PHASE I ASSESSMENT OF FILL CHARACTERISTICS

AREA-WIDE ASSESSMENT
SITE ASSESSMENT FUND GRANT AGREEMENT 94-31
MUSKEGON SHORELINE DEVELOPMENT
MUSKEGON, MICHIGAN

PREPARED FOR:

CITY OF MUSKEGON
933 TERRACE STREET
MUSKEGON, MICHIGAN 49443-0536

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EXECUTIVE SUMMARY

Dell Engineering, Inc. and Superior Environmental Corporation have completed a Phase I Assessment of fill materials along the southern shoreline of Muskegon Lake. The primary objectives of this Phase I study were to define the landward extent of fill, to determine the types of fill present, and to obtain preliminary chemical characterization data (metals and PAHs only). This assessment has indicated the presence of fill material along the entire study area. Fill materials generally consist of industrial fill (containing dark-colored foundry sands, slag, core sands, coal, cinders, etc.) or construction fill (containing glass, concrete, wood, metal, etc.). Apparently native soils were generally indicated by orangish-brown sand below either industrial fill, wood debris associated with former lumbering activities, or a peat layer potentially indicative of former wetlands/surface waters. The landward extent of fill materials is illustrated in Figures 1 and 2, and is noted to generally parallel the approximate 1837 shoreline. The fill boundary extends inland most significantly at areas of former surface water bodies (e.g., reported low-lying pond/wetland areas near the Kirksey-Anaconda site and the Dell/SEC dividing line), near Ryerson Creek, and near the south branch of the Muskegon River.

Sampling of the fill material indicates lead is the predominant metal with concentrations exceeding Part 201 residential aquifer protection criteria (in nearly all samples of fill material), and to a lesser extent, cadmium and chromium. Arsenic is the predominant metal in fill samples with concentrations exceeding Part 201 residential direct contact criteria, and to a lesser extent lead. Part 201 industrial direct contact criteria are only exceeded at one (1) sample (for lead only). Samples of apparently native soil within the Dell study area do not indicate an elevated background condition for Michigan 10 metals. Sampling for PAHs indicates detectable concentrations of these parameters in several fill samples; however, Part 201 residential aquifer protection and/or direct contact criteria are exceeded at only four (4) of nineteen (19) samples.

We recommend a Phase II investigation be performed in order to further characterize the fill material, background conditions (in the Superior study area), and potential impacts to groundwater and Muskegon Lake sediments. The scope of the proposed Phase II investigation is documented in the *Phase II Work Plan for Area-Wide Assessment of Fill Characteristics*.

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1.0 INTRODUCTION

A Phase I investigation of historic fill material along the shoreline of Muskegon Lake was performed by Dell Engineering, Inc. (Dell) and Superior Environmental Corporation (Superior) in accordance with an October 1996 *Work Plan for an Area-Wide Assessment of Fill Characteristics* (*Phase I Work Plan*). This work was performed for the City of Muskegon through a Grant from the Michigan Department of Environmental Quality's Site Assessment Fund (SAF) program dated July 14, 1995 (Project 94-31, Muskegon Shoreline Development).

Environmental and historical information reviewed for the *Phase I Work Plan* suggested filling activities were undertaken along the entire lakeshore within the approximate 3-mile Area-Wide study zone. Fill materials along the shoreline have reportedly consisted of sawdust and wood scrap, spent foundry sands, coal cinders, slag materials, coal tars, fly ash, and rubble. While limited environmental information was available for scattered individual sites within the Area-Wide zone, the Phase I investigation was performed to obtain a more generalized distribution of the fill and its characteristics through performance of soil borings and laboratory analysis of soil/fill samples. The Phase I investigation was divided into two (2) equal sections such that both Dell and Superior each covered approximately half of the Area-Wide zone.

Soil borings were limited to properties for which access was available and included City street right-of-ways, the CSX railroad right-of-way, and individual sites included as part of the City's SAF grant.

2.0 OBJECTIVES

The objectives of the Phase I Area-Wide evaluation were as follows:

- Determine, to the extent feasible, the horizontal (landward) and vertical limits of historic fill within the Area-Wide study boundaries;
- Determine the general nature of the historical fill (e.g., types of fill, etc.);
- Determine the contaminant characteristics of the predominant types of fill material;
- Assess the risks to human health and the environment the fill material poses (based on Phase I investigation laboratory results); and
- Make recommendations for a Phase II Area-Wide study which would further evaluate areas requiring additional characterization/investigation in order to adequately characterize risks to human health and the environment.

3.0 METHODOLOGY

3.1 SOIL BORINGS

Soil borings were performed at an approximate station interval of 200 feet along the Area-Wide study zone. At each boring station, multiple soil borings were performed as necessary to define the approximate landward extent of fill (as limited by accessible properties). Utility clearance was obtained at proposed boring locations prior to performing the borings. Soil borings were conducted with stainless steel hand augers and advanced to the water table or to the depth where native soils were encountered, based upon a visual inspection of the samples.

Dell soil borings were identified by the station number (starting at the western end of the Dell study area at the Grand Trunk Terminal Dock site) and the distance north or south of the original boring such that "S-3, 200' S" indicates the sample was collected approximately 200 feet south of the original boring at station S-3. Superior borings were identified by the station number (starting at the western end of the Superior study area at Sixth Street) and the offset number such that "ST2-B2" indicates the sample was collected at the next boring north or south of station ST2-B1.

3.2 SOIL SAMPLING

Soil samples were collected continuously from each soil boring for physical inspection and geologic logging. Soil characteristics are recorded on boring logs included in Appendix A. Samples with apparent volatile organic compound (VOC) impact were screened in the field with a photoionization detector (PID), as discussed in Section 3.2.1. The rationale for samples selected for laboratory analysis is discussed in Section 3.2.2. Sample collection and laboratory analytical procedures are discussed in Section 3.2.3

3.2.1 PID Screening

Samples with apparent VOC impact were screened with a Photovac, MicroTip model HL-2000 PID equipped with a 10.6 eV probe. The PID was calibrated to a benzene equivalent gas and

zeroed to background conditions prior to operation. Screening was performed by placing the sample in a glass jar, shaking the jar to volatilize potential VOCs, and placing the probe in the jar for a direct reading of headspace gas. PID screening results are recorded on boring logs included in Appendix A and discussed further in Section 4.1.

3.2.2 Sample Selection Rationale

At each boring station, generally one (1) soil sample representative of fill materials was collected for laboratory analysis. However, if no obvious fill material was encountered or if fill similar to prior borings was encountered, no soil samples were collected for laboratory analysis at that station. The sample depth did not necessarily correspond with the depth of maximum apparent impact, but was intended to be representative of average characteristics of a given fill type. Apparent railroad subgrade material near the surface (along the existing railroad) was not sampled. In areas where no evidence of industrial-type fill material was apparent, a soil sample was occasionally analyzed to verify "clean" soil.

Based on the evaluation of foundry waste characteristics documented in the *Phase I Work Plan*, contaminants of primary concern in the foundry fill materials are metals and polynuclear aromatic hydrocarbons (PAHs). Thus, analytical parameters for the Phase I study included Michigan 10 metals for each sample (arsenic, barium, cadmium, chromium, copper, lead, mercury, selenium, silver, and zinc). PAHs were also analyzed at select sampling locations believed to be generally representative of the fill type encountered over a given area.

The *Phase I Work Plan* proposed laboratory analysis of one (1) soil sample at each station. However, due to the presence of similar fill at multiple stations, samples were not analyzed from each station. This sampling rationale resulted in laboratory analysis of fifty-six (56) samples for metals and twelve (12) samples for PAHs within the Dell study zone, and twenty-four (24) samples for metals and seven (7) samples for PAHs within the Superior study zone.

As documented in the *Phase I Work Plan*, although other contaminants may be present in the fill (e.g., VOCs, phenolic compounds, formaldehyde, cyanide, polychlorinated biphenyls), these

parameters are felt to be of secondary concern due to their less frequent or undocumented use, and were not analyzed as part of the Phase I study.

3.2.3 Sample Collection & Laboratory Analytical Procedures

Sample collection and laboratory analytical procedures were conducted in conformance with the following documents:

- Michigan Department of Environmental Quality, *Hydrogeologic Study Guidance Document*, Draft, November, 1990;
- Michigan Department of Environmental Quality, *Environmental Response Division, Operational Memorandum #6, Revision 4*, dated September 13, 1995;
- Michigan Department of Environmental Quality, *Quality Assurance for Water and Sediment Sampling*, 1981;
- U.S. Environmental Protection Agency, *Test Methods for Evaluating Solid Wastes*, SW-846, 3rd Edition, November 1986, as amended; and
- U.S. Environmental Protection Agency, *Methods for Chemical Analysis of Water and Wastes*, EPA-600/4-799020, March 1993, as amended.

Samples for laboratory analysis were collected directly from the center portion of the hand auger bucket using a decontaminated trowel, and then placed into the appropriate sample container. Sample containers were then labeled, chain of custody documents completed, and the samples placed in an iced cooler chest for transport to Western Michigan Environmental Services, Inc. (for Dell samples) or Trace Analytical Laboratories, Inc. (for Superior samples) for laboratory analysis. Hand augers and the sampling trowel were decontaminated with deionized water and a non-phosphate detergent prior to and between each boring and sampling event.

3.3 GLOBAL POSITIONING SYSTEM COORDINATES

Soil borings were located on aerial photographs and latitudinal and longitudinal coordinates were determined utilizing global positioning system (GPS) equipment with differential beacon correction for improved accuracy. GPS surveying was performed in order to allow the City of Muskegon to implement boring locations and sampling data into their City-wide GIS system. GPS coordinates were obtained for most boring locations and are included on boring logs (Appendix A). Dell utilized a Garmin 75 and Superior utilized a Magellan NAV DLX-10. Both units were also equipped with differential beacon receivers to improve locational accuracy.

Due to a selective availability (signal degradation implemented by the U.S. Department of Defense), GPS signals are supposed to result in 100 meter accuracy 95% of the time. Differential GPS is supposed to increase the accuracy to as little as 5-10 meters by utilizing Coast Guard beacon transmitter signals. However, the presence of overhead power lines and structural interferences prevented the receipt of the differential beacon signal at several sampling stations, resulting in potential errors of 100 meters. At the Grand Trunk Terminal Dock site, Dell compared horizontal and vertical surveying data to differential GPS readings and the average difference being slightly less than 20 feet (maximum difference was 39 feet and minimum difference was 3 feet). Only one GPS reading fell out of the 5-10 meter accuracy expectation at the Grand Trunk Terminal Dock site.

4.0 DISCUSSION OF FINDINGS

4.1 FILL TYPE/CHARACTERISTICS

4.1.1 Dell Area-Wide

Fill materials encountered in the Dell Area-Wide study zone were generally consistent with expectations based on the *Phase I Work Plan* historical evaluation. As indicated on the soil boring logs, fill materials included apparently clean sands, silts, and clays; wood debris (sawdust and wood chips); foundry wastes (foundry sands, core sands, slag); coal; cinders; and other miscellaneous debris (e.g., metal, concrete, glass, etc.). No obvious coal tars or fly ash were encountered in the fill materials. The boring logs illustrate the apparent depth of fill with a cross-hatch graphic symbol. The fill depths were estimated based on the presence/absence of non-native debris and an assumed original/pre-fill ground surface elevation at/below a significant peat or wood layer (if encountered) or an orangish-brown, fine sand (apparently native).

Borings near the start of the Dell Area-Wide zone (those to the west of Ruddiman Creek) did not encounter consistent foundry-related fill material to the depth of the water table. Where encountered, fill consisted primarily of sand with traces of slag (and railroad subgrade materials) in upper-level soils. Petroleum odors and elevated PID readings (up to 851 ppm) were noted at S-1, -2, -3, and -7. The source of this apparent petroleum impact is unknown but several service stations are in the vicinity.

Borings along the railroad between Ruddiman Creek and Lakeshore Yacht Harbor generally encountered fill material (typically sand with slag and traces of coal, occasional clay) extending approximately to the water table. Petroleum odors were noted in borings along the Amoco Terminal site (S-19 through S-22). No PID readings were obtained since privately-funded site characterization data is publically available.

Several borings in the vicinity of Lakeshore Yacht Harbor encountered significant clay layers, with the clay layer at S-39 extending to at least 12 feet below the ground surface. Borings in the

vicinity of West Michigan Steel identified significant foundry fill material extending approximately to the water table. Petroleum odors were noted in boring S-42 (source unknown).

To the east of West Michigan Steel, near the Waterfront Center and former Shaw Walker facilities, little or no obvious industrial-type fill material was encountered in borings along the railroad and Western Avenue. These borings indicated apparently clean sand; however, where present, fill consisted primarily of sand with traces of slag.

To the east of the former Shaw Walker facility, from Hartshorn Marina to the western boundary of the Dell Area-Wide study at Sixth Street, foundry fill was encountered generally to the water table in borings along the railroad, with apparent fill thicknesses decreasing in borings to the south. Fill material consisted primarily of sand with slag, core sand, foundry sand, coal, and occasional pieces of metal. A layer of wood chips and sawdust approximately 4 feet thick was encountered at S-62, 150' South.

4.1.2 Superior Area-Wide

Fill materials identified in the area assessed by Superior in the Area-Wide study zone are generally characterized as industrial/foundry fill and construction/miscellaneous fill. Fill materials classified as industrial/foundry fill include materials containing dark-colored foundry sands and/or slag. Construction/miscellaneous fill includes predominantly light-colored sands with pieces of concrete, wood chips, metal fragments and glass fragments; indicating non-native materials.

Soil boring logs for each boring advanced by Superior to determine the fill area boundaries are included in Appendix A. The boring logs provide the depth and description of the character of the soils and/or fill materials encountered at each boring location.

Industrial/foundry fill was encountered the entire length of Superior's study zone, from Sixth Street to the South Branch of the Muskegon River. Underlying the industrial/foundry fill materials is either orange-brown sands, believed to be native, or wood debris, believed to be fill

material from the lumbering operations that existed along the south shore of Muskegon Lake in the late 1800s.

The construction/miscellaneous fill was identified from Sixth Street to Ryerson Creek, landward from the foundry fill. Construction/miscellaneous fill was also identified at the north end of the study zone, from Cross Avenue north to the river. At several boring locations, where construction/miscellaneous fill was identified in the near surface, industrial/foundry fill was found below the construction/miscellaneous fill.

Positive PID readings were recorded at three boring locations; ST10-B1 (120 ppm), ST19-B2 (3 ppm) and ST32-B1 (12 ppm). Each of these readings were recorded in saturated soils at the top of the groundwater table. The sources of the indicated VOCs is not known.

4.2 ESTIMATED LANDWARD EXTENT OF FILL

4.2.1 Dell Area-Wide

The estimated landward extent of fill along the lakeshore is illustrated in Figure 1. Fill boundaries are presented for fill extending to the water table (presumably indicative of the former shoreline, creeks, or wetlands) and for the estimated extent of any apparent industrial-type fill (not necessarily extending completely to the water table). It is presumed that fill is present in many areas further landward, but definition of these areas is beyond the scope of this Shoreline Development project. The approximate 1837 shoreline based on a government survey is also illustrated in Figure 1. The 1837 shoreline is expected to be indicative of the natural/pre-filling shoreline; however, due to the age of the survey, its accuracy has been questionable.

To the west of Ruddiman Creek, both fill boundaries generally run along the railroad. The estimated 1837 shoreline is located landward of the fill boundaries in this area. To the east of Ruddiman Creek, both fill boundaries and the estimated 1837 shoreline parallel each other and are

located on the landward side of the railroad. From Lakeshore Yacht Harbor to the former Shaw Walker facility, the estimated 1837 shoreline is located on the landward side of the boundary of fill extending to the water table. The extent of fill apparently extends south onto the Coles Quality Foods and Kirksey-Anaconda properties. Although borings along Western Avenue near the Kirksey-Anaconda property indicated only surface fill, borings performed on the southern portion of the Kirksey-Anaconda property (not within the Area-Wide scope) indicate foundry-type fill material extends down to a layer of sawdust and wood chips just above the water table. This may be attributable to placement of apparently clean fill material along Western Avenue or the former presence of a wetland area on the southern portion of the Kirksey-Anaconda site.

Both fill boundaries are generally on the landward side of the 1837 shoreline and the railroad over the remainder of the Dell Area-Wide study zone. The industrial fill boundary extends significantly south of the railroad and the water table fill boundary near the east end of the study area. A long-time Muskegon resident indicated a creek or pond was present near the intersection of Clay and Seventh Streets in the early 1900s, as suggested by the fill boundary in this area.

4.2.2 Superior Area-Wide

Figure 2 illustrates the fill boundaries in the study zone assessed by Superior. The boundaries of the two classifications of fill materials, industrial/foundry and construction/miscellaneous fill, are depicted on Figure 2.

In the area between Sixth Street (ST1) and Pine Avenue (ST14) the industrial/foundry fill boundary generally lies between the railroad tracks and the 1837 shoreline. In this same area construction/miscellaneous fill material was encountered landward of the industrial/foundry fill.

Ryerson Creek crosses Western Street between Eastern Avenue and Spring Street. The drainage area of the stream, east of Western Street and west of Wood Street, has been filled primarily with

industrial/foundry fill. Construction/miscellaneous fill is also present in the eastern portion of this area. Fill boundaries in this area were determined based on borings performed during investigation of the Farmer's Market site.

Between Eastern Avenue (ST16) and Cross Avenue (ST30) the fill material consists of industrial/foundry fill and parallels the southeast side of Western Street, landward of the 1837 shoreline and the railroad tracks. Between Cross Avenue (ST30) and the South Branch of the Muskegon River (ST37) the industrial/foundry fill continues to roughly parallel Western Street. Construction/miscellaneous fill is found in this area, north of ST30, between Western Street and Muskegon Avenue.

4.3 ANALYTICAL RESULTS

Analytical results for metals and PAHs are summarized in Tables 1 and 2, respectively. Laboratory analytical reports are included in Appendix B. Tabulated sampling results are compared to appropriate generic residential cleanup criteria established under Part 201 of Act 451, P.A. 451 of 1994, as amended. Applicable criteria are aquifer protection and direct contact values. Aquifer protection criteria are the higher of 20× drinking water values, soil/water partitioning values, and background default values. No site-specific leach tests or calculation of site-specific background values was performed.

As indicated in Table 1, all metals analyzed for were present at detectable concentrations in one or more of the eighty (80) samples. Metals present at concentrations exceeding residential cleanup criteria include cadmium, chromium, lead, arsenic, and mercury. Aquifer protection criteria were exceeded for the following metals: cadmium in seven (7) samples, chromium in eight (8) samples, lead in fifty-five (55) samples, arsenic in one (1) sample, and mercury in one (1) sample. Residential direct contact criteria were exceeded for lead in three (3) samples and arsenic in fifteen (15) samples. These analytical results are illustrated with color codes in Figures 1 and 2.

As indicated in Table 2, PAHs were present at detectable concentrations in fifteen (15) of the nineteen (19) samples on which PAH analysis was performed. Aquifer protection criteria were exceeded in only one (1) sample, and only for phenanthrene. Residential direct contact criteria were exceeded in four (4) of the samples for benzo(a)pyrene, and/or dibenzo(a,h)anthracene. Areas with PAH exceedences are also illustrated with color codes in Figures 1 and 2.

Although the PAH analysis on several samples resulted in detection limits slightly exceeding target values, all detection limits were less than applicable cleanup criteria.

Analytical results for samples with residential direct contact criteria exceedences were also compared to commercial and industrial direct contact criteria to evaluate potential exposure risks in these land use scenarios. Commercial direct contact criteria are exceeded only for lead in three (3) samples (ST4-B1, ST27-B1, and ST29-B1). Industrial direct contact criteria are exceeded only for lead in one (1) sample (ST29-B1).

Analytical results were compared to inhalation criteria presented in the ERD document entitled *Training Material for Part 201 Criteria*, January 1998, as updated March 1998. None of the generic infinite source volatile soil inhalation criteria were exceeded for PAHs, and none of the generic particulate soil inhalation criteria were exceeded for PAHs or metals (100 acre source size).

4.4 EVALUATION OF SAMPLE CHARACTERISTICS VS. ANALYTICAL RESULTS

4.4.1 Dell Area-Wide

Samples on which laboratory analysis was performed can be generally broken down into three (3) categories: apparently native soil, apparent fill material without evidence of industrial/foundry-type wastes, and fill material with apparent industrial/foundry-related waste components. Table 3

summarizes the soil characteristics and apparent category/soil type for each sample on which laboratory analysis was performed.

In samples of apparently clean, native sand (deeper samples at S-3, 200' S; S-8, 200' S; S-11, 30' N; S-12, 200' S; S-15, 60' N; S-38; S-46; S-48, 175' S; and S-54, 125' S), no PAHs or metals were present at concentrations exceeding cleanup criteria with the exception of S-54, 125' S. This sample, which contained lead at a concentration of 28 ppm (exceeding the aquifer protection criterion of 21 ppm), may have been impacted from foundry fill immediately above the sample interval. The lead concentration could also be indicative of a natural background condition. Although the sample from S-8, 200' S appeared to be clean, native sand, some PAH parameters were present at detectable concentrations (however, no cleanup criteria were exceeded).

