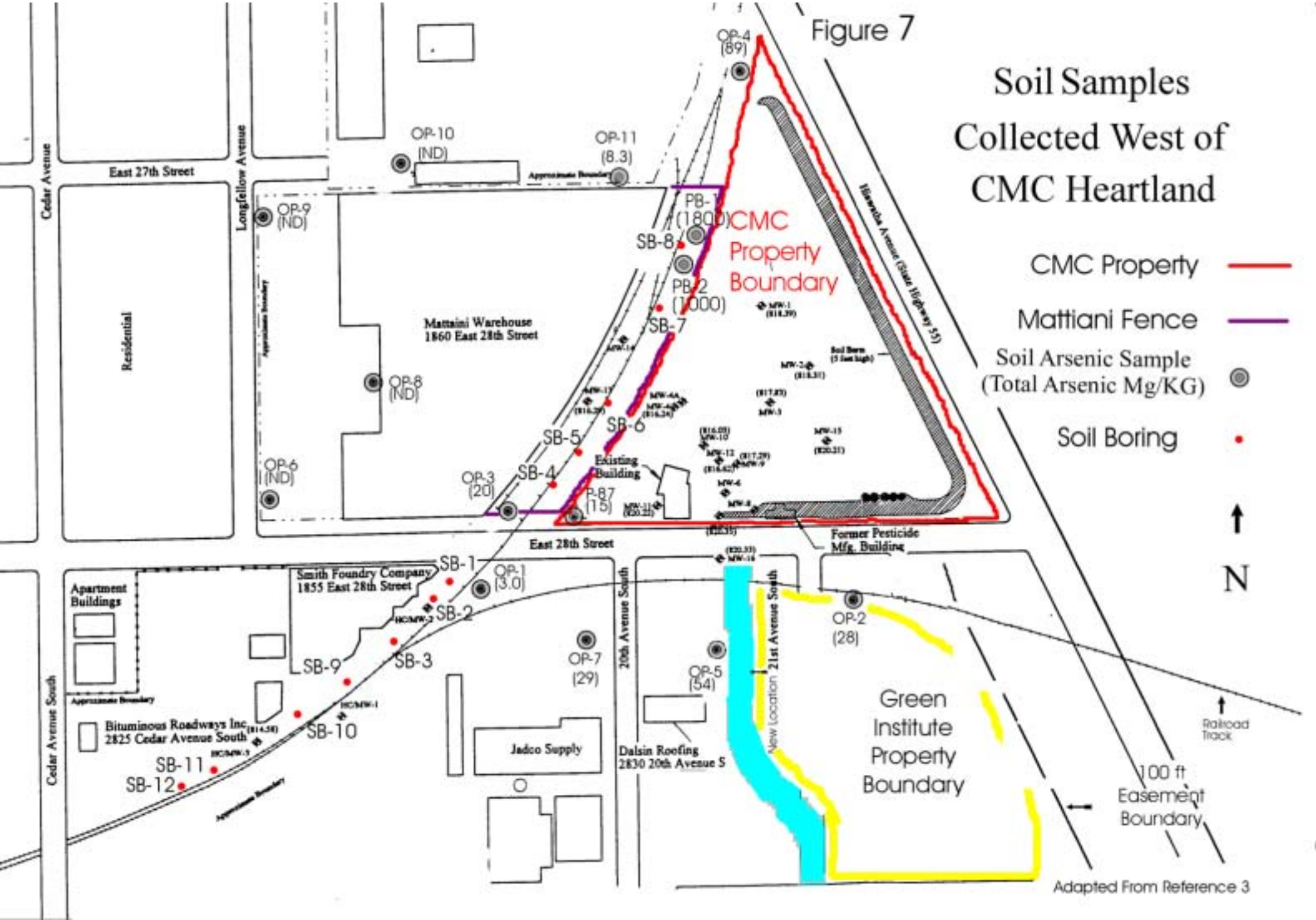


Figure 7
Soil Samples Collected West of CMC Heartland
CMC Property
Mattiani Fence
Soil Arsenic Sample (Total Arsenic Mg/KG)
Soil Boring
N
CMC Property Boundary
Green Institute Property Boundary
100 ft Easement Boundary
Railroad Track
Adapted From Reference 3
East 27th Street
East 28th Street
Cedar Avenue
Cedar Avenue South
Longfellow Avenue
20th Avenue South
21st Avenue South
New Location
Residential
Mattaini Warehouse 1860 East 28th Street
Smith Foundry Company 1855 East 28th Street
Apartment Buildings
Bituminous Roadways Inc 2825 Cedar Avenue South
Jadco Supply
Dalsin Roofing 2830 20th Avenue S
Existing Building
Former Pesticide Mfg. Building
OP-1 (3.0)
OP-2 (28)
OP-3 (20)
OP-4 (89)
OP-5 (54)
OP-6 (ND)
OP-7 (29)
OP-8 (ND)
OP-9 (ND)
OP-10 (ND)
OP-11 (8.3)
PB-1 (1800)
PB-2 (1000)
P-87 (15)
SB-1
SB-2
SB-3
SB-4
SB-5
SB-6
SB-7
SB-8
SB-9
SB-10
SB-11
SB-12