Samples of apparently clean fill material were identified based on the lack of industrial/foundry-related waste and the presence of an underlying peat/wood layer or orangish-brown sand believed to be representative of the original/pre-fill ground surface. Deeper samples from S-3, 30' N; S-17; S-29; and S-52 fell into this category. Analytical results for these samples indicated no exceedences for metals or PAHs.

In fill samples with obvious industrial/foundry-related waste, one or more metals were generally present at concentrations exceeding cleanup criteria, with exceptions noted at S-19, -23, -27, -37, -38, -40, -44, -45, and S-57, 80' S (which generally contained only a trace of apparent foundry fill). It should be noted that five (5) of the six (6) arsenic criteria exceedences were in the initial thirteen (13) stations. These samples all had significant quantities of slag. Since all apparently native soil samples had arsenic concentrations less than 1 ppm, the detection of arsenic is likely due to industrial processes, as opposed to a native background condition. Where analyzed, PAHs were present in all samples with apparent industrial/foundry-related fill material except S-19, S-37, and S-44. The two (2) samples with PAH exceedences were collected from areas with slag, cinders, and/or coal.

4.4.2 Superior Area-Wide

In Superior's study area, soil samples were collected for analysis from both the industrial/foundry fill area and the construction/miscellaneous fill area. Samples from the construction/miscellaneous fill area were predominantly collected from material that indicated the presence of foundry sands or slag (industrial/foundry fill is generally present beneath the construction/miscellaneous fill). The exception was the sample from ST4-B1, which was taken from construction/miscellaneous fill that did not indicate the presence of foundry material.

The characteristics of each sample, the depth from which the samples were collected and the contaminants that exceed MDEQ residential cleanup criteria are summarized in Table 3. Metals were detected in each of the twenty-four (24) samples analyzed at concentrations that exceed residential cleanup criteria. Exceedences are noted for lead, arsenic, cadmium, chromium, and mercury.

Arsenic concentrations at the following nine (9) samples exceed residential criteria: ST6-B1, ST13-B1, ST13-B4, ST17-B1, ST19-B1, ST25-B1, ST29-B1, ST32-B1 and ST37-B2. Arsenic levels at these nine (9) boring locations ranged from 7.3 mg/kg in sample ST19-B1 to 40 mg/kg in sample ST32-B1. All nine (9) of these samples were collected from the industrial/foundry fill area. No samples collected from the construction/miscellaneous fill area exceed residential criteria for arsenic. In general, arsenic levels were higher in the industrial/foundry fill material located north of Ryerson Creek.

Lead was detected at concentrations exceeding residential direct contact criteria in three (3) soil samples; ST4-B1, ST27-B1 and ST29-B1. The concentrations of lead in these three (3) samples ranged from a low of 450 mg/kg at ST27-B1 to a high of 1,300 mg/kg at ST29-B1. Sample ST4-B1 was taken from the construction/miscellaneous fill area, as discussed above. ST27-B1 and ST29-B1 were both taken from industrial/foundry fill material. No distinction could be made

between the range of lead levels observed in the industrial/foundry fill and those in the construction/miscellaneous fill area.

Most of the exceedences of residential criteria for cadmium and chromium were obtained in samples collected from the industrial/foundry fill material area. Only two (2) out of seven (7) samples from the construction/miscellaneous fill area contained metals other than lead at concentrations exceeding residential criteria (ST12-B7 with cadmium and chromium, and ST12-B8 with mercury).

Seven (7) soil samples were analyzed for PAHs; six (6) samples from the industrial/foundry fill area and one (1) sample from the construction/miscellaneous fill area. Concentrations of individual PAH compounds that exceed residential criteria were detected in two (2) of the six (6) samples from the industrial/foundry fill area; ST2-B2 and ST27-B1. Both of these samples were collected from the industrial/foundry fill area. The sample collected from the construction/miscellaneous fill area, ST12-B8, had no PAH compounds that exceeded residential criteria.

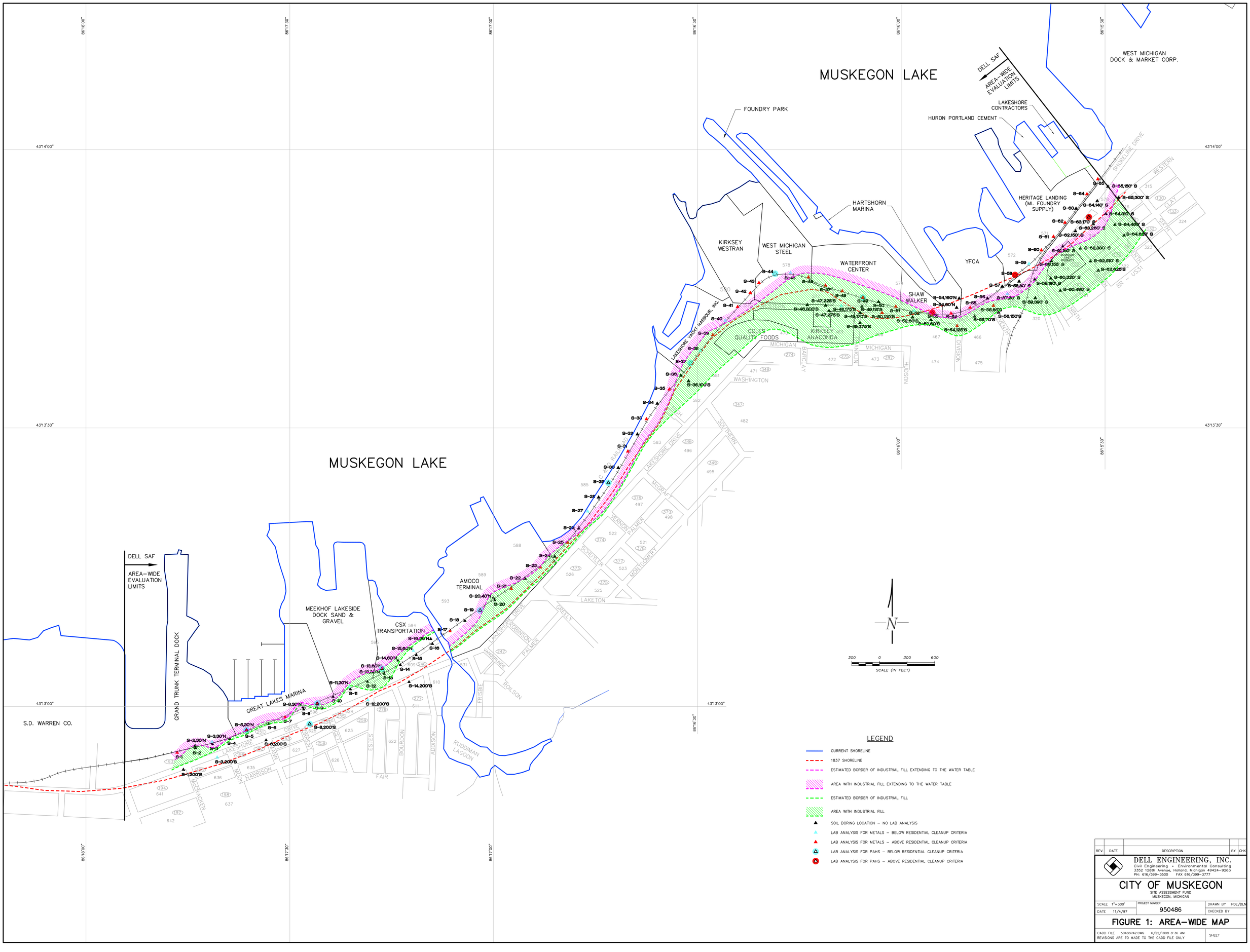
5.0 CONCLUSIONS & RECOMMENDATIONS

The Phase I Area-Wide assessment of fill along the southern shoreline of Muskegon Lake has indicated the presence of fill material along the entire study area. Fill materials generally consist of industrial fill (containing dark-colored foundry sands, slag, core sands, coal, cinders, etc.) or construction fill (containing glass, concrete, wood, metal, etc.). Apparently native soils were generally indicated by orangish-brown sand below either industrial fill, wood debris associated with former lumbering activities, or a peat layer potentially indicative of former wetlands/surface waters. The landward extent of fill materials is noted to generally parallel the approximate 1837 shoreline. The fill boundary extends inland most significantly at areas of former surface water bodies (e.g., reported low-lying pond/wetland areas near the Kirksey-Anaconda site and the Dell/SEC dividing line), near Ryerson Creek, and near the south branch of the Muskegon River.

Sampling of the fill material indicates lead is the predominant metal with concentrations exceeding Part 201 residential aquifer protection criteria (in nearly all samples of fill material), and to a lesser extent, cadmium and chromium. Arsenic is the predominant metal in fill samples with concentrations exceeding Part 201 residential direct contact criteria, and to a lesser extent lead. Part 201 industrial direct contact criteria are only exceeded at one (1) sample (for lead only). Samples of apparently native soil within the Dell study area do not indicate an elevated background condition for Michigan 10 metals. Sampling for PAHs indicates detectable concentrations of these parameters in several fill samples; however, Part 201 residential aquifer protection and/or direct contact criteria are exceeded at only four (4) of nineteen (19) samples.

We recommend a Phase II investigation be performed in order to further characterize the fill material, background conditions (in the Superior study area), and potential impacts to groundwater and Muskegon Lake sediments. The scope of the proposed Phase II investigation is documented in the *Phase II Work Plan for Area-Wide Assessment of Fill Characteristics*.

FIGURES



LEGEND

- CURRENT SHORELINE
- 1837 SHORELINE
- ESTIMATED BORDER OF INDUSTRIAL FILL EXTENDING TO THE WATER TABLE
- AREA WITH INDUSTRIAL FILL EXTENDING TO THE WATER TABLE
- ESTIMATED BORDER OF INDUSTRIAL FILL
- AREA WITH INDUSTRIAL FILL
- SOIL BORING LOCATION – NO LAB ANALYSIS
- LAB ANALYSIS FOR METALS – BELOW RESIDENTIAL CLEANUP CRITERIA
- LAB ANALYSIS FOR METALS – ABOVE RESIDENTIAL CLEANUP CRITERIA
- LAB ANALYSIS FOR PAHS – BELOW RESIDENTIAL CLEANUP CRITERIA
- LAB ANALYSIS FOR PAHS – ABOVE RESIDENTIAL CLEANUP CRITERIA

REV.	DATE	DESCRIPTION	BY	CHK

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CITY OF MUSKEGON

SITE ASSESSMENT FUND
MUSKEGON, MICHIGAN

SCALE 1"=300'	PROJECT NUMBER	DRAWN BY PDE/DLN
DATE 11/4/97	950486	CHECKED BY

FIGURE 1: AREA-WIDE MAP

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REVISIONS ARE TO MADE TO THE CADD FILE ONLY

SHEET

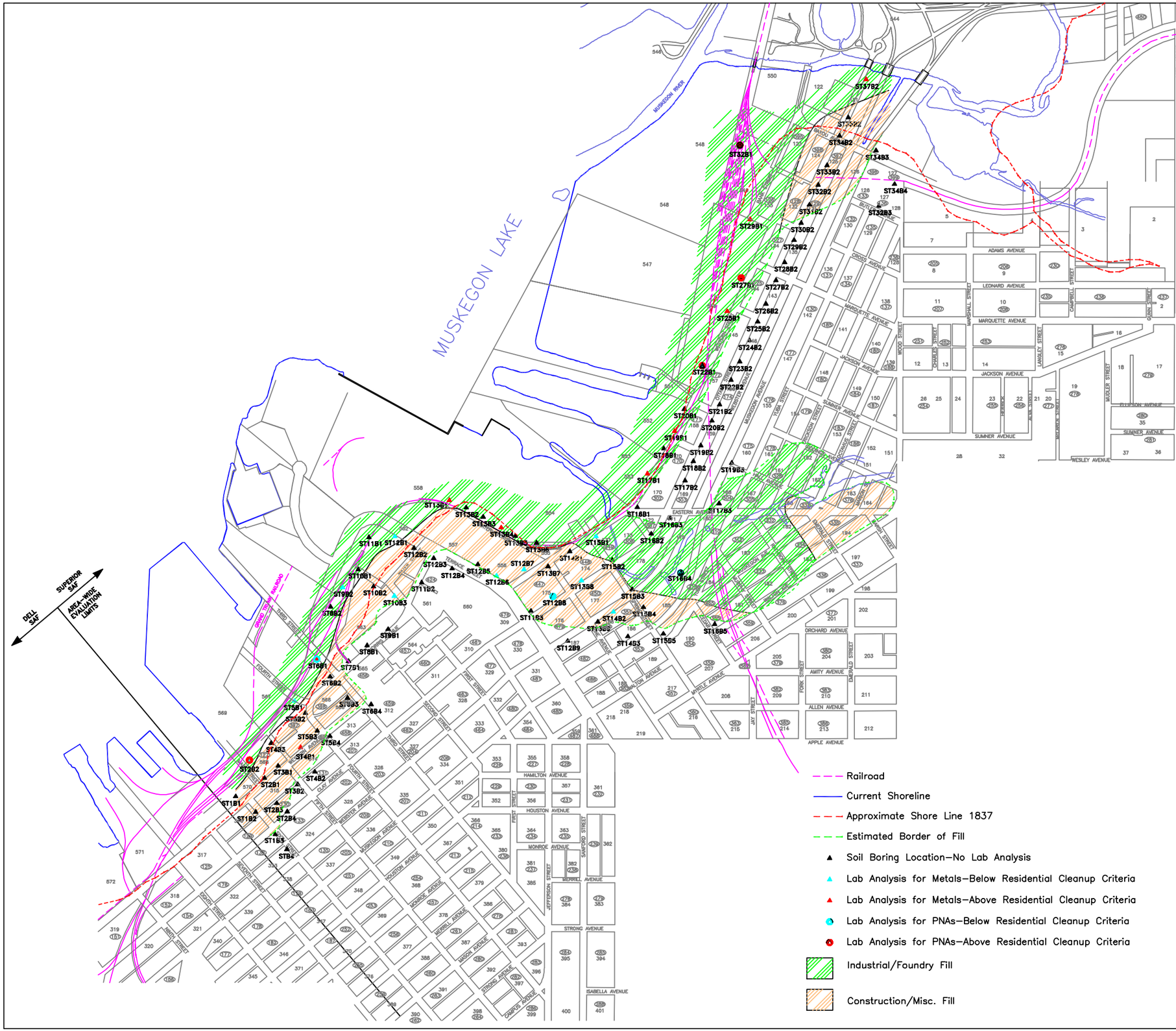

FIGURE 2

Drawing Title

City of Muskegon
Soil Boring Locations

Project Location

City of Muskegon
Area Wide
Muskegon County, Michigan

Date Drawn	3/25/98	Scale	as shown
Revision Date	jm 08/23/99	Project Mgr.	SM
Drawn By	Sheet No.	Drawing No.	
MC	8	MK1246-E0	

Superior ENVIRONMENTAL CORP

TABLES

TABLE 1 (Page 1 of 5)

SOIL SAMPLING RESULTS FOR METALS

City of Muskegon
Area Wide Study
Muskegon, Michigan

Boring Location	Depth (feet)	Sample Date	PARAMETER & CONCENTRATION (mg/kg)									
			Silver	Barium	Cadmium	Chromium	Copper	Lead	Zinc	Arsenic	Selenium	Mercury
S-1	1' - 2'	12/18/96	<0.26	62	0.053	7.0	20	31	28	**9.1**	0.70	0.15
S-3, 200'S	2' - 3'	2/25/97	<0.28	4.0	0.018	0.38	0.36	0.3	4.7	0.064	<0.030	<0.022
S-3, 30' N	2' - 3'	12/17/96	<0.26	5.0	<0.0026	1.3	1.6	2.2	4.9	0.42	0.022	<0.016
S-5, 30' N	2' - 3'	12/17/96	<0.26	45	2.7	14	59	9.6	250	**9.6**	0.27	0.077
S-7	2' - 3'	12/17/96	<0.26	44	0.076	7.3	26	77	93	**8.3**	<0.026	0.059
S-8, 200' S	3' - 4'	2/25/97	<0.28	14	0.37	2.6	4.9	19	22	0.69	<0.030	0.084
S-9	1.5' - 2.5'	12/17/96	<0.26	210	8.1	13	59	150	280	**16**	0.56	0.86
S-11, 30' N	1' - 2'	12/18/96	<0.26	58	0.018	2.2	2.6	3.7	24	0.87	0.049	<0.016
S-12, 200' S	2.5' - 3.5'	2/25/97	<0.28	5.6	0.0052	1.1	0.87	1.3	2.0	0.14	0.044	<0.022
S-13, 60' N	2' - 3'	12/18/96	<0.26	29	<0.0026	5.5	66	20	13	**7.0**	0.59	0.073
S-15, 60' N	3' - 4'	12/18/96	<0.26	7.3	<0.0026	2.4	1.9	2.2	6.3	0.66	<0.026	<0.016
S-17	0.5' - 1.5'	2/20/97	<0.39	44	0.03	4.6	20	320	40	3.3	0.28	0.15
S-17	3' - 4'	4/14/97	<0.25	8.0	0.29	1.7	1.9	4.0	6.2	0.47	<0.025	<0.0091
S-19	1.0' - 2.0'	2/20/97	<0.39	8.7	0.034	2.2	2.9	5.8	15	0.77	0.041	<0.018
S-21	0.0' - 1.0'	2/20/97	<0.39	38	0.067	3.9	45	99	150	3.4	0.61	1.0
S-23	0.0' - 1.0'	2/20/97	<0.39	31	0.028	3.0	15	35	31	2.1	0.21	0.05
S-23	3.5' - 4'	4/14/97	<0.25	7.1	0.31	2.2	3.9	5.3	6.4	1.3	0.12	<0.0091
S-25	3' - 4'	2/21/97	<0.28	14	0.49	2.7	9.5	33	23	0.86	0.13	0.2
CLEANUP CRITERIA[1]	Aquifer Protection[2]		4.5	1,300	6.0	30	160,000	21	2,400	23	4.1	1.7
	Direct Contact		2,000	30,000	210	2,000	16,000	400	140,000	6.6	2,100	130

NOTES:

- [1]Part 201 generic residential values per the ERD document entitled *Training Material for Part 201 Cleanup Criteria*, January 1998, as updated March 1998.
- [2] Cleanup criteria are the less restrictive of 20×drinking water, soil/water partitioning, and background default values.
- Shaded results exceed referenced aquifer protection criteria.
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TABLE 1 (Page 2 of 5)

SOIL SAMPLING RESULTS FOR METALS

City of Muskegon
Area Wide Study
Muskegon, Michigan

Boring Location	Depth (feet)	Sample Date	PARAMETER & CONCENTRATION (mg/kg)									
			Silver	Barium	Cadmium	Chromium	Copper	Lead	Zinc	Arsenic	Selenium	Mercury
S-27	3.5' - 4.0'	2/21/97	<0.28	13	0.69	3.6	10	11	95	0.99	<0.030	<0.022
S-29	2' - 3'	2/21/97	<0.28	17	0.52	5.6	5.3	3.7	11	0.68	0.071	<0.022
S-31	2' - 3'	2/21/97	<0.28	43	<0.28	0.69	21	27	70	<0.030	<0.030	0.19
S-33	1' - 2'	2/21/97	<0.28	39	1.4	8.7	26	36	37	3.0	0.16	0.039
S-35	2' - 3'	2/21/97	<0.28	43	1.4	9.2	21	31	53	1.3	0.14	0.12
S-37	1.0' - 2.0'	3/7/97	<0.38	25	1.3	6.0	24	16	18	2.1	<0.38	<0.019
S-38	2.0' - 3.0'	3/7/97	<0.38	26	1.0	7.9	17	12	34	2.0	<0.38	0.021
S-38	4.0' - 5.0'	3/26/97	<0.32	3.7	0.011	2.3	1.0	0.082	4.4	0.54	<0.032	<0.020
S-39	1.0' - 1.5'	3/7/97	<0.38	50	2.0	12	32	83	140	4.0	0.86	0.048
S-40	2.5' - 3.5'	3/10/07	<0.38	22	0.95	4.5	15	15	19	2.0	0.57	0.02
S-41	1.0' - 2.0'	3/10/97	<0.38	18	0.91	24	75	55	17	3.4	<0.38	0.043
S-42	2.0' - 2.5'	3/10/97	<0.38	51	4.6	24	75	360	97	4.6	0.42	0.021
S-43	3.0' - 4.0'	3/10/97	<0.38	7.8	1.1	6.0	8.4	22	11	0.95	<0.38	0.035
S-44	3.0' - 4.0'	3/10/97	<0.38	7.9	1.8	7.4	10	16	26	2.3	<0.38	0.032
S-45	4.5' - 5.0'	3/10/97	<0.38	7.1	1.5	3.3	23	15	22	1.5	<0.38	<0.019
S-46	1.0' - 2.0'	3/10/97	<0.38	47	11	11	34	52	120	**7.0**	<0.38	0.12
S-46	3' - 4'	3/26/97	<0.32	5.5	0.021	2.0	0.81	0.15	5.4	0.59	0.096	<0.020
CLEANUP CRITERIA[1]	Aquifer Protection[2]		4.5	1,300	6.0	30	160,000	21	2,400	23	4.1	1.7
	Direct Contact		2,000	30,000	210	2,000	16,000	400	140,000	6.6	2,100	130

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TABLE 1 (Page 3 of 5)

SOIL SAMPLING RESULTS FOR METALS

City of Muskegon
Area Wide Study
Muskegon, Michigan

Boring Location	Depth (feet)	Sample Date	PARAMETER & CONCENTRATION (mg/kg)									
			Silver	Barium	Cadmium	Chromium	Copper	Lead	Zinc	Arsenic	Selenium	Mercury
S-47	1.0' - 2.0'	3/10/97	<0.38	25	0.94	5.0	21	27	27	1.5	<0.38	0.03
S-48	1.0' - 1.5'	3/10/97	<0.38	26	1.4	5.8	24	61	76	2.7	0.47	0.045
S-48, 175' S	6' - 7'	3/12/97	<0.26	6.7	0.025	8.1	2.2	<0.26	8.0	0.68	<0.026	<0.021
S-49	1.0' - 2.0'	3/10/97	<0.38	23	26	4.3	20	72	47	1.8	<0.38	0.1
S-50, 130' S	2' - 3'	3/11/97	<0.26	31	1.2	8.6	10	34	36	1.2	0.068	0.086
S-51	0.5' - 1.5'	3/17/97	<0.29	640	2.5	13	47	240	240	2.7	0.33	0.041
S-52	1' - 2'	3/17/97	<0.29	23	0.8	3.9	8.6	15	24	0.98	0.068	<0.021
S-53	2' - 3'	3/17/97	<0.29	47	2.3	10	45	120	97	2.6	0.12	0.077
S-54	1' - 2'	3/17/97	<0.29	27	1.6	5.2	26	49	77	2.1	0.17	0.083
S-54, 125' S	1' - 2'	3/18/97	<0.29	20	0.61	4.5	3.2	28	15	0.83	<0.033	0.025
S-55	1' - 2'	3/17/97	<0.29	16	0.56	2.4	13	28	28	1.0	0.11	0.17
S-56, 85' S	1' - 2'	3/17/97	<0.29	30	0.69	5.1	7.2	35	34	1.5	<0.033	0.042
S-57, 80' S	1' - 2'	3/17/97	<0.29	13	0.62	3.9	5.7	13	18	0.94	0.039	0.026
S-58	1.5' - 2.5'	3/17/97	<0.29	65	2.3	9.4	57	250	200	3.0	0.072	0.085
S-59	2' - 3'	3/18/97	<0.29	12	0.61	2.8	5.0	8.5	16	0.73	0.049	0.056
S-60	3' - 4'	3/18/97	<0.29	52	3.7	41	200	29	44	3.8	0.04	0.056
S-61	1' - 2'	3/18/97	<0.29	53	2.9	8.8	28	66	87	4.8	0.2	0.55
CLEANUP CRITERIA[1]	Aquifer Protection[2]		4.5	1,300	6.0	30	160,000	21	2,400	23	4.1	1.7
	Direct Contact		2,000	30,000	210	2,000	16,000	400	140,000	6.6	2,100	130

NOTES:

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TABLE 1 (Page 4 of 5)

SOIL SAMPLING RESULTS FOR METALS

City of Muskegon
Area Wide Study
Muskegon, Michigan

Boring Location	Depth (feet)	Sample Date	PARAMETER & CONCENTRATION (mg/kg)									
			Silver	Barium	Cadmium	Chromium	Copper	Lead	Zinc	Arsenic	Selenium	Mercury
S-62	2' - 3'	3/18/97	<0.29	26	25	5	24	57	77	1.2	0.24	0.076
S-63, 170' S	1' - 2'	3/19/97	<0.29	99	10	68	180	340	700	2.9	0.33	0.2
S-64	1' - 2'	3/18/97	<0.29	40	2	7.5	27	49	78	3.4	0.24	0.12
S-65	1' - 2'	3/19/97	<0.29	40	2.3	5.7	22	26	29	4.1	0.18	0.17
ST2-B2	3'	12/16/96	<0.50	66	**0.30	8.8	20	***59	46	*4.0	<0.50	0.15
ST4-B1	6'	12/16/96	<0.50	63	0.25	6.3	80	**890**	77	2.5	<0.50	0.29
ST5-B1	2'	12/17/96	<0.50	62	0.39	12	26	56	72	1.8	<0.50	0.15
ST6-B1	4'	12/17/96	<0.50	41	0.78	11	41	230	150	**10**	<0.50	1.0
ST9-B2	3'	12/19/96	<0.50	48	1.2	8.1	32	54	82	6.4	0.81	0.10
ST10-B3	2'	12/19/96	<0.50	16	0.24	4.9	11	37	30	1.2	<0.50	<0.10
ST12-B1	2½'	12/20/96	<0.50	40	2.0	100	110	51	160	5.7	<0.50	<0.10
ST12-B6	1½'	12/31/96	<0.50	22	0.18	3.6	9.6	43	28	0.88	<0.50	0.21
ST12-B7	4'	12/31/96	<0.50	45	22	31	51	150	150	5.6	<0.50	<0.10
ST12-B8	½-2'	3/7/97	2.1	49	2.0	8.9	130	340	130	3.4	<0.50	3.2
ST13-B1	1'	1/8/97	<0.50	270	4.7	35	230	310	410	**21**	<0.50	0.18
ST13-B4	1'	1/8/97	<0.50	120	2.9	25	160	130	180	**7.8**	<0.50	0.18
ST13-B8	4'	1/3/97	<0.50	32	0.88	14	29	150	120	1.4	<0.50	0.10
CLEANUP CRITERIA[1]	Aquifer Protection[2]		4.5	1,300	6.0	30	160,000	21	2,400	23	4.1	1.7
	Direct Contact		2,000	30,000	210	2,000	16,000	400	140,000	6.6	2,100	130

NOTES:

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TABLE 1 (Page 5 of 5)

SOIL SAMPLING RESULTS FOR METALS

City of Muskegon
Area Wide Study
Muskegon, Michigan

Boring Location	Depth (feet)	Sample Date	PARAMETER & CONCENTRATION (mg/kg)									
			Silver	Barium	Cadmium	Chromium	Copper	Lead	Zinc	Arsenic	Selenium	Mercury
ST14-B2	6'	1/3/97	<0.50	120	0.38	16	37	200	110	3.7	0.62	<0.10
ST15-B1	2'	1/9/97	<0.50	49	1.1	8.6	51	66	57	5.3	<0.50	0.14
ST16-B4	1'	3/7/97	<0.50	110	1.2	12	49	240	250	6.3	<0.50	<0.100
ST17-B1	2'	1/9/97	<0.50	77	2.8	42	56	230	260	**11**	<0.50	0.12
ST19-B1	2'	1/15/97	<0.50	99	1.8	13	20	31	150	**7.3**	<0.50	<0.10
ST22-B1	½ - 2'	3/4/97	<0.50	40	1.1	7.8	25	88	78	5.5	<0.50	<0.10
ST25-B1	½ - 2'	3/4/97	<0.50	71	1.8	11	65	190	150	**7.8**	<0.50	0.36
ST27-B1	½ - 2'	3/4/97	<0.50	45	1.5	9.1	120	**450**	120	5.3	<0.50	0.86
ST29-B1	0 - 1'	3/4/97	<0.50	120	5.6	25	430	**1300**	590	**21**	<0.50	1.4
ST32-B1	½'	3/4/97	<0.50	140	2.9	35	240	310	390	40	<0.50	0.24
ST37-B2	2'	3/4/97	<0.50	26	6.8	67	210	15	23	**18**	<0.50	<0.10
CLEANUP CRITERIA[1]	Aquifer Protection[2]		4.5	1,300	6.0	30	160,000	21	2,400	23	4.1	1.7
	Direct Contact		2,000	30,000	210	2,000	16,000	400	140,000	6.6	2,100	130

NOTES:

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TABLE 2 (Page 1 of 2)

SOIL SAMPLING RESULTS FOR PAHs

City of Muskegon
Area Wide Study
Muskegon, Michigan

PARAMETER	CLEANUP CRITERIA[1]		BORING LOCATION & CONCENTRATION (µg/kg)											
	Aquifer Protection[2]	Direct Contact	S-5, 30'N 2' - 3'	S-8, 200'S 3' - 4'	S-9 1.5' - 2.5'	S-13, 60'N 2' - 3'	S-19 1' - 2'	S-29 2' - 3'	S-37 1' - 2'	S-44 3' - 4'	S-49 1' - 2'	S-53 2' - 3'	S-58 1.5' - 2.5'	S-63, 170'S 1' - 2'
Acenapthene	300,000	76,000,000	*	*	*	*	*	*	*	*	*	*	1,600	*
Acenaphthylene	2,900	1,500,000	*	*	*	*	*	*	*	*	*	440	*	*
Anthracene	41,000	420,000,000	*	*	*	*	*	*	*	*	*	600	3,700	*
Benzo(a)anthracene	ns	14,000	780	600	920	*	*	*	*	*	1,000	2,700	7,400	1,100
Benzo(b)fluoranthene	ns	14,000	750	370	940	*	*	*	*	*	1,100	2,000	4,900	1,100
Benzo(k)fluoranthene	ns	140,000	760	390	820	*	*	*	*	*	1,000	2,000	3,800	1,000
Benzo(ghi)perylene	ns	1,500,000	*	*	*	*	*	*	*	*	580	1,300	3,200	580
Benzo(a)pyrene	ns	1,400	*	480	840	*	*	*	*	*	1,000	**2,400**	**5,600**	910
Chrysene	ns	1,400,000	1,000	*	1,200	*	*	*	*	*	1,100	2,700	6,800	1,200
Dibenzo(a,h)anthracene	ns	1,400	*	*	*	*	*	*	*	*	*	860	**1,800**	380
Fluoranthene	720,000	51,000,000	1,400	1,500	2,100	*	*	*	*	*	1,800	3,800	13,000	1,800
Fluorene	390,000	51,000,000	*	*	*	*	*	*	*	*	*	*	2,100	*
Indeno(1,2,3-cd)pyrene	ns	14,000	*	*	*	*	*	*	*	*	590	1,500	3,500	650
Naphthalene	17,000	15,000,000	*	*	520	940	*	*	*	*	350	1,200	1,300	2,300
Phenanthrene	12,000	1,500,000	1,500	730	1,600	910	*	*	*	*	1,300	2,800	12,000	1,700
Pyrene	470,000	33,000,000	1,100	1,300	1,900	*	*	*	*	*	1,500	2,700	11,000	1,100

NOTES:

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- * Indicates parameter was not present at a detectable concentration.
- ns Indicates no cleanup criteria is specified for this parameter.
- Shaded results exceed referenced aquifer protection criteria.
- Bold/outlined results exceed referenced direct contact criteria.

TABLE 2 (Page 2 of 2)

SOIL SAMPLING RESULTS FOR PAHs

City of Muskegon
Area Wide Study
Muskegon, Michigan

PARAMETER	CLEANUP CRITERIA[1]		BORING LOCATION & CONCENTRATION (µg/kg)						
	Aquifer Protection[2]	Direct Contact	ST2-B2 3'	ST6-B1 4'	ST16-B4 1'	ST12-B8 0.5'-2'	ST22-B1 0.5'-2'	ST27-B1 0.5'-2'	ST32-B1 0.5'
Acenapthene	300,000	76,000,000	1,200	<360	<330	<330	<460	2,700	<620
Acenaphthylene	2,900	1,500,000	<380	<360	<330	<330	<460	680	<620
Anthracene	41,000	420,000,000	2,000	<360	<330	<330	<460	4,000	<620
Benzo(a)anthracene	ns	14,000	4,100	<360	<330	<330	<460	5,600	<620
Benzo(b)fluoranthene	ns	14,000	6,000	420	350	450	820	7,100	690
Benzo(k)fluoranthene	ns	140,000	2,000	<360	<330	<330	<460	2,400	<620
Benzo(ghi)perylene	ns	1,500,000	1,700	<360	<330	<330	<460	2,200	<620
Benzo(a)pyrene	ns	1,400	**4,300**	<360	<330	<330	480	**5,300**	<620
Chrysene	ns	1,400,000	4,200	<360	<330	<330	520	4,800	<620
Dibenzo(a,h)anthracene	ns	1,400	530	<360	<330	<330	<460	<560	<620
Fluoranthene	720,000	51,000,000	8,700	610	470	660	860	16,000	810
Fluorene	390,000	51,000,000	880	<360	<330	<330	<460	2,400	<620
Indeno(1,2,3-cd)pyrene	ns	14,000	2,300	<360	<330	<330	<460	2,500	<620
Naphthalene	17,000	15,000,000	570	<360	<330	<330	<460	3,500	<620
Phenanthrene	12,000	1,500,000	8,600	390	<330	390	690	17,000	760
Pyrene	470,000	33,000,000	9,100	600	430	560	870	14,000	810

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- Shaded results exceed referenced aquifer protection criteria.
- Bold/outlined results exceed referenced direct contact criteria.

TABLE 3 (Page 1 of 3)

SOIL SAMPLE CHARACTERISTICS SUMMARY

City of Muskegon
Area Wide Study
Muskegon, Michigan

SAMPLE	DEPTH	CHARACTERISTICS	PARAMETERS EXCEEDING CLEANUP CRITERIA
S-1	1' - 2'	black gravel w/slag & RR cinders	arsenic, lead
S-3, 200'S	2' - 3'	reddish brown sand	
S-3, 30' N	**2' - 3'**	**tan sand**	
S-5, 30' N	2' - 3'	brown/black/red sand w/slag, wood & metal	arsenic
S-7	2' - 3'	sand w/slag, glass, wood & organic matter	arsenic, lead
S-8, 200' S	3' - 4'	brown/tan sand	
S-9	1.5' - 2.5'	black sand w/slag & glass	arsenic, cadmium, lead
S-11, 30' N	1' - 2'	tan/brown sand	
S-12, 200' S	2.5' - 3.5'	reddish brown sand	
S-13, 60' N	2' - 3'	red/brown/black sand w/slag and core sand	arsenic
S-15, 60' N	3' - 4'	brown/tan sand w/gravel	
S-17	0.5' - 1.5'	black & dk. brown sand & slag	lead
S-17	**3' - 4'**	**orange/brown sand**	
S-19	1.0' - 2.0'	tan sand, trace slag & brown streaks	
S-21	0.0' - 1.0'	dk. brown/black sand, some slag	lead
S-23	0.0' - 1.0'	dk. brown sand, trace slag	lead
S-23	3.5' - 4'	dk. brown sand, trace slag	
S-25	3' - 4'	brown/black sand, little slag, wood, and clay	lead
S-27	3.5' - 4.0'	black & brown sand, some slag	
S-29	**2' - 3'**	**tan/brown sand, some clay**	
S-31	2' - 3'	dk. brown & brown sand, little slag	lead
S-33	1' - 2'	dk. brown sand, trace black sand & slag	lead
S-35	2' - 3'	black sand, slag & peat	lead
S-37	1.0' - 2.0'	brown & black sand, trace coal, slag, clay & gravel	
S-38	2.0' - 3.0'	lt. brown sand with occasional black pockets	
S-38	4.0' - 5.0'	tan sand	
S-39	1.0' - 1.5'	dk. brown sand, some slag & gravel, trace orange chalky material	lead
S-40	2.5' - 3.5'	brown silty sand, trace slag & core sand, occasional clay	
S-41	1.0' - 2.0'	brown, grey, white & black sand, trace cinders & coal	lead
S-42	2.0' - 2.5'	black sand, some gravel & cinders/slag	lead
S-43	3.0' - 4.0'	black silty sand, trace gravel, core sand, wire & slag	lead

NOTES:

- Shading indicates the sample consists of apparent industrial/foundry-related fill.
- Bold lettering indicates the sample consists of apparently clean fill material.
- Remaining samples (no shading or bold lettering) consist of apparently native soils.

TABLE 3 (Page 2 of 3)

SOIL SAMPLE CHARACTERISTICS SUMMARY

City of Muskegon
Area Wide Study
Muskegon, Michigan

SAMPLE	DEPTH	CHARACTERISTICS	PARAMETERS EXCEEDING CLEANUP CRITERIA
S-44	3.0' - 4.0'	dk. brown silty sand, some black & green slag, trace gravel & core sand	
S-45	4.5' - 5.0'	grey & brown sand, trace metal, white debris, coal & gravel	
S-46	1.0' - 2.0'	dk. brown, brownish red, and black silt/sand with slag, glass & brick	arsenic, cadmium, lead
S-46	3' - 4'	lt. & dk. brown sand, trace wood/roots	
S-47	1.0' - 2.0'	yellowish brown to black sand, trace slag, core sand & roots	lead
S-48	1.0' - 1.5'	brown & dk. brown sand, trace gravel & cinders	lead
S-48, 175' S	6' - 7'	tan sand, trace gravel	
S-49	1.0' - 2.0'	brown & black sand, trace glass & slag	cadmium, lead
S-50, 130' S	2' - 3'	dk. brown sand, some reddish-brown clay, trace slag & gravel	lead
S-51	0.5' - 1.5'	dk. brown sand, little slag, trace gravel & coal	lead
S-52	**1' - 2'**	**red, brown, orange & black sand**	
S-53	2' - 3'	brown to black sand, some coal, brick, cinders & concrete	lead, benzo(a)pyrene
S-54	1' - 2'	dk. brown to tan sand, trace slag, coal & gravel	lead
S-54, 125' S	1' - 2'	orangish brown to dk. brown sand, trace glass & gravel	lead
S-55	1' - 2'	dk. brown & black sand, little silt, trace slag, coal & core sand	lead
S-56, 85' S	1' - 2'	tan to black sand, little gravel	lead
S-57, 80' S	1' - 2'	dk. brown & brown sand, trace slag, metal, silt & gravel	
S-58	1.5' - 2.5'	dk. brown sand, little slag, red brick & lt. brown to black sand	lead, benzo(a)pyrene, dibenzo(a,h)anthracene
S-59	2' - 3'	tan, brown & black sand	
S-60	3' - 4'	dk. brown & black silty sand with slag, little coal, trace core sand	chromium, lead
S-61	1' - 2'	black slag, some sand, little silt, trace gravel	lead
S-62	2' - 3'	black sand & slag, little gravel & coal	cadmium, lead
S-63, 170' S	1' - 2'	dk. brown sand, little gravel, trace slag & debris	cadmium, chromium, lead
S-64	1' - 2'	dk. brown & black silty sand, little gravel, trace slag & coal	lead
S-65	1' - 2'	black sand, slag & gravel, trace cobbles & coal	lead

NOTES:

- Shading indicates the sample consists of apparent industrial/foundry-related fill.
- Bold lettering indicates the sample consists of apparently clean fill material.
- Remaining samples (no shading or bold lettering) consist of apparently native soils.

TABLE 3 (Page 3 of 3)

SOIL SAMPLE CHARACTERISTICS SUMMARY

City of Muskegon
Area Wide Study
Muskegon, Michigan

SAMPLE	DEPTH	CHARACTERISTICS	PARAMETERS EXCEEDING CLEANUP CRITERIA
ST2-B2	3'	black sand w/slag & brick	lead, benzo(a)pyrene
ST4-B1	6'	brown sand w/gravel, brick & concrete pieces	lead
ST5-B1	2'	sand w/plastic, aluminum & concrete pieces & wood chips	lead
ST6-B1	4'	black sand w/slag & glass pieces	lead, arsenic
ST9-B2	3'	black slag w/sand & burnt wood	lead
ST10-B3	2'	black sand w/slag	lead
ST12-B1	2 1/2'	black sand w/slag, pieces of concrete, brick & wood chips	lead, chromium
ST12-B6	1 1/2'	black sand w/slag & concrete pieces	lead
ST12-B7	4'	black sand w/slag & wood chips	lead, cadmium, chromium
ST12-B8	1/2' - 2'	black slag w/sand, steel pieces & misc. debris	lead, mercury
ST13-B1	1'	black slag w/gravel & brick pieces, trace sand	lead, arsenic, chromium
ST13-B4	1'	black slag w/sand & cobbles	lead, arsenic
ST13-B8	4'	black sand w/slag & steel, brick, tin & concrete pieces	lead
ST14-B2	6'	black & white foundry cores, some fire brick	lead
ST15-B1	2'	black sand w/slag, wood chips, and cobbles	lead
ST16-B4	1'	silt w/sand, wood chips & concrete pieces	lead
ST17-B1	2'	black slag w/sand, brick pieces, gravel, & railroad ties	lead, arsenic, chromium
ST19-B1	2'	black sand & slag w/gravel	lead, arsenic
ST22-B1	1/2'-2'	black sand w/slag, gravel, brick & concrete pieces	lead
ST25-B1	1/2'-2'	black sand w/slag & gravel	lead, arsenic
ST27-B1	1 1/2'-2	black foundry sand w/trace slag, wood chips, brick & gravel	lead, phenanthrene, benzo(a)pyrene
ST29-B1	0-1'	black slag w/gravel & steel pieces	lead, arsenic
ST32-B1	1/2'	black sand w/slag & gravel	lead, arsenic, chromium
ST37-B2	2'	red/brown slag w/cobbles	arsenic, cadmium, chromium

NOTES:

- All samples analyzed consisted of apparent industrial/foundry-related fill except for ST4-B1.