Figure 8 Arsenic Soil Concentrations South of the CMC Property

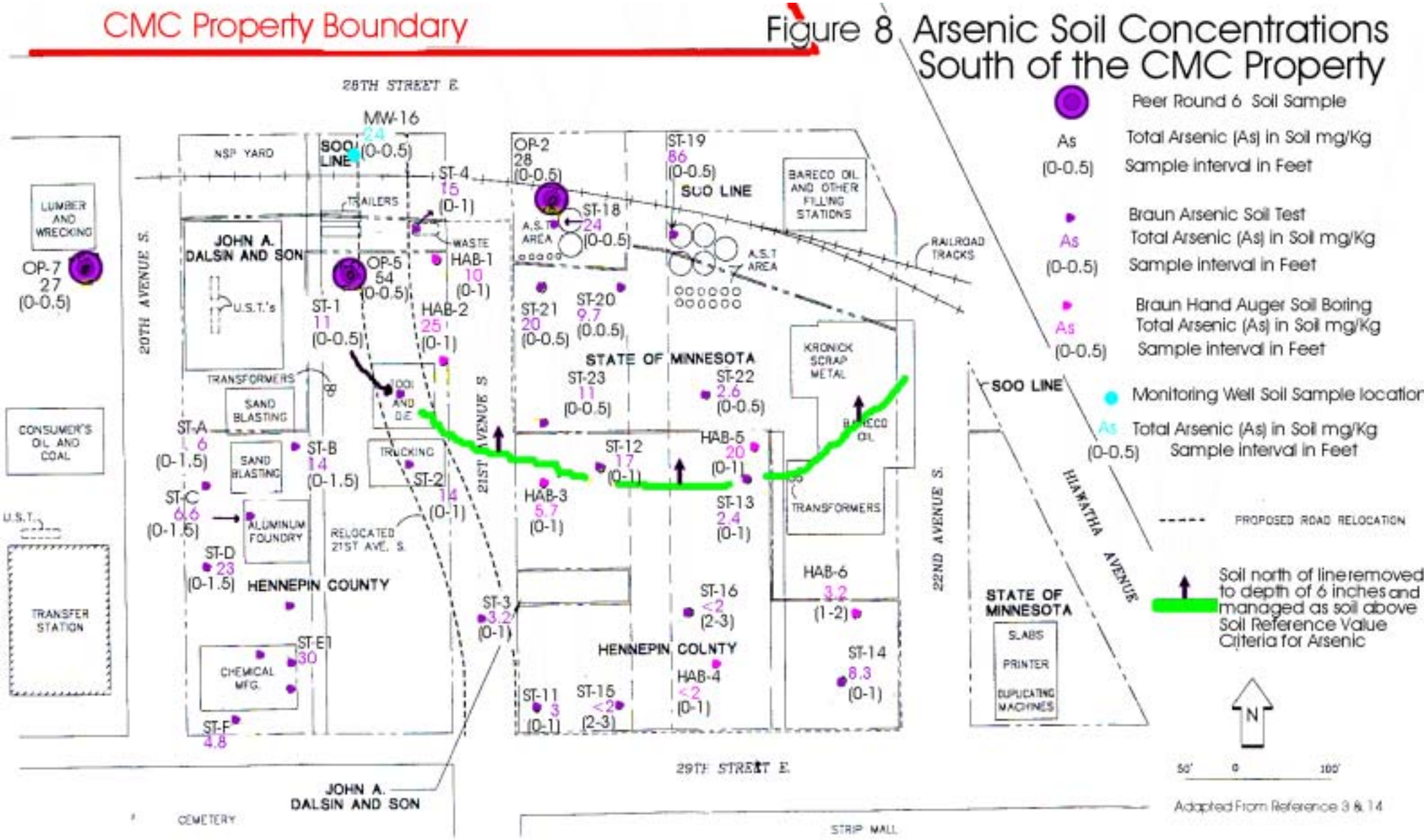