APPENDIX A

APPENDIX A

• SOIL BORING LOGS •

DELL ENGINEERING, INC.
Civil Engineering • Environmental Consulting
3352 128th Avenue, Holland, Michigan 49424-9263

LOG OF WELL/BORING S-1

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: RJB
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 12/17/96 Finished: 12/17/96
TIME: Started 11:10 am Finished: 11:40 am

GROUTING/SEAL

Depth/To	Material/Method
0'-8'	natural cuttings

DRILLING METHOD (S): 3.25" O.D. Hand Auger
DEPTH: 8'

REMARKS: Split graphic log indicates fill.
43° 12.914' N, 86° 17.739' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 6 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
	X					2		0'-2' Black GRAVEL with slag and RR cinders, dry, no odor.
2						5		2'-5' Tan fine and medium SAND, dry, no odor.
4						6		5'-6' Dark brown fine and medium SAND, moist, no odor.
6						6.5		6'-6.5' WOOD, wet at 6 feet.
				581		8		6.5'-8' Black fine and medium SAND, wet, strong petroleum odor.
8								EOB @ 8.0'
10								
12								

DELL ENGINEERING, INC.
Civil Engineering • Environmental Consulting
3352 128th Avenue, Holland, Michigan 49424-9263

LOG OF WELL/BORING S-1, 200'S

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: RJB
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 12/17/96 Finished: 12/17/96
TIME: Started Finished:

GROUTING/SEAL Depth/To	Material/Method
0'-7.5'	natural cuttings

DRILLING METHOD (S)	DEPTH
3.25" O.D. Hand Auger	7.5'

REMARKS: Split graphic log indicates fill.
43° 12.884' N, 86° 17.729' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 7 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						1.5		0'-1.5' GRAVEL with RR cinders, and fine and medium sand, dry, no odor
2								1.5'-6' Tan fine and medium SAND, dry, no odor.
4								
						6		6'-7.5' Tan fine and medium SAND, moist, no odor.
6				0				Wet @ 7 feet.
						7.5		EOB @ 7.5'
8								
10								
12								

DELL ENGINEERING, INC.
Civil Engineering • Environmental Consulting
3352 128th Avenue, Holland, Michigan 49424-9263

LOG OF WELL/BORING S-2

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: RJB
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 12/17/96 Finished: 12/17/96
TIME: Started 2:30 pm Finished: 2:50 pm

GROUTING/SEAL

Depth/To	Material/Method
0'-7'	natural cuttings

DRILLING METHOD (S) DEPTH
3.25" O.D. Hand Auger 7'

REMARKS: Split graphic log indicates fill.
43' 12.917' N, 86' 17.701' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 6 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						1		0'-1' Black/brown fine and medium SAND with RR cinders, dry, no odor.
2						5		1'-5' Tan fine and medium SAND, dry, no odor.
4								
6				851		7		5'-7' Brown/black fine and medium SAND, moist/wet, strong petroleum odor Wet at 6 feet.
8								EOB @ 7.0'
10								
12								

DELL ENGINEERING, INC.
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3352 128th Avenue, Holland, Michigan 49424-9263

LOG OF WELL/BORING S-2, 30'N

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: RJB
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 12/17/96 Finished: 12/17/96
TIME: Started Finished:

GROUTING/SEAL

Depth/To	Material/Method
0'-3'	natural cuttings

DRILLING METHOD (S) DEPTH
3.25" O.D. Hand Auger 3'

REMARKS: Split graphic log indicates fill.

GROUND SURFACE ELEVATION: ft.

WATER LEVEL BELOW GROUND DURING DRILLING: ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						3		0'-3' Red/brown/black/yellow foundry SAND with slag, dry, no odor.
								EOB @ 3 feet - Auger refusal
2								
4								
6								
8								
10								
12								

DELL ENGINEERING, INC.
Civil Engineering • Environmental Consulting
3352 128th Avenue, Holland, Michigan 49424-9263

LOG OF WELL/BORING S-3

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: RJB
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 12/17/96 Finished: 12/17/96
TIME: Started 2:50 pm Finished: 3:30 pm

GROUTING/SEAL

Depth/To	Material/Method
0'-7'	natural cuttings

DRILLING METHOD (S) DEPTH
3.25" O.D. Hand Auger 7'

REMARKS: Split graphic log indicates fill.
43' 12.924' N, 86' 17.669' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 6 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						.3		0'-0.3' GRAVEL.
						1		0.3'-1' Black/brown fine and medium SAND, dry, no odor.
2						5		1'-5' Tan fine and medium SAND, moist, no odor.
4								
6				15		6		5'-6' Black/brown fine and medium SAND, moist/wet, strong petroleum odor
						7		6'-7' Black fine and medium SAND with red wood, wet, petroleum decay odor
								EOB @ 7.0'
8								
10								
12								

DELL ENGINEERING, INC.
Civil Engineering • Environmental Consulting
3352 128th Avenue, Holland, Michigan 49424-9263

LOG OF WELL/BORING S-3, 30' N

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: RJB
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 12/17/96 Finished: 12/17/96
TIME: Started Finished:

GROUTING/SEAL

Depth/To	Material/Method
0'-7'	natural cuttings

DRILLING METHOD (S) DEPTH
3.25" O.D. Hand Auger 7'

REMARKS: Split graphic log indicates fill.

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 6 ft.

DEPTH feet	SAMPLE INTERVAL	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						.3		0'-0.3' GRAVEL.
						1		0.3'-1' Black/brown fine and medium SAND, dry, no odor.
2	X					5		1'-5' Tan fine and medium SAND, moist, no odor.
4						6		5'-6' Black/brown fine and medium SAND, moist/wet, strong petroleum odor
6						7		6'-7' Black fine and medium SAND with red wood, wet, petroleum decay odor
								EOB @ 7.0'
8								
10								
12								

DELL ENGINEERING, INC.
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3352 128th Avenue, Holland, Michigan 49424-9263

LOG OF WELL/BORING S-3, 200'S

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: RJB
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 12/18/96 Finished: 12/18/96
TIME: Started 9:00 am Finished: 9:15 am

GROUTING/SEAL

Depth/To	Material/Method
0'-6'	natural cuttings

DRILLING METHOD (S): 3.25" O.D. Hand Auger — DEPTH: 6'

REMARKS: Split graphic log indicates fill.

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 6 ft.

DEPTH feet	SAMPLE INTERVAL	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						1		0'-1' Black TOPSOIL with vegetation at surface, dry, no odor.
2						5		1'-5' Reddish brown fine and medium SAND, dry, no odor.
						5.5		5'-5.5' Tan fine and medium SAND, dry, no odor.
						6		5.5'-6' Tan fine and medium SAND, wet, no odor.
4, 6, 8, 10, 12								Wet at 6 feet, EOB @ 6 feet

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LOG OF WELL/BORING S-4

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: RJB
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 12/17/96 Finished: 12/17/96
TIME: Started 10:05 am Finished: 10:25 am

GROUTING/SEAL

Depth/To	Material/Method
0'-5.5'	natural cuttings

DRILLING METHOD (S): 3.25" O.D. Hand Auger
DEPTH: 5.5'

REMARKS: Split graphic log indicates fill.
43° 12.943' N, 86° 17.626' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 5 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						1		0'-1' Brown/black fine and medium SAND with slag and gravel, dry, no odor.
2								1'-4.5' Tan/brown fine and medium SAND, dry, no odor.
4						4.5		
				0		5.5		4.5'-5.5' Brown/black fine and medium SAND, moist, no odor. Wet at 5 feet.
6								EOB @ 5.5'
8								
10								
12								

DELL ENGINEERING, INC.
Civil Engineering • Environmental Consulting
3352 128th Avenue, Holland, Michigan 49424-9263

LOG OF WELL/BORING S-5

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: RJB
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 12/17/96 Finished: 12/17/96
TIME: Started 10:35 am Finished: 10:40 am

GROUTING/SEAL

Depth/To	Material/Method
0'-5'	natural cuttings

DRILLING METHOD (S) DEPTH
3.25" O.D. Hand Auger 5'

REMARKS: Split graphic log indicates fill.
43' 12.956' N, 86' 17.573' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 5 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						1		
2								1'-5' Brown/black fine and medium SAND, dry, no odor.
4								
				0		5		Wet at 5 feet, EOB @ 5 feet.
6								
8								
10								
12								

DELL ENGINEERING, INC.
Civil Engineering • Environmental Consulting
3352 128th Avenue, Holland, Michigan 49424-9263

LOG OF WELL/BORING S-5, 30'N

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: RJB
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 12/17/96 Finished: 12/17/96
TIME: Started 10:25 am Finished: 10:35 am

GROUTING/SEAL

Depth/To	Material/Method
0'-6'	natural cuttings

DRILLING METHOD (S) DEPTH
3.25" O.D. Hand Auger 6'

REMARKS: Split graphic log indicates fill.

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 5 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						1		
2	X			0				1'-6' Brown/black/red fine and medium SAND with slag, wood, and metal, moist, no odor
4								
								Wet at 5 feet
6						6		EOB @ 6'
8								
10								
12								

DELL ENGINEERING, INC.
Civil Engineering • Environmental Consulting
3352 128th Avenue, Holland, Michigan 49424-9263

LOG OF WELL/BORING S-6

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: RJB
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 12/17/96 Finished: 12/17/96
TIME: Started 10:45 am Finished: 10:52 am

GROUTING/SEAL

Depth/To	Material/Method
0'-2.5'	natural cuttings

DRILLING METHOD (S): 3.25" O.D. Hand Auger
DEPTH: 2.5'

REMARKS: Split graphic log indicates fill.

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 2 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						1		0'-1' Railroad GRAVEL.
2				0		2.5		1'-2.5' Brown fine and medium SAND, dry, no odor. Wet at 2 feet,
								EOB @ 2.5 feet.
4								
6								
8								
10								
12								

DELL ENGINEERING, INC.
Civil Engineering • Environmental Consulting
3352 128th Avenue, Holland, Michigan 49424-9263

LOG OF WELL/BORING S-6, 200'S

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: RJB
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 12/17/96 Finished: 12/17/96
TIME: Started 11:05 am Finished: 11:20 am

GROUTING/SEAL

Depth/To	Material/Method
0'-7'	natural cuttings

DRILLING METHOD (S) DEPTH
3.25" O.D. Hand Auger 7'

REMARKS: Split graphic log indicates fill.
43' 12.935' N, 86' 17.519' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: ____ ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						1		0'-1' Fine and medium SAND with gravel and bricks, dry, no odor.
2								1'-7' Tan fine and medium SAND, dry, no odor.
4								
6						7		
				0				EOB @ 7 feet.
8								
10								
12								

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LOG OF WELL/BORING S-7

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: RJB
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 12/17/96 Finished: 12/17/96
TIME: Started 10:52 am Finished: 11:05 am

GROUTING/SEAL

Depth/To	Material/Method
0'-4'	natural cuttings

DRILLING METHOD (S) DEPTH
3.25" O.D. Hand Auger 4'

REMARKS: Split graphic log indicates fill.
43° 12.983'N, 86° 17.485'W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 4 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						1		0'-1' Railroad GRAVEL.
						2		1'-2' Fine and medium SAND.
2	X					4		2'-4' Fine and medium SAND with slag, glass, wood, and organic materials, moist, strong petroleum odor.
4								Wet at 4 feet EOB @ 4 feet.
6								
8								
10								
12								

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LOG OF WELL/BORING S-8

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: RJB
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 12/17/96 Finished: 12/17/96
TIME: Started Finished: 2:20 pm

GROUTING/SEAL

Depth/To	Material/Method
0'-2'	natural cuttings

DRILLING METHOD (S) DEPTH
3.25" O.D. Hand Auger 2'

REMARKS: Split graphic log indicates fill.
43' 12.995' N, 86' 17.445' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 2 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						2		0'-2' Brown/black fine and medium SAND with gravel, moist, no odor
2				0				Wet at 2 feet, EOB @ 2 feet.
4								
6								
8								
10								
12								

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LOG OF WELL/BORING S-8, 30'N

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: RJB
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 12/17/96 Finished: 12/17/96
TIME: Started Finished:

GROUTING/SEAL

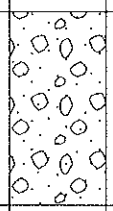
Depth/To	Material/Method
0'-2'	natural cuttings

DRILLING METHOD (S) DEPTH
3.25" O.D. Hand Auger 2'

REMARKS: Split graphic log indicates fill.

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 2 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						2		0'-2' Brown/black fine and medium SAND with gravel, moist, no odor.
2				0				Wet at 2 feet, EOB @ 2 feet.
4								
6								
8								
10								
12								

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LOG OF WELL/BORING S-8, 200'S

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: RJB
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 12/17/96 Finished: 12/17/96
TIME: Started Finished:

GROUTING/SEAL

Depth/To	Material/Method
0'-7'	natural cuttings

DRILLING METHOD (S): 3.25" O.D. Hand Auger — DEPTH: 7'

REMARKS: Split graphic log indicates fill.
43° 12.976' N, 86° 17.425' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 6.5 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						1		0'-1' Brown/black fine and medium SAND with vegetation at surface, moist, no odor.
2								1'-7' Brown/tan fine and medium SAND, dry, no odor.
4	X							
6								Wet at 6.5 feet.
				0		7		
								EOB @ 7 feet (cave-in).
8								
10								
12								

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LOG OF WELL/BORING S-9

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: RJB
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 12/17/96 Finished: 12/17/96
TIME: Started 1:30 pm Finished: 1:55 pm

GROUTING/SEAL

Depth/To	Material/Method
0'-4'	natural cuttings

DRILLING METHOD (S) DEPTH
3.25" O.D. Hand Auger 4'

REMARKS: Split graphic log indicates fill.
43° 13.007' N, 86° 17.410' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 3 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						2.5		0'-2.5' Black fine and medium SAND with glass and slag, moist, no odor.
2	X			0				
						4		2.5'-4.0' Brown/tan fine and medium SAND, moist, no odor. Wet at 3.0 feet.
4								EOB @ 4 feet (cave-in).
6								
8								
10								
12								

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LOG OF WELL/BORING S-10

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: RJB
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 12/17/96 Finished: 12/17/96
TIME: Started 1:55 pm Finished: 2:05 pm

GROUTING/SEAL

Depth/To	Material/Method
0'-2'	natural cuttings

DRILLING METHOD (S): 3.25" O.D. Hand Auger
DEPTH: 2'

REMARKS: Split graphic log indicates fill.
43° 13.021' N, 86° 17.370' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 2 ft.

DEPTH feet	SAMPLE INTERVAL	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						1		0'-1' Railroad GRAVEL.
						2		1'-2' Fine and medium SAND with slag, dry, no odor.
2								Wet at 2 feet. EOB @ 2 feet.
4								
6								
8								
10								
12								

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LOG OF WELL/BORING S-11

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: RJB
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 12/18/96 Finished: 12/18/96
TIME: Started 8:40 am Finished: 8:45 am

GROUTING/SEAL

Depth/To	Material/Method
0'-4'	natural cuttings

DRILLING METHOD (S) DEPTH
3.25" O.D. Hand Auger 4'

REMARKS: Split graphic log indicates fill.
43' 13.054' N, 86' 17.339' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 3.5 ft.

DEPTH feet	SAMPLE INTERVAL	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						.5		0'-0.5' Fine and medium SAND with topsoil and humus, vegetation at surface, dry, no odor.
								0.5'-3.5' Tan/brown fine and medium SAND, dry, no odor.
2								
								Wet @ 3.5 feet.
4						4		EOB @ 4 feet
6								
8								
10								
12								

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LOG OF WELL/BORING S-11, 30'N

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: RJB
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 12/18/96 Finished: 12/18/96
TIME: Started 8:45 am Finished: 8:50 am

GROUTING/SEAL

Depth/To	Material/Method
0'-2.5'	natural cuttings

DRILLING METHOD (S): 3.25" O.D. Hand Auger
DEPTH: 2.5'

REMARKS: Split graphic log indicates fill.

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 2 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						.5		0'-0.5' Fine and medium SAND with topsoil and humus, vegetation at surface, dry, no odor.
	X							0.5'-2' Tan/brown fine and medium SAND, dry, no odor.
2								Wet @ 2 feet.
						2.5		EOB @ 2.5 feet
4								
6								
8								
10								
12								

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LOG OF WELL/BORING S-12

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: RJB
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 12/18/96 Finished: 12/18/96
TIME: Started 9:45 am Finished: 10:10 am

GROUTING/SEAL

Depth/To	Material/Method
0'-4.5'	natural cuttings

DRILLING METHOD (S) DEPTH
3.25" O.D. Hand Auger 4.5'

REMARKS: Split graphic log indicates fill.
43' 13.087' N, 86' 17.276' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 4 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						2.5		0'-2.5' Black/brown fine and medium SAND with glass, metal, and humus, dry, no odor.
2								
						4.5		2.5'-4.5' Brown/reddish fine and medium SAND, dry, no odor. Wet @ 4'.
4				0				
								EOB @ 4.5'.
6								
8								
10								
12								

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LOG OF WELL/BORING S-12, 200'S

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: RJB
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 12/18/96 Finished: 12/18/96
TIME: Started Finished:

GROUTING/SEAL

Depth/To	Material/Method
0'-7'	natural cuttings

DRILLING METHOD (S): 3.25" O.D. Hand Auger — DEPTH: 7'

REMARKS: Split graphic log indicates fill.
43° 13.021' N, 86° 17.285' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 6.5 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						1.5		0'-1.5' Red/brown fine and medium SAND with fine gravel, dry no odor.
2						2.5		1.5'-2.5' Brown/black fine and medium SAND, dry, no odor.
	X					3.5		2.5'-3.5' Reddish brown fine and medium SAND, dry, no odor.
4						5.0		3.5'-5.0' Brown fine and medium SAND, dry, no odor.
6				0		7.0		5.0'-7.0' Tan fine and medium SAND, dry, no odor. Wet at 6.5 feet.
8								EOB @ 7 feet (cave-in).
10								
12								

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LOG OF WELL/BORING S-13

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: RJB
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 12/18/96 Finished: 12/18/96
TIME: Started 10:30 am Finished: 10:40 am

GROUTING/SEAL

Depth/To	Material/Method
0'-4'	natural cuttings

DRILLING METHOD (S) DEPTH
3.25" O.D. Hand Auger 4'

REMARKS: Split graphic log indicates fill.
43° 13.061' N, 86° 17.253' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 4 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						0.5		0'-0.5' Black TOPSOIL, dry, no odor.
						1.5		0.5'-1.5' Reddish brown/black, fine and medium SAND, dry, no odor.
2								1.5'-4' Brown fine and medium SAND, dry, no odor.
4				0.0		4.0		Wet @ 4'. EOB @ 4'.
6								
8								
10								
12								

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LOG OF WELL/BORING S-13 30' N

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: RJB
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 12/18/96 Finished: 12/18/96
TIME: Started 10:20 am Finished: 10:30 am

GROUTING/SEAL

Depth/To	Material/Method
0'-4'	natural cuttings

DRILLING METHOD (S): 3.25" O.D. Hand Auger — DEPTH: 4'

REMARKS: Split graphic log indicates fill.

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 4 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						1		0'-1' Black fine and medium SAND, dry, no odor.
						2		1'-2' Red/brown fine and medium SAND, dry, no odor.
2								2'-4' Tan fine and medium SAND, dry, no odor.
4				0		4		Wet @ 4'. EOB @ 4'.
6								
8								
10								
12								

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LOG OF WELL/BORING S-13 60' N

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: RJB
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 12/18/96 Finished: 12/18/96
TIME: Started 10:15 am Finished: 10:20 am

GROUTING/SEAL

Depth/To	Material/Method
0'-4'	natural cuttings

DRILLING METHOD (S) DEPTH
3.25" O.D. Hand Auger 4'

REMARKS: Split graphic log indicates fill.

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 3 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
								0'-4' Red, brown, and black fine and medium SAND with slag and core sand, dry, no odor.
2	X							
				0				Wet at 3'.
4						4		EOB @ 4'.
6								
8								
10								
12								

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LOG OF WELL/BORING S-14

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: RJB
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 12/18/96 Finished: 12/18/96
TIME: Started 11:00 am Finished: 11:10 am

GROUTING/SEAL

Depth/To	Material/Method
0'-4'	natural cuttings

DRILLING METHOD (S) DEPTH
3.25" O.D. Hand Auger 4'

REMARKS: Split graphic log indicates fill.
43° 13.082' N, 86° 17.210' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 4 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						1		0'-1' Black TOPSOIL, dry, no odor.
2						4		1'-4' Brown/tan fine and medium SAND, dry, no odor.
4								Wet @ 4'. EOB @ 4'.
6								
8								
10								
12								

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LOG OF WELL/BORING S-14, 60' N

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: RJB
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 12/18/96 Finished: 12/18/96
TIME: Started 10:40 am Finished: 11:00 am

GROUTING/SEAL

Depth/To	Material/Method
0'-4'	natural cuttings

DRILLING METHOD (S): 3.25" O.D. Hand Auger
DEPTH: 4'

REMARKS: Split graphic log indicates fill.
43' 13.078' N, 86' 17.202' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 4 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						1		0'-1' Black with orange fine and medium SAND, dry, no odor.
2								1'-4' Tan and brown fine and medium SAND, dry, no odor.
4				0.0		4		Wet @4'. EOB @ 4'
6								
8								
10								
12								

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LOG OF WELL/BORING S-14, 200' S

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: RJB
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 12/18/96 Finished: 12/18/96
TIME: Started 9:15 am Finished: 9:30 am

GROUTING/SEAL

Depth/To	Material/Method
0'-9.5'	natural cuttings

DRILLING METHOD (S) DEPTH
3.25" O.D. Hand Auger 9.5'

REMARKS: Split graphic log indicates fill.