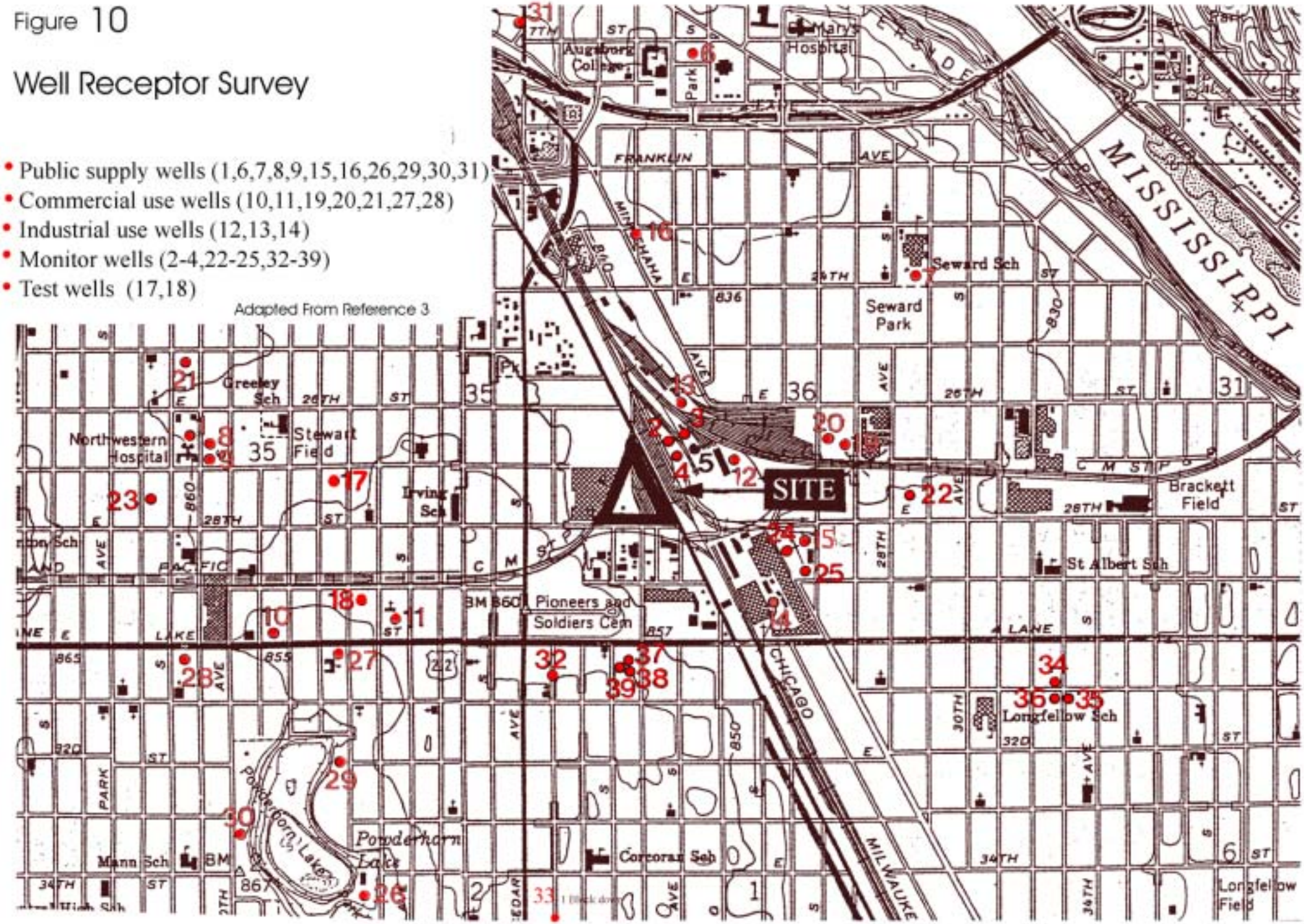
Figure 9 Estimated Extent of Groundwater Arsenic Concentrations Greater than 50 ug/L

Figure 10

Well Receptor Survey

- Public supply wells (1,6,7,8,9,15,16,26,29,30,31)
- Commercial use wells (10,11,19,20,21,27,28)
- Industrial use wells (12,13,14)
- Monitor wells (2-4,22-25,32-39)
- Test wells (17,18)

Adapted From Reference 3



Attachment A
Monitoring Wells Characteristics

Monitoring Well Details				
Well ID/Unique ID #	Hole Depth (feet)	Screen Interval Feet	Static Water Table (feet)	Aquifer
MW-1/ 576216	35	20-30	24	Surficial
HC/MW-1/532266	22	12-22	12.3	Surficial
MW-2/ 576217	33	18-28	24	Surficial
HC/MW-2/532267	22	12-22	12.5	Surficial
MW-3/ 576218	33	23-33	28	Surficial
HC/MW-3/ 532268	20	10-20	10.5	Surficial
MW-4/ 576219	33	22-32	26	Surficial
MW-4A/ 576176	53	48-52	26	Surficial
MW-13/ 576177	31	21-31	25	Surficial
MW-14/ 576178	33	22-32	25	Surficial
MW-15/ 576175	29	19-29	23.5	Surficial
MW-16/ 576179	30	20-30	23	Surficial
MW-17/594026	48	35-45	36	Surficial
MW-17A/594027	52	47-52	35	Surficial
MW-18/594029	53	43-53	48	Surficial
MW-18D/608679	121	113-118	60	St Peter
MW-19/594028	50	40-50	43	Surficial
MW-20/598239	60	50-60	53	Surficial
MW-21/598240	60	50-60	53	Surficial
MW-22/608680	121	112-117	50	St Peter
MW-23/608678	59	47-57	50	Surficial
MW-24/				St Peter

Attachment B

Minnesota Department of Agriculture Letter About
Risk-Based Cleanup Goal Calculations and Parameters

FEB 07 2000

COPY

Minnesota Department of Agriculture

February 3, 2000

(651) 282-2696

Charles Harrison
CMC Heartland Partners
547 West Jackson Boulevard
Chicago, Illinois 60661

RE: COMMENTS ON ADDITIONAL INVESTIGATION –"ROUND 11 REPORT" AND SOIL CLEANUP GOAL PROPOSAL

SITE NAME: CMC HEARTLAND PARTNERS LITE YARD SITE, MINNEAPOLIS
MDA CASE FILE NO.: 95-0100

Dear Mr. Harrison:

Minnesota Department of Agriculture (MDA) Incident Response Unit staff have reviewed the Peer Environmental (Peer) document titled "Additional Investigation – Round 11" (Report) dated August 1999 for the CMC Heartland Partners Lite Yard site (Site). The report includes a soil cleanup goal proposal for contaminated soils on and off the Site.