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 9 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						1		0'-1' Black TOPSOIL with vegetation at surface, dry, no odor.
2								1'-6' Reddish brown fine and medium SAND, dry, no odor.
4								
6						6		6'-9.5' Tan/brown fine and medium SAND, dry, no odor.
8				0		9.5		Wet at 9'.
10								EOB @ 9.5'.
12								

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LOG OF WELL/BORING S-15

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: RJB
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 12/18/96 Finished: 12/18/96
TIME: Started 11:10 am Finished: 11:15 am

GROUTING/SEAL

Depth/To	Material/Method
0'-6.5'	natural cuttings

DRILLING METHOD (S): 3.25" O.D. Hand Auger
DEPTH: 6.5'

REMARKS: Split graphic log indicates fill.
43° 13.096' N, 86° 17.162' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 6 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						1		0'-1' Black TOPSOIL, dry, no odor.
						2		1'-2' Reddish brown fine and medium SAND with gravel, dry, no odor.
2								2'-6.5' Brown/tan fine and medium SAND with gravel, dry, no odor.
4								
6						6.5		Wet at 6 feet.
								EOB @ 6.5'
8								
10								
12								

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3352 128th Avenue, Holland, Michigan 49424-9263

LOG OF WELL/BORING S-15, 60' N

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: RJB
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 12/18/96 Finished: 12/18/96
TIME: Started 11:15 am Finished: 11:25 am

GROUTING/SEAL

Depth/To	Material/Method
0'-6.5'	natural cuttings

DRILLING METHOD (S): 3.25" O.D. Hand Auger
DEPTH: 6.5'

REMARKS: Split graphic log indicates fill.
43° 13.102' N, 86° 17.172' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 6 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						1		0'-1' Black TOPSOIL, dry, no odor.
						2		1'-2' Reddish brown fine and medium SAND with gravel, dry, no odor.
2								2'-6.5' Brown/tan fine and medium SAND with gravel, dry, no odor.
4	X							
6						6.5		Wet at 6 feet.
								EOB @ 6.5'
8								
10								
12								

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LOG OF WELL/BORING S-16

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: RJB
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 12/18/96 Finished: 12/18/96
TIME: Started Finished:

GROUTING/SEAL

Depth/To	Material/Method
0'-6.5'	natural cuttings

DRILLING METHOD (S) DEPTH
3.25" O.D. Hand Auger 6.5'

REMARKS: Split graphic log indicates fill.
43' 13.114' N, 86' 17.130' W

GROUND SURFACE ELEVATION: ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 6 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						1		0'-1' Black TOPSOIL, dry, no odor.
						2		1'-2' Reddish brown fine and medium SAND with gravel, dry, no odor.
2								2'-6.5' Brown/tan fine and medium SAND with gravel, dry, no odor.
4								
6						6.5		Wet at 6 feet.
								EOB @ 6.5'
8								
10								
12								

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LOG OF WELL/BORING S-16, 60' N

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: RJB
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 12/18/96 Finished: 12/18/96
TIME: Started 11:25 am Finished: 11:40 am

GROUTING/SEAL

Depth/To	Material/Method
0'-6'	natural cuttings

DRILLING METHOD (S) DEPTH
3.25" O.D. Hand Auger 6'

REMARKS: Split graphic log indicates fill.
43° 13.124' N, 86° 17.137' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 6 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						5		0'-5' Brown fine and medium SAND, dry, no odor.
						6		5'-6' Tan fine and medium SAND, moist, no odor.
								Wet at 6 feet. EOB @ 6 feet.

2
4
6
8
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12

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LOG OF WELL/BORING S-17

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: CAW
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 2/20/97 Finished: 2/20/97
TIME: Started 1:40 pm Finished: 2:05 pm

GROUTING/SEAL

Depth/To	Material/Method
0'-6'	natural cuttings

DRILLING METHOD (S) DEPTH
3.25" O.D. Hand Auger 6'

REMARKS: Split graphic log indicates fill.
43' 13.140' N, 86' 17.088' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 5.5 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
	X					1		0'-1' Black fine SAND and SLAG, moist.
2						2.5		1'-2.5' Dark brown fine SAND with trace slag, moist.
4	X					5		2.5'-5' Orangish-brown fine SAND, moist.
6						6		5'-6' Tan fine SAND with trace wood debris, moist, becoming wet at 5.5'.
								EOB @ 6'.
8								
10								
12								

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LOG OF WELL/BORING S-18

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: RJB
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 2/20/97 Finished: 2/20/97
TIME: Started 1:40 pm Finished: 2:00 pm

GROUTING/SEAL

Depth/To	Material/Method
0'-6'	natural cuttings

DRILLING METHOD (S) DEPTH
3.25" O.D. Hand Auger 6'

REMARKS: Split graphic log indicates fill.
43° 13.158' N, 86° 17.052' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 6 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						1		0'-1' Black fine and medium SAND with slag, dry, no odor.
2						4		1'-4' Brown/black/tan fine and medium SAND with some slag, dry, no odor.
4						6		4'-6' Brown/tan fine and medium SAND with coal and slag at 4.5', moist, no odor.
6								Wet @ 6'. EOB @ 6'.
8								
10								
12								

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LOG OF WELL/BORING S-19

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: CAW
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 2/20/97 Finished: 2/20/97
TIME: Started 2:05 pm Finished: 2:30 pm

GROUTING/SEAL

Depth/To	Material/Method
0'-6'	natural cuttings

DRILLING METHOD (S) DEPTH
3.25" O.D. Hand Auger 6'

REMARKS: Split graphic log indicates fill.
43° 13.176' N, 86° 17.016' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 5.5 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						0.5		0'-0.5' TOPSOIL, moist.
2, 4	X					6		0.5'-6' Tan fine SAND with occasional thin brown streaks, trace slag, moist, becoming wet @ 5'-5.5', petroleum odor @ 5'-6'.
6, 8, 10, 12								EOB @ 6'.

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LOG OF WELL/BORING S-20

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: RJB
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 2/20/97 Finished: 2/20/97
TIME: Started Finished:

GROUTING/SEAL

Depth/To	Material/Method
0'-6'	natural cuttings

DRILLING METHOD (S) DEPTH
3.25" O.D. Hand Auger 6'

REMARKS: Split graphic log indicates fill.
43' 13.199' N, 86' 16.983' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 6 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						4		0'-4' Brown fine and medium SAND with some slag and coal, dry, no odor.
						6		4'-6' Brown/black fine and medium SAND, moist, very strong petroleum odor.
								Wet @ 6'. EOB @ 6'.

2
4
6
8
10
12

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LOG OF WELL/BORING S-20, 40' N

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: RJB
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 2/20/97 Finished: 2/20/97
TIME: Started Finished:

GROUTING/SEAL

Depth/To	Material/Method
0'-6'	natural cuttings

DRILLING METHOD (S) DEPTH
3.25" O.D. Hand Auger 6'

REMARKS: Split graphic log indicates fill.

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 6 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						1.5		0'-1.5' Stiff brown CLAY, dry, no odor.
2						3		1.5'-3' Brown/tan fine and medium SAND.
						4		3'-4' Black fine and medium SAND with some slag and coal, dry, no odor.
4						6		4'-6' Brown fine and medium SAND, moist, very strong petroleum odor.
6								Wet @ 6'. EOB @ 6'.
8								
10								
12								

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LOG OF WELL/BORING S-21

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: CAW
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 2/20/97 Finished: 2/20/97
TIME: Started 2:30 pm Finished: 3:00 pm

GROUTING/SEAL

Depth/To	Material/Method
0'-5'	natural cuttings

DRILLING METHOD (S) DEPTH
3.25" O.D. Hand Auger 5'

REMARKS: Split graphic log indicates fill.
43° 13.216' N, 86° 16.942' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 5 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
	X					2		0'-2' Dark brown and black fine SAND with some slag, moist.
2						3		2'-3' Light brown fine SAND, moist to dry.
						3.5		3'-3.5' Gray and black fine SAND, moist.
4						5		3.5'-5' Light gray fine SAND, moist, becoming wet between 4.5'-5', slight petroleum odor.
								EOB @ 5'.
6								
8								
10								
12								

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LOG OF WELL/BORING S-22

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: RJB
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started Finished:
TIME: Started Finished:

GROUTING/SEAL

Depth/To	Material/Method
0'-5'	natural cuttings

DRILLING METHOD (S): 3.25" O.D. Hand Auger
DEPTH: 5'

REMARKS: Split graphic log indicates fill.
43° 13.229' N, 86° 16.910' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 5 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						2		0'-2' Brown/black fine and medium SAND with gravel and slag, dry, no odor.
2						3		2'-3' Black fine and medium SAND and SLAG, dry, no odor.
4						5		3'-5' Brown/black fine and medium SAND and WOOD with some slag, moist, very strong petroleum odor.
6								Wet @ 5'. EOB @ 5'.
8								
10								
12								

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LOG OF WELL/BORING S-23

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: CAW
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 2/20/97 Finished: 2/20/97
TIME: Started 3:00 pm Finished: 3:30 pm

GROUTING/SEAL

Depth/To	Material/Method
0'-5'	natural cuttings

DRILLING METHOD (S): 3.25" O.D. Hand Auger
DEPTH: 5'

REMARKS: Split graphic log indicates fill.
43° 13.257' N, 86° 16.872' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 4 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
	X					4		0'-4' Dark brown fine SAND with trace slag, moist.
2								
4	X					5		4'-5' Tan fine to medium SAND, wet.
								EOB @ 5'.
6								
8								
10								
12								

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LOG OF WELL/BORING S-24

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: RJB
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 2/20/97 Finished: 2/20/97
TIME: Started Finished:

GROUTING/SEAL

Depth/To	Material/Method
0'-4.5'	natural cuttings

DRILLING METHOD (S): 3.25" O.D. Hand Auger
DEPTH: 4.5'

REMARKS: Split graphic log indicates fill.
43' 13.281' N, 86' 16.845' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 4.5 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						2		0'-2' Brown/black fine and medium SAND and SLAG, dry, no odor
2						3		2'-3' Brown fine and medium SAND with some slag, dry, no odor.
4						4.5		3'-4.5' Tan fine and medium SAND, moist, no odor.
								Wet @ 4.5'. EOB @ 4.5'.
6								
8								
10								
12								

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LOG OF WELL/BORING S-25

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: RJB
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 2/24/97 Finished: 2/24/97
TIME: Started Finished:

GROUTING/SEAL

Depth/To	Material/Method
0'-5.5'	natural cuttings

DRILLING METHOD (S) DEPTH
3.25" O.D. Hand Auger 5.5'

REMARKS: Split graphic log indicates fill.
43' 13.302' N, 86° 16.806' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 5 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						1.5		0'-1.5' Brown/black fine and medium SAND with roots and wood, dry, no odor.
2						3		1.5'-3' Black/brown fine and medium SAND, dry, no odor.
4	X					4.5		3'-4.5' Brown/black fine and medium SAND with little slag, wood, and clay, dry, no odor.
						5.5		4.5'-5.5' Brown/tan fine and medium SAND, wet at 5', no odor.
6								EOB @ 5.5'.
8								
10								
12								

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LOG OF WELL/BORING S-26

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: CAW
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 2/24/97 Finished: 2/24/97
TIME: Started 11:50 am Finished: 12:10 pm

GROUTING/SEAL

Depth/To	Material/Method
0'-6.5'	natural cuttings

DRILLING METHOD (S) 3.25" O.D. Hand Auger
DEPTH 6.5'

REMARKS: Split graphic log indicates fill.
43° 13.337' N, 86° 16.801' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 5.8 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						0.5		0'-0.5' TOPSOIL.
2						2.5		0.5'-2.5' Dark brown fine SAND with trace slag, moist.
4						4.5		2.5'-4.5' Brown fine SAND with trace slag, moist.
						5.5		4.5'-5.5' Black and brown fine SAND with trace slag, moist.
						5.8		5.5'-5.8' PEAT, moist.
6						6.5		5.8'-6.5' Tan medium SAND, wet.
								EOB @ 6.5'.
8								
10								
12								

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LOG OF WELL/BORING S-27

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: CAW
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 2/24/97 Finished: 2/24/97
TIME: Started 12:10 pm Finished: 12:30 pm

GROUTING/SEAL

Depth/To	Material/Method
0'-5'	natural cuttings

DRILLING METHOD (S): 3.25" O.D. Hand Auger
DEPTH: 5'

REMARKS: Split graphic log indicates fill.
43° 13.364' N, 86° 16.830' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 4.2 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						1		0'-1' Dark brown fine SAND and SLAG, moist.
2						3.2		1'-3.2' Tan fine SAND, moist.
						3.5		3.2'-3.5' Medium, brown CLAY, moist.
4	X					4		3.5'-4' Black and brown fine SAND with some slag, moist.
						4.2		4'-4.2' PEAT, moist.
						5		4.2'-5' Tan fine and medium SAND with trace gravel, wet.
								EOB @ 5'.
6								
8								
10								
12								

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LOG OF WELL/BORING S-28

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: RJB
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 2/24/97 Finished: 2/24/97
TIME: Started Finished:

GROUTING/SEAL

Depth/To	Material/Method
0'-4'	natural cuttings

DRILLING METHOD (S): 3.25" O.D. Hand Auger
DEPTH: 4'

REMARKS: Split graphic log indicates fill.
43' 13.378' N, 86' 16.712' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: ____ ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						2		0'-2' Brown/black fine and medium SAND, GRAVEL, and SLAG, dry, no odor
2						3		2'-3' Black/brown fine and medium SAND with some coal and slag.
						4		3'-4' Dark brown fine and medium SAND, dry, no odor.
4								EOB @ 4' due to auger refusal in PEAT with roots and wood.
6								
8								
10								
12								

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LOG OF WELL/BORING S-29

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: RJB
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 2/24/97 Finished: 2/24/97
TIME: Started Finished:

GROUTING/SEAL

Depth/To	Material/Method
0'-4.5'	natural cuttings

DRILLING METHOD (S): 3.25" O.D. Hand Auger
DEPTH: 4.5'

REMARKS: Split graphic log indicates fill.
43' 13.392' N, 86' 16.710' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 4.5 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						1		0'-1' Black fine and medium SAND, GRAVEL, and SLAG, dry, no odor
						2		1'-2' Dark brown fine and medium SAND, dry, no odor.
2	X					4		2'-4' Tan/brown fine and medium SAND with some clay, dry, no odor.
4						4.5		4'-4.5' Black PEAT with wood/roots, moist, no odor.
								Wet @ 4.5'. EOB @ 4.5'.
6								
8								
10								
12								

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3352 128th Avenue, Holland, Michigan 49424-9263

LOG OF WELL/BORING S-30

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: CAW
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 2/24/97 Finished: 2/24/97
TIME: Started 2:10 pm Finished: 2:40 pm

GROUTING/SEAL

Depth/To	Material/Method
0'-6'	natural cuttings

DRILLING METHOD (S): 3.25" O.D. Hand Auger
DEPTH: 6'

REMARKS: Split graphic log indicates fill.
43° 13.441' N, 86° 16.726' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 5.5 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						1.3		0'-1.3' Black fine SAND and SLAG with trace gravel (possible former RR subgrade), moist.
2						3		1.3'-3' Brown fine SAND with trace clay chunks.
4						6		3'-6' Grayish brown CLAY with some sand pockets and trace wood debris, moist, wet at ~5.5'.
6								EOB @ 6'.
8								
10								
12								

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LOG OF WELL/BORING S-31

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: CAW
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 2/24/97 Finished: 2/24/97
TIME: Started 2:40 pm Finished: 3:20 pm

GROUTING/SEAL

Depth/To	Material/Method
0'-5'	natural cuttings

DRILLING METHOD (S): 3.25" O.D. Hand Auger
DEPTH: 5'

REMARKS: Split graphic log indicates fill.
43° 13.471' N, 86° 16.685' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 4.5 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						2		0'-2' Brown fine SAND and GRAVEL with some slag, moist to dry.
2	X					3.5		2'-3.5' Dark brown and brown fine SAND with little slag, moist.
						4		3.5'-4' Dark brown fine SAND and PEAT, trace wood.
4						5		4'-5' Brown/gray fine SAND with clay chunks, trace wood, wet at 4.5'.
								EOB @ 5'.
6								
8								
10								
12								

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LOG OF WELL/BORING S-32

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: RJB
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 2/24/97 Finished: 2/24/97
TIME: Started Finished:

GROUTING/SEAL

Depth/To	Material/Method
0'-5'	natural cuttings

DRILLING METHOD (S) DEPTH
3.25" O.D. Hand Auger 5'

REMARKS: Split graphic log indicates fill.
43° 13.511' N, 86° 16.650' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 5 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						2		0'-2' Black/brown fine and medium SAND with gravel, slag, and some coal, dry, no odor.
2						3		2'-3' Black/brown fine and medium SAND with slag, and some gravel, dry, no odor.
4						4.5		3'-4.5' Brown fine and medium SAND with some slag, dry, no odor.
						5		4.5'-5' Black PEAT, organics, and wood, moist/wet, no odor.
								EOB @ 5'.
6								
8								
10								
12								

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LOG OF WELL/BORING S-33

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: CAW
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 2/24/97 Finished: 2/24/97
TIME: Started 3:20 pm Finished: 3:50 pm

GROUTING/SEAL

Depth/To	Material/Method
0'-5.5'	natural cuttings

DRILLING METHOD (S): 3.25" O.D. Hand Auger
DEPTH: 5.5'

REMARKS: Split graphic log indicates fill.
43° 13.525' N, 86° 16.625' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 4.5 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
	X					2.5		0'-2.5' Dark brown fine SAND with trace black sand and slag, moist.
						3		2.5'-3' Light brown fine SAND with trace clay.
						4.5		3'-4.5' Gray/brown fine SAND and soft CLAY chunks, little wood, moist.
						5.5		4.5'-5.5' Brown fine to medium SAND with trace gravel, wet.
								EOB @ 5.5'.

2 4 6 8 10 12

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LOG OF WELL/BORING S-34

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: RJB
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 2/24/97 Finished: 2/24/97
TIME: Started Finished:

GROUTING/SEAL

Depth/To	Material/Method
0'-4.5'	natural cuttings

DRILLING METHOD (S): 3.25" O.D. Hand Auger — DEPTH: 4.5'

REMARKS: Split graphic log indicates fill.
43' 13.541' N, 86' 16.604' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 4 ft.

DEPTH feet	SAMPLE INTERVAL	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						1		0'-1' Fine and medium SAND and GRAVEL with some clay, dry, no odor.
2								1'-4' Brown sandy CLAY, dry, no odor.
4						4		
						4.5		4'-4.5' Black WOOD, wet.
								EOB @ 4.5'.
6								
8								
10								
12								

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LOG OF WELL/BORING S-35

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: CAW
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 2/24/97 Finished: 2/24/97
TIME: Started 4:00 pm Finished: 4:20 pm

GROUTING/SEAL

Depth/To	Material/Method
0'-4'	natural cuttings

DRILLING METHOD (S): 3.25" O.D. Hand Auger — DEPTH: 4'

REMARKS: Split graphic log indicates fill.
43° 13.582' N, 86° 16.574' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 3.5 ft.

DEPTH feet	SAMPLE INTERVAL	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						1		0'-1' Red and tan core sand, some brown fine sand.
						1.7		1'-1.7' Dark brown fine SAND with trace clay and slag, moist.
2						2.5		1.7'-2.5' Black SLAG and fine SAND, moist.
						3.5		2.5'-3.5' PEAT and black fine SAND, moist.
4						4		3.5'-4' Dark gray fine and medium SAND with wood, wet.
								EOB @ 4'.
6								
8								
10								
12								

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LOG OF WELL/BORING S-36

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: RJB
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 2/24/97 Finished: 2/24/97
TIME: Started Finished:

GROUTING/SEAL

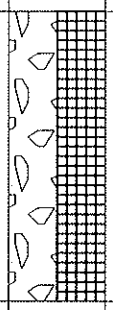
Depth/To	Material/Method
0'-3'	natural cuttings

DRILLING METHOD (S) DEPTH
3.25" O.D. Hand Auger 3'

REMARKS: Split graphic log indicates fill.
43° 13.594' N, 86° 16.528' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 3 ft.

DEPTH feet	SAMPLE INTERVAL	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						3		0'-3' Black fine and medium SAND with concrete, gravel, brick, and slag, concete and vegetation at surface.
								EOB @ 3' due to auger refusal.
2								
4								
6								
8								
10								
12								

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LOG OF WELL/BORING S-36, 100' S

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: RJB
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 2/24/97 Finished: 2/24/97
TIME: Started Finished:

GROUTING/SEAL

Depth/To	Material/Method
0'-4'	natural cuttings

DRILLING METHOD (S) DEPTH
3.25" O.D. Hand Auger 4'

REMARKS: Split graphic log indicates fill.

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 4 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						1		0'-1' Black/brown/reddish fine and medium SAND, dry, no odor.
2						4		1'-4' Brown CLAY with some sand seams, moist, no odor.
4								EOB @ 4'.
6								
8								
10								
12								

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LOG OF WELL/BORING S-37

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: CAW
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 3/7/97 Finished: 3/7/97
TIME: Started 8:40 am Finished: 9:20 am

GROUTING/SEAL

Depth/To	Material/Method
0'-7'	natural cuttings

DRILLING METHOD (S): 3.25" O.D. Hand Auger — DEPTH: 7'

REMARKS: Split graphic log indicates fill.
43° 13.626' N, 86° 16.520' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 6.5 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						0.8		0'-0.8' TOPSOIL and coarse GRAVEL, moist to dry.
2	X					2.3		0.8'-2.3' Brown and black fine SAND with trace clay, fine gravel, coal, and slag.
4, 6						6.5		2.3'-6.5' Brown and gray CLAY with occasional pockets of brown and black fine sand, moist to dry.
						7		6.5'-7' Tan fine to medium SAND with trace wood, wet.
8, 10, 12								EOB @ 7'.

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LOG OF WELL/BORING S-38

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: CAW
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 3/7/97 Finished: 3/7/97
TIME: Started 9:25 am Finished: 10:00 am

GROUTING/SEAL

Depth/To	Material/Method
0'-7'	natural cuttings

DRILLING METHOD (S): 3.25" O.D. Hand Auger
DEPTH: 7'

REMARKS: Split graphic log indicates fill.
43° 13.655' N, 86° 16.489' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 6.8 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						1		0'-1' TOPSOIL and coarse GRAVEL, moist to dry.
						2		1'-2' Dark brown fine SAND with some slag, moist to dry.
2	X					3		2'-3' Light brown fine SAND with occasional pockets of black sand, moist to dry.
						3.5		3'-3.5' Light brown fine SAND with some coarse sand and pockets of brown clay, moist to dry.
4	X					5		3.5'-5' Tan fine SAND with some medium sand and trace coarse sand, moist.
6						7		5'-7' Tan fine SAND, moist. Wet at 6.8
								EOB @ 7'.
8								
10								
12								

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LOG OF WELL/BORING S-39

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: CAW
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 3/7/97 Finished: 3/7/97
TIME: Started 10:00 am Finished: 11:10 am

GROUTING/SEAL

Depth/To	Material/Method
0'-12'	natural cuttings

DRILLING METHOD (S): 3.25" O.D. Hand Auger
DEPTH: 12'

REMARKS: Split graphic log indicates fill.
43° 13.677' N, 86° 16.462' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: ____ ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						0.5		0'-0.5' TOPSOIL.
	☒					1.5		0.5'-1.5' Dark brown fine SAND with some slag and fine gravel, trace chunks of light orange chalky material.
2								1.5'-12' Stiff, brownish-gray CLAY with some light gray mottling, moist to dry.
4								3.5'-5' Becoming softer, sandy clay, moist to wet, (possible wet seam)
6								5'-12' Becoming brown and stiff, moist to dry.
8								
10								
12						12		EOB @ 12'.
14								
16								
18								

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LOG OF WELL/BORING S-40

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: CAW
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 3/10/97 Finished: 3/10/97
TIME: Started 9:45 am Finished: 10:10 am

GROUTING/SEAL

Depth/To	Material/Method
0'-6'	natural cuttings

DRILLING METHOD (S): 3.25" O.D. Hand Auger
DEPTH: 6'

REMARKS: Split graphic log indicates fill.
43° 13.712' N, 86° 16.437' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 5.5 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						0.5		0'-0.5' TOPSOIL.
						2		0.5'-2' Black SLAG - some large chunks, with some fine sand.
2						5.3		2'-5.3' Brown silty fine SAND with occasional pockets of dark gray clayey sand at 3.5'-4', trace slag and core sand, moist.
4						5.5		5.3'-5.5' Soft, decayed WOOD.
						6		5.5'-6' Tan fine and medium SAND, wet.
6								EOB @ 6'.
8								
10								
12								

DELL ENGINEERING, INC.
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LOG OF WELL/BORING S-41

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: KJV
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 3/10/97 Finished: 3/10/97
TIME: Started 9:50 am Finished: 10:10 am

GROUTING/SEAL

Depth/To	Material/Method
0'-4.3'	natural cuttings

DRILLING METHOD (S): 3.25" O.D. Hand Auger
DEPTH: 4.3'

REMARKS: Split graphic log indicates fill.
43° 13.738' N, 86° 16.406' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 4 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						0.2		0'-0.2' Dark brown sandy TOPSOIL with grass and some silt.
						0.8		0.2'-0.8' Dark brown fine SAND with some fine and coarse gravel size black glassy cinders.
	X					1.5		0.8'-1.5' Brown fine SAND with some black and brown vesicular cinders (fine to coarse gravel size), and some fine black sand.
						1.7		1.5'-1.7' Gray silty fine SAND (unnatural looking) with some white and brown medium sand and trace black, brittle coal.
2								1.7'-3.5' Brown fine SAND with some very fine black sand, trace black fine gravel, trace silt, and trace black coal.
								3'-3.5' Orange and very moist.
						3.5		
						4		3.5'-4' Brown sandy SILT and WOOD with some tan and red/orange brick material.
4						4.3		4'-4.3' Light brown fine SAND with some medium and coarse sand, and trace fine gravel, wet.
								EOB @ 4.3'
6								
8								
10								
12								

DELL ENGINEERING, INC.
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3352 128th Avenue, Holland, Michigan 49424-9263

LOG OF WELL/BORING S-42

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: KJV
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 3/10/97 Finished: 3/10/97
TIME: Started 10:35 am Finished: 11:25 am

GROUTING/SEAL

Depth/To	Material/Method
0'-2.5'	natural cuttings

DRILLING METHOD (S): 3.25" O.D. Hand Auger
DEPTH: 2.5'

REMARKS: Split graphic log indicates fill.
43' 13.757' N, 86' 16.369' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: ____ ft.

DEPTH feet	SAMPLE INTERVAL	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						0.2		0'-0.2' Dark brown fine SAND with some grass at surface.
								0.2'-1' Tan coarse limestone GRAVEL with dark silty fine SAND.
						1		
						1.2		1'-1.2' Dark brown silty fine SAND with some brown/orange sand and crushed tan brick, trace rounded fine gravel, trace fine and coarse gravel size, hard, unnatural material.
2	X							1.2'-1.3' Black very fine SAND with trace brown fine sand and trace orange/brown cinders.
						2.5		1.3'-2.5' Black fine SAND with some black fine, rounded gravel, strong petroleum odor.
								2'-2.5' Some coarse gravel, little coarse gravel size hard material, and little glassy vesicular cinders.
								EOB/auger refusal @ 2.5'.
4								
6								
8								
10								
12								

DELL ENGINEERING, INC.
Civil Engineering • Environmental Consulting
3352 128th Avenue, Holland, Michigan 49424-9263

LOG OF WELL/BORING S-43

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: CAW
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 3/10/97 Finished: 3/10/97
TIME: Started 10:30 am Finished: 11:15 am

GROUTING/SEAL

Depth/To	Material/Method
0'-7.5'	natural cuttings

DRILLING METHOD (S): 3.25" O.D. Hand Auger
DEPTH: 7.5'

REMARKS: Split graphic log indicates fill.
43° 13.784' N, 86° 16.358' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 5.5 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						0.5		0'-0.5' Dark brown silty fine SAND with some coarse gravel, moist to dry.
2						5		0.5'-5' Black silty fine SAND with trace fine gravel, core sand, wire, and slag.
4	X							
						5.7		5'-5.7' Gray, black, and orange fine SAND, moist, wet at 5.5'.
6						6.2		5.7'-6.2' Black fine SAND with little slag, wet.
						7		6.2'-7' Reddish brown WOOD, moist.
						7.5		7'-7.5' Light brown fine and medium SAND, wet.
8								EOB @ 7.5'
10								
12								

DELL ENGINEERING, INC.
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3352 128th Avenue, Holland, Michigan 49424-9263

LOG OF WELL/BORING S-44

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: CAW
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 3/10/97 Finished: 3/10/97
TIME: Started 11:25 am Finished: 1:20 pm

GROUTING/SEAL

Depth/To	Material/Method
0'-5.5'	natural cuttings

DRILLING METHOD (S): 3.25" O.D. Hand Auger
DEPTH: 5.5'

REMARKS: Split graphic log indicates fill.
43° 13.799' N, 86° 16.313' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 5.5 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						0.5		0'-0.5' Dark brown silty fine SAND with wood chips at surface, moist to dry.
						1.5		0.5'-1.5' White coarse GRAVEL with some dark brown silty fine sand.
2								1.5'-5.5' Dark brown silty fine SAND, with some black and green slag, trace fine gravel, and trace reddish core sand, moist.
4	X							
						5.5		
6								Wet at 5.5'. EOB/auger refusal @ 5.5'
8								
10								
12								

DELL ENGINEERING, INC.
Civil Engineering • Environmental Consulting
3352 128th Avenue, Holland, Michigan 49424-9263

LOG OF WELL/BORING S-45

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: KJV
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 3/10/97 Finished: 3/10/97
TIME: Started 1:05 pm Finished: 2:15 pm

GROUTING/SEAL

Depth/To	Material/Method
0'-9.5'	natural cuttings

DRILLING METHOD (S): 3.25" O.D. Hand Auger
DEPTH: 9.5'

REMARKS: Split graphic log indicates fill.
43° 13.805' N, 86° 16.247' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 7.2 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						0.5		0'-0.5' Dark brown silty fine SAND.
						1		0.5'-1' Dark brown silty fine SAND with some coarse limestone gravel.
						1.7		1'-1.7' Dark brown silty fine SAND with some fine and coarse gravel, metal slag (rusty 3" size), trace black brittle coal.
2								1.7'-5' Gray/brown fine SAND with some brown fine sand, trace metal parts (nail and bolt), trace brittle grayish white material - some in 2"-3" consolidated chunks, trace black brittle coal, and trace fine gravel.
4	X					5		
						5.3		5'-5.3' Gray fine SAND with some brown fine sand.
						5.7		5.3'-5.7' Grayish brown fine SAND with some consolidated gray material (possible gray slag) and fine gravel.
6						6		5.7'-6' Gray material (consolidated, soft to hard and brittle) and gray fine SAND.
						6.5		6'-6.5' Gray fine SAND with some rust colored sand
						7		6.5'-7' Grayish brown fine SAND and metal/rusty material-flakes and rust sand, very moist.
						7.2		7'-7.2' Dark brown WOOD.
						7.5		7.2'-7.5' Brown very fine SAND and SILT with some black very fine sand/silt, wet.
8						8		7.5'-8' Light brown fine SAND with some medium sand and trace coarse sand, wet.
						9.3		8'-9.3' Brown to rusty brown wood pulp, moist.
						9.5		9.3'-9.5' Light brown fine SAND, wet.
10								EOB @ 9.5'
12								

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LOG OF WELL/BORING S-46

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: CAW
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 3/10/97 Finished: 3/10/97
TIME: Started 1:25 pm Finished: 2:00 pm

GROUTING/SEAL

Depth/To	Material/Method
0'-7'	natural cuttings

DRILLING METHOD (S): 3.25" O.D. Hand Auger — DEPTH: 7'

REMARKS: Split graphic log indicates fill.
43° 13.797' N, 86° 16.226' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 6.5 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
								0'-1.3' Dark brown and black silty fine SAND with slag, moist to dry.
	X					1.3		
						1.8		1.3'-1.8' Brownish red sandy SILT with glass and brick debris.
2						2.2		1.8'-2.2' Dark brown and black silty fine SAND with slag, moist to dry.
						2.8		2.2'-2.8' Black fine SAND with trace slag and roots (similar to topsoil), moist to dry.
	X							2.8'-7' Light brown fine SAND with trace wood/roots, moist to dry.
								Dark brown/black pocket @ ~3.5'.
4								
								Becoming grayish-tan, moist @ ~5'.
6								
								Wet @ 6.5'.
						7		EOB @ 7'
8								
10								
12								

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LOG OF WELL/BORING S-46, 300' S

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: CAW
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 3/12/97 Finished: 3/12/97
TIME: Started 9:00 am Finished: 9:30 am

GROUTING/SEAL

Depth/To	Material/Method
0'-12'	natural cuttings

DRILLING METHOD (S): 3.25" O.D. Hand Auger
DEPTH: 12'

REMARKS: Split graphic log indicates fill.
43° 13.742' N, 86° 16.237' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 11.5 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						1		0'-1' Dark brown fine SAND with little silt, moist to dry. 1" black silty fine sand seam at 0.5'.
						1.5		1'-1.5' Black fine SAND with some brown pockets and little silt, trace glass and reddish, chalky material.
2						2		1.5'-2' Gray fine SAND, moist to dry.
						3		2'-3' Orangish-brown fine SAND with trace medium and coarse sand and fine gravel, moist to dry.
4						4.5		3'-4.5' Brown fine to coarse SAND with trace gravel, moist to dry, becoming tan at 4'-4.5'.
6, 8						10		4.5'-10' tan fine SAND with little silt and trace medium and coarse sand, moist, occasional sandy silt seams.
10, 12						12		10'-12' Light brown fine SAND with little coarse sand and trace gravel, wet at 11.5'.
14, 16, 18								EOB @ 12'

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LOG OF WELL/BORING S-47

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: CAW
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 3/10/97 Finished: 3/10/97
TIME: Started 2:15 pm Finished: 2:45 pm

GROUTING/SEAL

Depth/To	Material/Method
0'-7'	natural cuttings

DRILLING METHOD (S) DEPTH
3.25" O.D. Hand Auger 7'

REMARKS: Split graphic log indicates fill.
43° 13.782' N, 86° 16.192' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 5.8 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						0.5		0'-0.5' Brown fine to coarse SAND with fine gravel.
	X					1.5		0.5'-1.5' Dark brown fine SAND with some silt, trace fine gravel and slag.
2						3.5		1.5'-3.5' Brown, yellowish brown, and black fine SAND with trace core sand chunks and trace small roots, moist to dry.
4						6.5		3.5'-6.5' Grayish tan silty fine SAND, moist, becoming wet at ~5.8'.
6						7		6.5'-7' Grayish tan fine SAND with trace silt, wet.
								EOB @ 7'
8								
10								
12								

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LOG OF WELL/BORING S-47, 225' S

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: CAW
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 3/12/97 Finished: 3/12/97
TIME: Started 10:10 am Finished: 10:25 am

GROUTING/SEAL

Depth/To	Material/Method
0'-4'	natural cuttings

DRILLING METHOD (S) DEPTH
3.25" O.D. Hand Auger 4'

REMARKS: Split graphic log indicates fill.
43' 13.746' N, 86' 16.190' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: ____ ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						0.8		0'-0.8' TOPSOIL (Dark brown fine SAND, little silt, trace roots and fine gravel), moist to dry.
						1.2		0.8'-1.2' Gray fine SAND, moist to dry.
2						2.2		1.2'-2.2' Orangish-brown fine SAND with trace fine gravel and medium sand. Gradual fading to light brown.
4						4		2.2'-4' Light brown fine SAND with little medium and coarse sand, and fine gravel, moist to dry.
								EOB @ 4'
6								
8								
10								
12								

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LOG OF WELL/BORING S-47, 275' S

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: CAW
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 3/12/97 Finished: 3/12/97
TIME: Started 10:35 am Finished: 10:45 am

GROUTING/SEAL

Depth/To	Material/Method
0'-4'	natural cuttings

DRILLING METHOD (S): 3.25" O.D. Hand Auger — DEPTH: 4'

REMARKS: Split graphic log indicates fill.
43° 13.741' N, 86° 16.185' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: ____ ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						1		0'-1' TOPSOIL
						1.5		1'-1.5' Gray and brown fine SAND.
2						3		1.5'-3' Orangish-brown fine SAND with trace coarse sand and fine gravel.
						4		3'-4' Light brown fine to coarse SAND with trace fine gravel.
4								EOB @ 4'
6								
8								
10								
12								

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LOG OF WELL/BORING S-48

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: KJV
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 3/10/97 Finished: 3/10/97
TIME: Started 2:20 pm Finished: 3:15 pm

GROUTING/SEAL

Depth/To	Material/Method
0'-7'	natural cuttings

DRILLING METHOD (S): 3.25" O.D. Hand Auger — DEPTH: 7'

REMARKS: Split graphic log indicates fill.
43° 13.771' N, 86° 16.149' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 7 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						1		0'-1' Dark brown fine SAND with trace fine gravel and little black ½" cinders.
	X					1.5		1'-1.5' Dark brown and brown fine SAND with trace fine gravel and little <½" cinders.
2						2		1.5'-2.0' Brown fine SAND with some fine gravel, trace coarse gravel, and trace dark brown fine sand.
						3.5		2.0'-3.5' Light brown fine SAND with some fine gravel and trace coarse gravel.
4						4.5		3.5'-4.5' Light brown fine SAND.
						5.5		4.5'-5.5' Light brown fine SAND with some fine gravel.
6						6		5.5'-6.0' Light brown fine SAND with trace black very fine sand, 2" limestone gravel (1 stone), moist.
						7		6'-7' Light brown fine SAND with some medium sand and little fine gravel, very moist.
								Wet @ 7', EOB @ 7'.
8								
10								
12								

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3352 128th Avenue, Holland, Michigan 49424-9263

LOG OF WELL/BORING S-48, 175' S

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: CAW
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 3/12/97 Finished: 3/12/97
TIME: Started 10:50 am Finished: 11:10 am

GROUTING/SEAL

Depth/To	Material/Method
0'-7'	natural cuttings

DRILLING METHOD (S): 3.25" O.D. Hand Auger
DEPTH: 7'

REMARKS: Split graphic log indicates fill.
43° 13.741' N, 86° 16.157' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: ____ ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						0.7		0'-0.7' TOPSOIL
						1		0.7'-1' Gray and brown fine SAND, moist to dry.
						2		1'-2' Orangish-brown fine SAND with trace roots and silt, moist to dry.
2						5.5		2'-5.5' Light brown/tan fine SAND with trace medium sand and fine gravel, moist to dry.
6	X					7		5.5'-7' Tan fine to coarse SAND with trace gravel, moist to dry. becoming brownish 6.5'-7'.
								EOB @ 7'
8								
10								
12								

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LOG OF WELL/BORING S-49

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: CAW
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 3/10/97 Finished: 3/10/97
TIME: Started 2:50 pm Finished: 3:15 pm

GROUTING/SEAL

Depth/To	Material/Method
0'-9'	natural cuttings

DRILLING METHOD (S): 3.25" O.D. Hand Auger
DEPTH: 9'

REMARKS: Split graphic log indicates fill.
43° 13.763' N, 86° 16.106' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 7.5 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						0.5		0'-0.5' TOPSOIL
						1		0.5'-1' Black fine SAND with some slag and trace gravel.
	X					2		1'-2' Brown and black fine SAND with trace glass and slag.
2								2'-7' Tan fine SAND with some medium and coarse sand, and trace fine gravel.
4								4'-6' no gravel
6						7		
						7.5		7'-7.5' Tan SILT with trace fine sand and reddish iron streaks, moist to wet.
						8		7.5'-8' Grayish tan fine SAND with trace fine gravel, wet.
8						8.5		8'-8.5' Tan fine to coarse SAND and fine GRAVEL, wet.
						9		8.5'-9' Gray SILT with trace coarse sand and fine gravel, wet.
								EOB @ 9'
10								
12								

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LOG OF WELL/BORING S-49, 115' S

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: CAW
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 3/12/97 Finished: 3/12/97
TIME: Started 11:20 am Finished: 11:55 am

GROUTING/SEAL

Depth/To	Material/Method
0'-7'	natural cuttings

DRILLING METHOD (S): 3.25" O.D. Hand Auger
DEPTH: 7'

REMARKS: Split graphic log indicates fill.
43° 13.747' N, 86° 16.100' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: ____ ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						0.5		0'-0.5' TOPSOIL
						1		0.5'-1' Light brown/gray fine SAND.
						1.4		1'-1.4' Fine GRAVEL and gray SILT with some fine to coarse sand.
						2		1.4'-2' COBBLES and brown fine SAND with some orange brick-like material and slag.
2						2.5		2'-2.5' Black and gray fine SAND, moist to dry.
						3.5		2.5'-3.5' Orange-brown fine SAND with little medium sand and trace gravel, moist to dry.
4						5.5		3.5'-5.5' Light brown fine SAND, moist to dry.
6						7		5.5'-7' Tan fine SAND with little medium and coarse sand, and trace fine gravel, moist to dry.
8								EOB @ 7'
10								
12								

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LOG OF WELL/BORING S-49, 170' S

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: CAW
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 3/12/97 Finished: 3/12/97
TIME: Started 1:40 pm Finished: 2:20 pm

GROUTING/SEAL

Depth/To	Material/Method
0'-7'	natural cuttings

DRILLING METHOD (S) DEPTH
3.25" O.D. Hand Auger 7'

REMARKS: Split graphic log indicates fill.
43° 13.730' N, 86° 16.102' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: ____ ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
2						2.5		0'-2.5' Brown and black fine SAND with trace fine gravel, slag, and pale yellow and orange chalk-like material, moist to dry.
						3		2.5'-3' Brown and gray fine SAND, moist to dry.
						3.4		3'-3.4' Black sandy SILT (similar to topsoil).
						3.7		3.4'-3.7' Gray fine SAND with trace silt.
4						4.1		3.7'-4.1' Brown silty fine SAND, moist.
						5		4.1'-5' Tan/light brown fine SAND with trace coarse sand, moist to dry
6						7		5'-7' Tan fine SAND with little medium to coarse sand and trace fine gravel, moist to dry.
8								EOB @ 7'
10								
12								

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LOG OF WELL/BORING S-49, 275' S

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: CAW
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 3/12/97 Finished: 3/12/97
TIME: Started 2:35 pm Finished: 2:55 pm

GROUTING/SEAL

Depth/To	Material/Method
0'-4'	natural cuttings

DRILLING METHOD (S): 3.25" O.D. Hand Auger
DEPTH: 4'

REMARKS: Split graphic log indicates fill.