The MDA staff has the following comments on the proposed soil cleanup goals, which include a MDA revised soil cleanup goal for on-Site soils. The MDA revised soil cleanup goal is considered "conditional" until a written Response Action Plan (RAP) including details on site redevelopment are reviewed and approved by MDA staff.

Health Risk Based Cleanup Goal Proposal

The Report proposes a risk based cleanup goal (RBCG) for arsenic in soil of 47.5 parts per million (ppm). This number is based on the methodology used by the Minnesota Pollution Control Agency (MPCA) and the MDA in developing risk based cleanup numbers. The cleanup goal assumes long-term exposure (via ingestion, dermal contact and inhalation of arsenic on soil particulate) of an industrial worker on Site.

The Report proposes using changes to five (5) exposure parameters based on a USEPA document referenced in the Report. The MDA has reviewed each proposed change to the exposure parameters in light of the referenced USEPA exposure factor guidance document as well as the MPCA Soil Reference Value (SRV) guidance. The five (5) modified exposure factors proposed include; averaging time, ingestion rate, surface contact area, skin adherence factor and unit risk for air. Only the changes to the averaging time and soil ingestion rate were found to be acceptable modifications depending on additional information as described below. The other three factors had very little affect on the final number regardless.

The table in attachment A. shows the Peer proposed RBCG compared with two MDA revised cleanup goal numbers. The two MDA numbers are different only by changing the soil ingestion rate from 50 to 80 mg/day. As described in the MPCA SRV guidance, 50 mg/day is appropriate for indoor workers only (e.g., office workers) as a higher ingestion rate would be more appropriate for workers involved in outdoor work activities. Hence, there is a need to review final Site development plans along with the RAP in order to accurately predict worker (construction and long-term worker) exposure to contaminated soil. The other

default parameters listed under the MDA revised numbers have been determined to be appropriate for estimating worker exposure in a restricted access setting. Note: The MPCA exposure parameters used (listed in attachment A) are based on the same USEPA document cited by Peer with some modifications as deemed appropriate by MPCA's toxicologist. The MDA intends to rely upon the use of default exposure parameters contained in the SRV guidance, recognizing the particular expertise of the MPCA and MDH staff toxicologists in this regard. Please review the MPCA SRV technical support document for a description and explanation of the various exposure parameters.

Soil Leaching Pathway Cleanup Goal Proposal

The Report also describes and proposes an arsenic soil cleanup goal of 47 ppm based on the MPCA Soil Leaching Value (SLV) methodology. The MPCA SLV guidance as well as MDA's approach to developing similar cleanup goals are both based on USEPA's Soil Screening Levels (SSL) guidance with some differences in using various modifying criteria.

The Report describes a site-specific distribution coefficient (Kd) which is a primary or influential factor in the leaching model equation. A leaching equation is used to quantify the extent to which contaminants in soil will migrate to the water table and result in a ground water concentration exceeding some applicable standard at a down gradient receptor (e.g., well, surface water). The Report describes the development of an average Kd value based on leaching data from multiple soil samples from Site. The MDA staff believe the average Kd value used is not appropriate or representative of contaminant leaching based on the following:

- three (3) of the six (6) borings in which soil samples were collected for leaching tests, were installed outside the known source area where the highest soil contamination exists and which is the probable source of ongoing leaching to the groundwater
- leaching data from the top four (4) feet of soil was used which will likely be removed due to human health risk reasons
- the transformed data set of Kd values does not appear to be normally distributed, and therefore the median value of the original data set (using data from below four (4) feet at depth) is a better estimation