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: ____ ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						1.3		0'-1.3' Dark brown/black fine SAND with little silt, trace slag, fine gravel, glass, and bone, moist to dry.
2						2.2		1.3'-2.2' Brown and black fine SAND, little silt, trace slag, and fine gravel, moist to dry. 2'-2.2' Trace wood.
						2.5		2.2'-2.5' Gray fine SAND.
						3		2.5'-3' Orangish-brown fine SAND with trace gravel, moist to dry.
4						4		3'-4' Light brown fine SAND with trace coarse sand and fine gravel, moist to dry.
								EOB @ 4'
6								
8								
10								
12								

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LOG OF WELL/BORING S-50

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: CAW
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 3/11/97 Finished: 3/11/97
TIME: Started 2:15 pm Finished: 2:45 pm

GROUTING/SEAL

Depth/To	Material/Method
0'-9'	natural cuttings

DRILLING METHOD (S): 3.25" O.D. Hand Auger
DEPTH: 9'

REMARKS: Split graphic log indicates fill.
43° 13.751' N, 86° 16.054' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 7.7 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						0.5		0'-0.5' TOPSOIL with trace slag and glass.
2						3		0.5'-3' Brown fine and medium SAND with trace coarse sand, moist to dry.
4						4		3'-4' Brown fine to coarse SAND with trace fine gravel, moist to dry.
6						7.2		4'-7.2' Tan fine SAND with little medium sand and trace fine gravel, moist, wet just above silt.
						7.7		7.2'-7.7' Light brown and gray SILT with little coarse sand, moist.
8						9		7.7'-9' Light tan fine SAND with trace medium and coarse sand and fine gravel, wet.
10								EOB @ 9'
12								

DELL ENGINEERING, INC.
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3352 128th Avenue, Holland, Michigan 49424-9263

LOG OF WELL/BORING S-50, 130' S

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: CAW
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 3/11/97 Finished: 3/11/97
TIME: Started 2:55 pm Finished: 3:25 pm

GROUTING/SEAL

Depth/To	Material/Method
0'-10'	natural cuttings

DRILLING METHOD (S): 3.25" O.D. Hand Auger
DEPTH: 10'

REMARKS: Split graphic log indicates fill.
43' 13.739' N, 86' 16.057' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 9 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						0.5		0'-0.5' Tan fine SAND.
						1		0.5'-1' Dark brown silty fine SAND with trace fine gravel.
						1.5		1'-1.5' Stiff, reddish brown CLAY with some dark brown fine sand mixed in, moist to dry.
2	X					3.7		1.5'-3.7' Dark brown fine SAND with some stiff reddish-brown clay chunks, trace slag and fine gravel.
4						4.2		3.7'-4.2' Light brown fine SAND with trace fine gravel.
						4.8		4.2'-4.8' Orangish-brown fine SAND with some silt, little fine gravel, moist to dry.
								4.8'-10' Light tan fine SAND with little coarse sand.
6								6'-7' light brown, little fine gravel.
8								Wet at 9'.
10						10		EOB @ 10'
12								

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3352 128th Avenue, Holland, Michigan 49424-9263

LOG OF WELL/BORING S-51

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: CAW
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 3/17/97 Finished: 3/17/97
TIME: Started 9:40 am Finished: 10:05 am

GROUTING/SEAL

Depth/To	Material/Method
0'-9.2'	natural cuttings

DRILLING METHOD (S) DEPTH
3.25" O.D. Hand Auger 9.2'

REMARKS: Split graphic log indicates fill.
43° 13.738' N, 86° 16.042' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 8.7 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
	X					1.7		0'-1.7' Dark brown fine and medium SAND, little slag, and trace fine gravel and coal, moist to dry.
2						2.5		1.7'-2.5' Orangish-brown fine to medium SAND, some coarse sand, trace fine gravel, moist to dry.
4						4		2.5'-4' Tan fine to medium SAND, some coarse sand, trace fine gravel, moist to dry.
6						6.5		4'-6.5' Tan fine SAND with trace coarse sand and fine gravel, moist to dry.
						7		6.5'-7' Light brown fine to medium SAND with some silt, moist.
8						9.2		7'-9.2' Tan fine SAND, little medium and coarse sand, trace fine gravel, moist to dry, becoming wet at ~8.7'.
10								EOB @ 9.2'
12								

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LOG OF WELL/BORING S-52

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: KJV
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 3/17/97 Finished: 3/17/97
TIME: Started 9:40 am Finished: 10:10 am

GROUTING/SEAL

Depth/To	Material/Method
0'-8'	natural cuttings

DRILLING METHOD (S): 3.25" O.D. Hand Auger — DEPTH: 8'

REMARKS: Split graphic log indicates fill.
43° 13.738' N, 86° 16.003' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 8 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						1		0'-1' Dark brown sandy TOPSOIL, little fine gravel, trace black coal, vegetation at surface.
	X					1.75		1'-1.75' Brown fine SAND, some orange/brown fine sand, little red and tan sand (possibly old brick), trace coarse sand.
2						2		1.75'-2' Dark brown fine SAND with some brown sand, little black sand.
								2'-5.5' Orangish-brown fine SAND, trace fine gravel.
4								
						5.5		
6						6.25		5.5'-6.25' Orangish-brown fine SAND, some coarse sand, trace fine gravel.
						7		6.25'-7' Light brown fine SAND, slightly moist.
8						8		7'-8' Light brown fine SAND, some medium sand, little coarse sand, very moist.
								Wet @ 8'. EOB @ 8'.
10								
12								

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LOG OF WELL/BORING S-52, 60' S

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: CAW
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 3/17/97 Finished: 3/17/97
TIME: Started 9:15 am Finished: 4:30 am

GROUTING/SEAL

Depth/To	Material/Method
0'-4'	natural cuttings

DRILLING METHOD (S) DEPTH
3.25" O.D. Hand Auger 4'

REMARKS: Split graphic log indicates fill.
43° 13.755' N, 86° 15.966' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: ____ ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						0.8		0'-0.8' Dark brown and brown fine SAND, trace slag, concrete, silt, and roots, dry.
2						2.2		0.8'-2.2' Orangish-brown fine and medium SAND, trace fine gravel, moist to dry.
4						4		2.2'-4' Light brown/tan fine and medium SAND, little coarse sand, trace fine gravel, moist to dry.
								EOB @ 4'
6								
8								
10								
12								

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LOG OF WELL/BORING S-53

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: KJV
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 3/17/97 Finished: 3/17/97
TIME: Started Finished:

GROUTING/SEAL

Depth/To	Material/Method
0'-5.5'	natural cuttings

DRILLING METHOD (S) DEPTH
3.25" O.D. Hand Auger 5.5'

REMARKS: Split graphic log indicates fill.
43° 13.732' N, 86° 15.931' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: ____ ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						0.5		0'-0.5' Dark brown sandy TOPSOIL, little coarse sand size black material.
						0.7		0.5'-0.7' Grayish brown fine SAND.
						1		0.7'-1' Brown fine SAND, some coarse sand and fine to coarse gravel.
2	X					2.5		1'-2.5' Black fine SAND, some brown fine sand, some coarse sand to fine gravel size, vesicular, black cinders, some coal, little fine gravel, trace coarse gravel size concrete.
						3.5		2.5'-3.5' Dark brown and brown fine SAND, trace crushed red brick. 3'-3.5' Sand becomes mostly brown, little rusty metalic material and fine gravel size black cinders.
4						4.3		3.5'-4.2' Dark brown silty fine SAND, some orange and tan sand (old bricks), little coarse sand size black cinders and coal.
						4.75		4.2'-4.3' Dark brown WOOD. 4.3'-4.75' Dark brown with some brown fine SAND, little orange crushed brick-sand, little black silty fine sand.
						5.25		4.75'-5.25' Brown WOOD.
						5.5		5.25'-5.5' Grayish-tan fine SAND, little medium sand, rock ? at 5.5'.
6								EOB @ 5.5' due to auger refusal.
8								
10								
12								

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LOG OF WELL/BORING S-53, 60' S

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: CAW
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 3/18/97 Finished: 3/18/97
TIME: Started 9:30 am Finished: 9:45 am

GROUTING/SEAL

Depth/To	Material/Method
0'-4'	natural cuttings

DRILLING METHOD (S): 3.25" O.D. Hand Auger
DEPTH: 4'

REMARKS: Split graphic log indicates fill.
43° 13.731' N, 86° 15.925' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: ____ ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						0.3		0'-0.3' Dark brown silty fine SAND, moist to dry.
						0.5		0.3'-0.5' Tan fine SAND.
						0.7		0.5'-0.7' Dark brown and black fine SAND, trace fine gravel, slag, and wood.
2						3		0.7'-3' Orangish-brown fine and medium SAND, little coarse sand, trace fine gravel, gradual color change to tan/light brown.
4						4		3'-4' Tan/light brown fine and medium SAND, little coarse sand, trace fine gravel.
								EOB @ 4'
6								
8								
10								
12								

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LOG OF WELL/BORING S-54

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: CAW
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 3/17/97 Finished: 3/17/97
TIME: Started 10:30 am Finished: 11:20 am

GROUTING/SEAL

Depth/To	Material/Method
0'-7.3'	natural cuttings

DRILLING METHOD (S): 3.25" O.D. Hand Auger — DEPTH: 7.3'

REMARKS: Split graphic log indicates fill.
43° 13.732' N, 86° 15.888' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 5 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
	X					1.7		0'-1.7' Dark brown fine SAND, some silt, trace slag, coal, and fine gravel, moist.
2						2.1		1.7'-2.1' Brown and tan fine SAND, trace fine gravel, slag/coal, moist to dry.
						3		2.1'-3' Tan fine to very fine SAND, trace medium sand and black sand with dark brown streaks/pockets.
4						4		3'-4' Brown fine SAND, trace black fine sand with pale yellow and reddish chalky material.
						5		4'-5' Brown, dark brown, and black WOOD (rotted).
6						6.8		5'-6.8' Dark grayish-brown fine to coarse SAND with trace silt, wet.
						7.3		6.8'-7.3' Tan fine to coarse SAND with trace silt, wet.
8								EOB @ 7.3'
10								
12								

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LOG OF WELL/BORING S-54, 60' N

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: CAW
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 3/17/97 Finished: 3/17/97
TIME: Started Finished:

GROUTING/SEAL

Depth/To	Material/Method
0'-5.7'	natural cuttings

DRILLING METHOD (S) DEPTH
3.25" O.D. Hand Auger 5.7'

REMARKS: Split graphic log indicates fill.

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 4.7 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
								0'-5' Dark brown fine SAND, some fine to coarse gravel, little dark reddish-brown core sand, trace wood and coal, some gray clay 1.7'-2.3'
2								
4								
						5		Wet at 4.7'.
						5.7		5'-5.7' GRAVEL, wet.
6								EOB @ 5.7'
8								
10								
12								

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LOG OF WELL/BORING S-54, 160' N

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: KJV
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 3/17/97 Finished: 3/17/97
TIME: Started Finished:

GROUTING/SEAL

Depth/To	Material/Method
0'-4'	natural cuttings

DRILLING METHOD (S): 3.25" O.D. Hand Auger
DEPTH: 4'

REMARKS: Split graphic log indicates fill.

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 3.5 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						0.25		0'-0.25' Dark brown sandy TOPSOIL, grass at surface.
						1.5		0.25'-1.5' Light brown fine SAND.
2						3.5		1.5'-3.5' Dark brown fine SAND, some black and rusty slag/consolidated sand, metal and wire, orange sand from 2.5'-3.0', moist to wet.
4						4		3.5'-4' Black and brown silty fine SAND, some medium sand and fine gravel, wet.
								EOB @ 4'.
6								
8								
10								
12								

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LOG OF WELL/BORING S-54, 125' S

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: CAW
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 3/18/97 Finished: 3/18/97
TIME: Started 9:50 am Finished: 10:25 am

GROUTING/SEAL

Depth/To	Material/Method
0'-6.5'	natural cuttings

DRILLING METHOD (S): 3.25" O.D. Hand Auger
DEPTH: 6.5'

REMARKS: Split graphic log indicates fill.
43° 13.736' N, 86° 15.883' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 5.5 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						1.2		0'-1.2' Dark brown/black fine SAND, some silt, trace glass, moist to dry.
2	X					2.5		1.2'-2.5' Orangish-brown, brown, and dark brown fine SAND, trace coarse sand and fine gravel, moist to dry.
4						5.5		2.5'-5.5' Light brown/tan fine SAND, trace fine gravel and medium to coarse sand, wet at 5.5'.
6						6		5.5'-6' Tan fine to coarse SAND, trace fine gravel.
						6.5		6'-6.5' Tan fine and coarse SAND and SILT, trace fine gravel.
								EOB @ 6.5'.
8								
10								
12								

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LOG OF WELL/BORING S-55

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: CAW
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 3/17/97 Finished: 3/17/97
TIME: Started 1:10 pm Finished: 1:30 pm

GROUTING/SEAL

Depth/To	Material/Method
0'-4.5'	natural cuttings

DRILLING METHOD (S) DEPTH
3.25" O.D. Hand Auger 4.5'

REMARKS: Split graphic log indicates fill.
43° 13.743' N, 86° 15.838' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 3.7 ft.

DEPTH feet	SAMPLE INTERVAL	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
								0'-4.5' Dark brown and black fine SAND, little medium sand and silt, trace coal, slag, and dark red/brown core sand, moist to dry.
2								
4								Wet at 3.7'.
						4.5		EOB @ 4.5'
6								
8								
10								
12								

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LOG OF WELL/BORING S-55, 70' S

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: KJV
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 3/17/97 Finished: 3/17/97
TIME: Started 1:15 pm Finished: 1:40 pm

GROUTING/SEAL

Depth/To	Material/Method
0'-3.8'	natural cuttings

DRILLING METHOD (S) DEPTH
3.25" O.D. Hand Auger 3.8'

REMARKS: Split graphic log indicates fill.
43° 13.735' N, 86° 15.824' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 3.8 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						0.25		0'-0.25' Dark brown sandy TOPSOIL with roots, little fine gravel.
						0.75		0.25'-0.75' Light brown fine SAND.
						1.5		0.75'-1.5' Dark brown fine SAND, some fine gravel, trace crushed concrete.
						2		1.5'-2' Light brown fine SAND, little fine gravel.
2						3.8		2'-3.8' Brown fine SAND, some fine gravel, little coarse sand.
4								Wet @ 3.8'. EOB @ 3.8'.
6								
8								
10								
12								

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LOG OF WELL/BORING S-56

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: CAW
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 3/17/97 Finished: 3/17/97
TIME: Started 1:30 pm Finished: 2:20 pm

GROUTING/SEAL

Depth/To	Material/Method
0'-4.7'	natural cuttings

DRILLING METHOD (S): 3.25" O.D. Hand Auger
DEPTH: 4.7'

REMARKS: Split graphic log indicates fill.
43' 13.759' N, 86' 15.805' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 4.3 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						1.5		0'-1.5' Dark brown fine SAND, trace coal, slag and silt, moist to dry.
2						2.5		1.5'-2.5' Gray and dark brown fine SAND with little slag and coal, moist to dry.
						4		2.5'-4' Tan fine SAND, some black fine sand, little slag and coal, moist to dry.
4						4.3		4'-4.3' WOOD, PEAT and black fine SAND, moist.
						4.7		4.3'-4.7' Light gray fine and medium SAND, wet.
								EOB @ 4.7'
6								
8								
10								
12								

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LOG OF WELL/BORING S-56, 85' S

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: KJV
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 3/17/97 Finished: 3/17/97
TIME: Started 1:45 pm Finished: 2:15 pm

GROUTING/SEAL

Depth/To	Material/Method
0'-4'	natural cuttings

DRILLING METHOD (S): 3.25" O.D. Hand Auger
DEPTH: 4'

REMARKS: Split graphic log indicates fill.
43' 13.749' N, 86' 15.788' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 4 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						0.2		0'-0.2' Dark brown sandy TOPSOIL with grass at surface.
						0.3		0.2'-0.3' Light brown fine SAND, some dark brown fine sand.
						0.5		0.3'-0.5' Dark brown fine SAND, some coarse gravel, trace red/brown fine gravel size, glassy material.
						1.75		0.5'-1.75' Light brown fine SAND, some brown fine sand, little dark brown fine sand and fine gravel.
2						2		1.75'-2' Mixture of orange, black, and light tan fine SAND.
						2.5		2'-2.5' Orangish-brown fine SAND.
						4		2.5'-4' Light orangish-brown fine SAND.
4								Wet @ 4'. EOB @ 4'.
6								
8								
10								
12								

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LOG OF WELL/BORING S-56, 150' S

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: CAW
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 4/1/97 Finished: 4/1/97
TIME: Started 2:15 pm Finished: 2:40 pm

GROUTING/SEAL

Depth/To	Material/Method
0'-6.8'	natural cuttings

DRILLING METHOD (S): 3.25" O.D. Hand Auger
DEPTH: 6.8'

REMARKS: Split graphic log indicates fill.
43° 13.726' N, 86° 15.766' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 6.2 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						1.5		0'-1.5' Dark brown fine SAND, little fine gravel, trace black peat patches/wood, moist to dry.
2								1.5'-6.8' Orangish-brown fine SAND becoming tan/light tan, trace medium and coarse sand and fine gravel, moist to dry.
4								
6						6.8		Wet @ 6.2'.
								EOB @ 6.8'.
8								
10								
12								

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LOG OF WELL/BORING S-57

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: KJV
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 3/17/97 Finished: 3/17/97
TIME: Started Finished:

GROUTING/SEAL

Depth/To	Material/Method
0'-4'	natural cuttings

DRILLING METHOD (S) DEPTH
3.25" O.D. Hand Auger 4'

REMARKS: Split graphic log indicates fill.
43° 13.782' N, 86° 15.762' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 3.75 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						1		0'-1' Dark brown fine SAND with coarse gravel, little brown/red and black cinders and fine gravel size glassy material.
						2		1'-2' Brown and light brown fine SAND, little red brick and trace orangish-yellow consolidated sandy material/rusty metal.
2						4		2'-4' Light brown and dark brown to black mixture of fine SAND, little rusty cinders and consolidated sand chunks, little fine gravel, wet at 3.75'.
4								EOB @ 4'.
6								
8								
10								
12								

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LOG OF WELL/BORING S-57, 80' S

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: CAW
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 3/17/97 Finished: 3/17/97
TIME: Started 2:30 pm Finished: 3:00 pm

GROUTING/SEAL

Depth/To	Material/Method
0'-4'	natural cuttings

DRILLING METHOD (S) DEPTH
3.25" O.D. Hand Auger 4'

REMARKS: Split graphic log indicates fill.
43° 13.774' N, 86° 15.749' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 3.5 ft.

DEPTH feet	SAMPLE INTERVAL	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
								0'-4' Dark brown and brown fine SAND with trace coarse sand, fine gravel, slag, metal, and silt, moist to dry.
2								
								Wet @ 3.5'
4						4		EOB @ 4'
6								
8								
10								
12								

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LOG OF WELL/BORING S-58

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: KJV
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 3/17/97 Finished: 3/17/97
TIME: Started Finished:

GROUTING/SEAL

Depth/To	Material/Method
0'-5'	natural cuttings

DRILLING METHOD (S) DEPTH
3.25" O.D. Hand Auger 5'

REMARKS: Split graphic log indicates fill.
43' 13.791' N, 86' 15.721' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 4.5 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						0.75		0'-0.75' Black fine SAND, little black and rusty brown glassy cinder.
2	X					4		0.75'-4' Dark brown, fine SAND, little red brick, gray porous material, slag, and light brown to black fine sand.
4						5		4'-5' Black silty fine and coarse SAND, wet at 4.5'.
6								EOB @ 5'.
8								
10								
12								

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LOG OF WELL/BORING S-58, 80' S

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: CAW
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 3/17/97 Finished: 3/17/97
TIME: Started Finished:

GROUTING/SEAL

Depth/To	Material/Method
0'-4.2'	natural cuttings

DRILLING METHOD (S): 3.25" O.D. Hand Auger
DEPTH: 4.2'

REMARKS: Split graphic log indicates fill.
43' 13.792' N, 86' 15.720' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: ____ ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						0.3		0'-0.3' Dark brown silty fine SAND, little fine gravel, moist to dry.
						1		0.3'-1' Light brown and black fine SAND with fine gravel, little slag.
2						2.8		1'-2.8' Light brown fine SAND, occasional pockets of dense black fine sand.
						3		2.8'-3' Dark brown fine SAND, trace slag and silt, moist to dry.
						3.7		3'-3.7' Black silty fine SAND, little coal and slag, trace wood and orange, chalky material.
4						4.2		3.7'-4.2' Dark brown fine SAND, little fine gravel and silt, trace slag and medium to coarse sand.
								EOB @ 4.2' due to auger refusal.
6								
8								
10								
12								

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LOG OF WELL/BORING S-59

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: CAW
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 3/18/97 Finished: 3/18/97
TIME: Started 10:35 am Finished: 11:15 am

GROUTING/SEAL

Depth/To	Material/Method
0'-6'	natural cuttings

DRILLING METHOD (S): 3.25" O.D. Hand Auger
DEPTH: 6'

REMARKS: Split graphic log indicates fill.
43° 13.821' N, 86° 15.694' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 3.7 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						1.4		0'-1.4' Dark brown silty fine SAND, trace slag and fine gravel, moist to dry.
2	X					3.7		1.4'-3.7' Tan, brown, and black fine SAND, moist to dry.
4						4		3.7'-4' Dark brown fine SAND with large chunks of orange chalky material and black and green, glassy slag, some dark brown silty fine sand, wet
						4.2		4'-4.2' Black PEAT/SILT, trace gray fine sand, moist.
						4.8		4.2'-4.8' Gray very fine SAND, some silt, wet.
								4.8'-6' Brown very fine SAND, some silt, wet.
6						6		EOB @ 6'.
8								
10								
12								

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LOG OF WELL/BORING S-59, 180' S

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: CAW
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 3/19/97 Finished: 3/19/97
TIME: Started Finished:

GROUTING/SEAL

Depth/To	Material/Method
0'-8.5'	natural cuttings

DRILLING METHOD (S): 3.25" O.D. Hand Auger
DEPTH: 8.5'

REMARKS: Split graphic log indicates fill.
43' 13.797' N, 86' 15.681' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 8 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
2, 4, 6						6.2		0'-6.2' Dark brown and black fine SAND with slag, little black silt, trace glass, coal, core-sand, wood, fine gravel, and brick-like/chalky material. Some wood @ 1'-1.5'.
						7		6.2'-7' Brown fine to coarse SAND, little fine gravel and silt.
						7.4		7'-7.4' Gray and black fine SAND, little wood.
8						8.5		7.4'-8.5' Orangish-brown to brown very fine SAND, trace medium sand and wood, wet at 8'.
10, 12								EOB @ 8.5'.