The Kd value calculated by Peer (178 L/Kg) was therefore not used and a value of 101 L/Kg was used instead. The MDA staff made other modifications to the leaching equation values as reported in the Table on attachment B. The other modifications to the leaching equation are:

1. The use of the Minnesota Department of Health (MDH) Health Based Value of 20 ug/L for arsenic instead of the MCL of 50 ug/L.
2. A revised fraction of total organic carbon estimate based on removing the one high TOC value reported from the sample 99P-4(0-2).
3. The use of a higher value for the dilution-attenuation factor

The above described revisions made to the leaching equation resulted in a leaching value of 40 ppm. Please contact me if you need additional justification or information involving the modifications made as outlined above.

In summary, some modifications were made to the proposed human health based and leaching based soil cleanup goals. The MDA staff revised Site soil cleanup goal is proposed to be either 30 (based on direct contact) or 40 (leaching based) ppm depending on the final Site redevelopment plans and associated exposures to contaminated soil. The off-Site soil cleanup goal based on the MPCA reference

value of 12 ppm is approved. Please be informed there is a short-term construction worker soil reference value for arsenic of 55 ppm which will be used to protect workers involved in site construction activities where exposure to contaminated soil is likely (e.g., utility trenching, building footings etc.).

The MDA staff request that you and your contractor please submit a final Response/Corrective Action Plan addressing the soil contamination on and off Site. If you have questions about this project or would like to discuss an alternative approach, please contact me at (651) 282-2696 or Roger Mackedanz at 282-2697.

Sincerely,

Michael Loughran, Hydrologist
Incident Response Unit
Agronomy & Plant Protection Division

MJL:jlh

Enclosures

cc: Randall Sippel, Peer
Steve Jansen, Peer
Roger Mackedanz, MDA
Dan Pena, MDH

MDA Letter

Attachment A.

CMC Heartland Partners Lite Yard Site

Human health based soil cleanup goal

$$RBCG = \frac{TR \times AT\ (cancer)}{ED \times [(CSF \times IRS \times 0.75 \times FI \times Efa/\ (BW \times 10E{+}6\ mg/kg)) + (CSF \times SA \times AF \times ABS \times Efb/\ (BW \times 10E{+}6 mg/kg)) + (UR \times Efa \times 1000ug/mg/\ (PEF))]}$$

Variable	Description	Units	Peer proposed Value	MDA indoor workers only Value	MDA Indoor/ outdoor workers Value
RBCG=	allowable concentration of arsenic in soil	mg/kg	**47.50**	**44**	**30**
TR=	target cancer risk	unitless	1.0E-05	1.0E-05	1.0E-05
AT=	cancer effect specific averaging time	days	27375	27375	27375
ED=	exposure duration	years	25	25	25
CSF=	arsenic cancer slope factor	mg/kg/day	1.5	1.5	1.5
IRS=	ingestion rate	mg/day	50	50	80
Climate Conv.=	0.75 of time spent outside	unitless	0.75	0.75	0.75
FI=	fractional intake from contaminanted soil	unitless	1	1	1
Efa=	ingestion and inhalation exposure frequenc	days/year	250	250	250
BW=	body weight	kg	70	70	70
SA=	surface contact area	cm2/event	5700	3400	3400
AF=	skin adherence factor	mg/cm2	0.08	0.13	0.13
ABS=	arsenic dermal absorption factor	unitless	0.03	0.03	0.03
Efb=	dermal exposure frequency	unitless	90	150	150
UR=	unit risk for air	unitless	4.3E-03	4.3E-03	4.3E-03
PEF=	particulate emission factor	ug/m3	3.3E+08	3.3E+08	3.3E+08
Factor Conv=	1.00E+06	mg/kg	1.0E+06	1.0E+06	1.0E+06
Factor Conv=	1.00E+03	ug/l	1.0E+03	1.0E+03	1.0E+03