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LOG OF WELL/BORING S-59, 390' S

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: CAW
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 4/1/97 Finished: 4/1/97
TIME: Started 2:45 pm Finished: 3:15 pm

GROUTING/SEAL

Depth/To	Material/Method
0'-5'	natural cuttings

DRILLING METHOD (S) DEPTH
3.25" O.D. Hand Auger 5'

REMARKS: Split graphic log indicates fill.
43° 13.763' N, 86° 15.680' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 4.5 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						2		0'-2' Dark brown/black fine SAND with slag, trace fine gravel.
2						2.5		2'-2.5' Tan fine SAND, moist to dry.
						3		2.5'-3' Orangish-brown fine SAND, little medium and coarse sand, moist to dry.
4						5		3'-5' Tan fine to very fine SAND, trace medium SAND, wet 4.5'.
6								EOB @ 5'.
8								
10								
12								

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LOG OF WELL/BORING S-60

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: CAW
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 3/18/97 Finished: 3/18/97
TIME: Started 11:30 am Finished: 12:00 pm

GROUTING/SEAL

Depth/To	Material/Method
0'-4.2'	natural cuttings

DRILLING METHOD (S) DEPTH
3.25" O.D. Hand Auger 4.2

REMARKS: Split graphic log indicates fill.
43° 13.847' N, 86° 15.666' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 4 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
								0'-4.2' Dark brown/black silty fine SAND with slag, little coal, trace reddish-brown core sand.
2								
	X							
4						4.2		Wet at 4'.
								EOB/obstruction @ 4.2'.
6								
8								
10								
12								

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LOG OF WELL/BORING S-60, 155' S

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: CAW
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 3/19/97 Finished: 3/19/97
TIME: Started 1:45 pm Finished: 2:15 pm

GROUTING/SEAL

Depth/To	Material/Method
0'-5.5'	natural cuttings

DRILLING METHOD (S) DEPTH
3.25" O.D. Hand Auger 5.5'

REMARKS: Split graphic log indicates fill.
43' 13.839' N, 86' 15.638' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 4 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						0.7		0'-0.7' TOPSOIL.
						2		0.7'-2' Black fine and coarse SLAG, some black fine sand and silt, trace white consolidated material, moist to dry.
2						2.5		2'-2.5' Dark brown fine SAND with slag and possible core sand or slag, trace fine gravel and coal, moist to dry.
						2.8		2.5'-2.8' Light brown fine SAND, trace medium sand, moist to dry.
						3		2.8'-3' Dark brown PEAT, trace wood, moist.
						3.4		3'-3.4' Gray fine SAND, trace gravel.
4						5.5		3.4'-5.5' Orangish-brown very fine SAND, trace fine gravel and silt, moist to dry, becoming brown @ 4'. Wet at 4'.
6								EOB @ 5.5'.
8								
10								
12								

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LOG OF WELL/BORING S-60, 320' S

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: CAW
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 4/14/97 Finished: 4/14/97
TIME: Started 11:25 am Finished: 12:00 pm

GROUTING/SEAL

Depth/To	Material/Method
0'-6'	natural cuttings

DRILLING METHOD (S): 3.25" O.D. Hand Auger
DEPTH: 6'

REMARKS: Split graphic log indicates fill.
43° 13.801' N, 86° 15.645' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 5.3 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						1.8		0'-1.8' Dark brown silty fine SAND, trace fine gravel and slag, moist to dry.
2						2.2		1.8'-2.2' Gray/black SLAG, some fine sand and silt, moist to dry.
						2.5		2.2'-2.5' Dark brown PEAT.
						3.2		2.5'-3.2' Gray and black fine SAND, trace silt, moist to dry.
4						6		3.2'-6' Orangish-brown, fading to tan, very fine to fine SAND, little silt, moist. Wet at 5.3'.
6								EOB @ 6'.
8								
10								
12								

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LOG OF WELL/BORING S-60, 490' S

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: TPO
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 4/14/97 Finished: 4/14/97
TIME: Started Finished:

GROUTING/SEAL

Depth/To	Material/Method
0'-7'	natural cuttings

DRILLING METHOD (S): 3.25" O.D. Hand Auger
DEPTH: 7'

REMARKS: Split graphic log indicates fill.
43° 13.777' N, 86° 15.620' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 7 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						2		0'-2' Gray fine SAND with cobbles, asphalt, and concrete chunks.
2						7		2'-7' Tan fine SAND, trace fine to coarse gravel.
4								
6								
								Wet @ 7'. EOB @ 7'.
8								
10								
12								

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LOG OF WELL/BORING S-61

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: CAW
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 3/18/97 Finished: 3/18/97
TIME: Started 1:00 pm Finished: 2:00 pm

GROUTING/SEAL

Depth/To	Material/Method
0'-6'	natural cuttings

DRILLING METHOD (S) DEPTH
3.25" O.D. Hand Auger 6'

REMARKS: Split graphic log indicates fill.
43° 13.875' N, 86° 15.642' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: ____ ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
2	X					2.8		0'-2.8' Black ½" to fine SLAG, some fine sand, little silt, trace fine gravel, moist to dry.
						3.3		2.8'-3.3' Brown fine GRAVEL and fine to coarse silty SAND, moist to dry.
4						5.3		3.3'-5.3' Brown and dark brown fine SAND, little slag, trace core sand, moist to dry.
6						6		5.3'-6' Black fine SAND and small slag chunks, trace fine gravel, silt, and cobbles, moist to dry.
								EOB @ 6' due to auger refusal.
8								
10								
12								

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LOG OF WELL/BORING S-61, 150' S

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: CAW
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 3/19/97 Finished: 3/19/97
TIME: Started 1:20 pm Finished:

GROUTING/SEAL

Depth/To	Material/Method
0'-5.5'	natural cuttings

DRILLING METHOD (S): 3.25" O.D. Hand Auger — DEPTH: 5.5'

REMARKS: Split graphic log indicates fill.
43' 13.866' N, 86' 15.630' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 4 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						0.5		0'-0.5' Dark brown silty fine SAND (topsoil).
2								0.5'-5.5' Brown to dark brown fine SAND, trace slag, coal, fine gravel, and coarse sand, moist to dry.
4								Wet at 4'.
						5.5		EOB @ 5.5'.
6								
8								
10								
12								

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LOG OF WELL/BORING S-62

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: CAW
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 3/18/97 Finished: 3/18/97
TIME: Started 2:10 pm Finished: 2:45 pm

GROUTING/SEAL

Depth/To	Material/Method
0'-6'	natural cuttings

DRILLING METHOD (S)	DEPTH
3.25" O.D. Hand Auger	6'

REMARKS: Split graphic log indicates fill.
43° 13.902' N, 86° 15.613' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 3.7 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						0.8		0'-0.8' Brown fine SAND and CLAY, trace fine gravel and slag, moist to dry.
						1		0.8'-1' Brown fine SAND, moist to dry.
2	X					4.5		1'-4.5' Black fine and medium SAND and SLAG, little fine gravel and coal like material, moist to dry, becoming wet at 3.7'.
4						6		4.5'-6' Light brown very fine SAND, trace silt and medium sand, wet.
6								EOB @ 6'.
8								
10								
12								

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LOG OF WELL/BORING S-62, 150' S

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: CAW
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 3/19/97 Finished: 3/19/97
TIME: Started 11:40 am Finished:

GROUTING/SEAL

Depth/To	Material/Method
0'-8'	natural cuttings

DRILLING METHOD (S): 3.25" O.D. Hand Auger
DEPTH: 8'

REMARKS: Split graphic log indicates fill.
43' 13.872' N, 86' 15.593' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 3.5 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						0.7		0'-0.7' Dark brown silty fine SAND, trace fine gravel and slag.
2						3.3		0.7'-3.3' Brown fine to very fine SAND, trace slag, coal, and fine gravel.
4						4		3.3'-4' Brown and black fine to very fine SAND, trace slag, coal, and fine gravel, wet at ~3.5'.
6						8		4'-8' Black and brown rotted WOOD, wet.
8								EOB @ 8'.
10								
12								

DELL ENGINEERING, INC.
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LOG OF WELL/BORING S-62, 330' S

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: TPO
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 4/14/97 Finished: 4/14/97
TIME: Started Finished:

GROUTING/SEAL

Depth/To	Material/Method
0'-5'	natural cuttings

DRILLING METHOD (S) DEPTH
3.25" O.D. Hand Auger 5'

REMARKS: Split graphic log indicates fill.

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 4.2 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						1		0'-1' Black TOPSOIL, trace slag/coal fragments.
						1.5		1'-1.5' Black and tan fine SAND, some brick fragments.
2						2.5		1.5'-2.5' Tan SAND.
						3		2.5'-3' Gray fine SAND, some roots.
						3.5		3'-3.5' White fine SAND, roots.
4						5		3.5'-5' Brown fine SAND, roots, moist. Wet at 4.2'.
6								EOB @ 5'.
8								
10								
12								

DELL ENGINEERING, INC.
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3352 128th Avenue, Holland, Michigan 49424-9263

LOG OF WELL/BORING S-62, 510' S

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: CAW
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 4/14/97 Finished: 4/14/97
TIME: Started 10:40 am Finished: 11:00 am

GROUTING/SEAL

Depth/To	Material/Method
0'-5.5'	natural cuttings

DRILLING METHOD (S): 3.25" O.D. Hand Auger
DEPTH: 5.5'

REMARKS: Split graphic log indicates fill.

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 4.2 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
								0'-4.8' Dark brown fine SAND, little silt, trace fine gravel, slag, wood, occasional tan seams, moist to dry.
2								
4								Wet at 4.2'.
						4.8		4.8'-5.5' Tan very fine to fine SAND, trace silt, wet.
						5.5		EOB @ 5.5'.
6								
8								
10								
12								

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LOG OF WELL/BORING S-62, 625' S

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: CAW
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 4/14/97 Finished: 4/14/97
TIME: Started 11:05 am Finished: 11:20 am

GROUTING/SEAL

Depth/To	Material/Method
0'-4'	natural cuttings

DRILLING METHOD (S) DEPTH
3.25" O.D. Hand Auger 4'

REMARKS: Split graphic log indicates fill.

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 3.8 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						0.4		0'-0.4' SUBGRADE/GRAVEL.
						1		0.4'-1' Brown and dark brown fine SAND, little fine gravel, trace glass, coal, slag, moist to dry.
						1.5		1'-1.5' Dark brown/black PEAT, some rotted wood, moist.
						1.8		1.5'-1.8' Gray fine SAND, moist to dry.
2								1.8'-4' Orangish-brown silty fine SAND, becoming light brown/tan, moist to dry.
4						4		Wet at 3.8'.
								EOB @ 4'.
6								
8								
10								
12								

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LOG OF WELL/BORING S-63

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: CAW
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 3/18/97 Finished: 3/18/97
TIME: Started 2:48 pm Finished: 3:05 pm

GROUTING/SEAL

Depth/To	Material/Method
0'-3.5'	natural cuttings

DRILLING METHOD (S) DEPTH
3.25" O.D. Hand Auger 3.5'

REMARKS: Split graphic log indicates fill.
43° 13.931' N, 86° 15.586' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 1.8 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						0.8		0'-0.8' Dark brown fine SAND, little silt, trace slag and fine gravel moist to dry.
2						3.5		0.8'-3.5' Tan very fine SAND, little medium and coarse sand, trace fine gravel, moist, becoming wet at ~1.8'.
4								EOB @ 3.5'.
6								
8								
10								
12								

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LOG OF WELL/BORING S-63, 170' S

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: CAW
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 3/19/97 Finished: 3/19/97
TIME: Started 11:15 am Finished: 11:40 am

GROUTING/SEAL

Depth/To	Material/Method
0'-4.2'	natural cuttings

DRILLING METHOD (S) DEPTH
3.25" O.D. Hand Auger 4.2'

REMARKS: Split graphic log indicates fill.
43° 13.917' N, 86° 15.546' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 2.5 ft.

DEPTH feet	SAMPLE INTERVAL	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
								0'-2' Dark brown fine SAND, little fine gravel, trace slag, glass, yellow and orange chalky material, vitrified clay sewer pipe, moist to dry.
2						2		2'-4' Light brown and black very fine SAND, trace glass, slag, small coal chunks, wet at ~2.5'.
4						4 4.2		4'-4.2' Black silty fine SAND and WOOD, wet. EOB @ 4.2'.
6								
8								
10								
12								

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LOG OF WELL/BORING S-63, 260' S

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: CAW
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 4/1/97 Finished: 4/1/97
TIME: Started 11:15 am Finished: 12:20 pm

GROUTING/SEAL

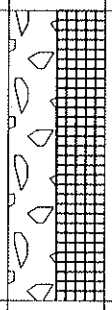
Depth/To	Material/Method
0'-3'	natural cuttings

DRILLING METHOD (S): 3.25" O.D. Hand Auger
DEPTH: 3'

REMARKS: Split graphic log indicates fill.
43° 13.904' N, 86° 15.545' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: ____ ft.

DEPTH feet	SAMPLE INTERVAL	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						3		0'-3' Dark brown fine SAND, fine GRAVEL, and SLAG, some vitrified clay pipe pieces.
								EOB/auger refusal @ 3'.
2								
4								
6								
8								
10								
12								

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LOG OF WELL/BORING S-64

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: CAW
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 3/18/97 Finished: 3/18/97
TIME: Started 3:10 pm Finished: 3:35 pm

GROUTING/SEAL

Depth/To	Material/Method
0'-4'	natural cuttings

DRILLING METHOD (S): 3.25" O.D. Hand Auger
DEPTH: 4'

REMARKS: Split graphic log indicates fill.
43° 13.956' N, 86° 15.560' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 2.2 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
	X					2		0'-2' Dark brown and black silty fine SAND, little fine gravel, trace slag and coal-like material, moist to dry.
2						4		2'-4' Brown very fine SAND, some silt and medium sand, trace coarse sand and fine to coarse limestone gravel, occasional black seams, wet at 2.2'.
4								EOB @ 4'.
6								
8								
10								
12								

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LOG OF WELL/BORING S-64, 140' S

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: CAW
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 3/19/97 Finished: 3/19/97
TIME: Started 10:15 am Finished: 10:25 am

GROUTING/SEAL

Depth/To	Material/Method
0'-6.5'	natural cuttings

DRILLING METHOD (S): 3.25" O.D. Hand Auger
DEPTH: 3.5'

REMARKS: Split graphic log indicates fill.
43° 13.956' N, 86° 15.560' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 3.5 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						0.5		0'-0.5' TOPSOIL.
2						3		0.5'-3' Brown, tan, dark brown, black, and orangish-brown fine SAND, little slag, reddish-brown core sand, trace coal, moist to dry.
4						5		3'-5' Orangish-brown SILT with some black pockets, some fine sand, moist, becoming moist to wet at 3.5'.
						5.3		5'-5.3' Black fine to coarse SAND, little fine gravel and slag.
6						6		5.3'-6' Black SILT and WOOD (or peat), little fine sand.
						6.5		6'-6.5' Brown fine SAND, little silt, wet.
								EOB @ 6.5'.
8								
10								
12								

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LOG OF WELL/BORING S-64, 310' S

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: CAW
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 4/1/97 Finished: 4/1/97
TIME: Started 12:20 pm Finished: 1:10 pm

GROUTING/SEAL

Depth/To	Material/Method
0'-6.5'	natural cuttings

DRILLING METHOD (S): 3.25" O.D. Hand Auger
DEPTH: 6.5'

REMARKS: Split graphic log indicates fill.
43° 13.919' N, 86° 15.503' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 6.0 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
								0'-5.5' Dark brown fine SAND, little gravel, trace slag, yellowish-chalky debris, glass, concrete pipe, moist to dry.
2								
								3.4'-4' Trace wood chunks.
4								4'-5' Gray sandstone chunks.
								5'-5.5' Some black and tan fine sand.
						5.5		5.5'-6.5' Tan very fine SAND, moist.
6								Wet @ 6'.
						6.5		EOB @ 6.5'.
8								
10								
12								

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LOG OF WELL/BORING S-64, 460' S

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: CAW
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 4/1/97 Finished: 4/1/97
TIME: Started 3:45 pm Finished:

GROUTING/SEAL

Depth/To	Material/Method
0'-5.5'	natural cuttings

DRILLING METHOD (S): 3.25" O.D. Hand Auger
DEPTH: 5.5'

REMARKS: Split graphic log indicates fill.
43' 13.899' N, 86° 15.478' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 5 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						2.2		0'-2.2' Dark brown fine SAND, little black slag, trace fine gravel, trace orange chalky/brick material, moist to dry.
2						3.5		2.2'-3.5' Orangish-brown and fine SAND, occasional black pockets (peat?), trace slag 2.2'-3', moist to dry.
4						5.5		3.5'-5.5' Tan fine SAND, little medium and coarse sand, wet at 5'.
6								EOB @ 5.5'.
8								
10								
12								

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LOG OF WELL/BORING S-64, 620' S

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: TPO
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 4/14/97 Finished: 4/14/97
TIME: Started Finished:

GROUTING/SEAL

Depth/To	Material/Method
0'-6.5'	natural cuttings

DRILLING METHOD (S) DEPTH
3.25" O.D. Hand Auger 6.5'

REMARKS: Split graphic log indicates fill.
43° 13.875' N, 86° 15.435 W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 6.5 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
2						2.5		0'-2.5' Dark gray fine SAND, trace steel and coal, trace fine gravel.
						3.5		2.5'-3.5' Dark gray and brown fine SAND, trace fine gravel.
4						4.5		3.5'-4.5' WOOD.
6						6.5		4.5'-6.5' White/tan/brown fine SAND.
8								Wet @ 6.5'. EOB @ 6.5'.
10								
12								

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LOG OF WELL/BORING S-65

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: CAW
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 3/19/97 Finished: 3/19/97
TIME: Started 9:30 am Finished: 9:50 am

GROUTING/SEAL

Depth/To	Material/Method
0'-3'	natural cuttings

DRILLING METHOD (S): 3.25" O.D. Hand Auger
DEPTH: 3'

REMARKS: Split graphic log indicates fill.
43° 13.987' N, 86° 15.533' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 2.2 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						0.8		0'-0.8' Brown/dark brown silty fine SAND, some fine gravel, trace slag and wood, moist to dry.
	X					1.8		0.8'-1.8' Black fine to coarse SAND, slag, and fine gravel, trace cobbles and coal, moist to dry.
2						3		1.8'-3' Brown fine SAND, little medium and coarse sand, trace medium gravel and coal, trace silt, wet @ 2.2'.
								EOB @ 3'.
4								
6								
8								
10								
12								

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LOG OF WELL/BORING S-65, 150' S

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: CAW
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 3/19/97 Finished: 3/19/97
TIME: Started 9:55 am Finished: 10:20 am

GROUTING/SEAL

Depth/To	Material/Method
0'-4'	natural cuttings

DRILLING METHOD (S) DEPTH
3.25" O.D. Hand Auger 4'

REMARKS: Split graphic log indicates fill.
43° 13.982' N, 86° 15.521' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 3.2 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
						0.5		0'-0.5' TOPSOIL
						1.2		0.5'-1.2' Brown fine SAND, trace medium sand and fine gravel, moist to dry.
						1.8		1.2'-1.8' Brown coarse SAND/very fine gravel, some fine sand, moist to dry.
2								1.8'-4' Brown fine SAND, trace wood, silt, coal, fine gravel, and coarse sand, moist.
								Wet @ 3.2'.
4						4		EOB @ 4'.
6								
8								
10								
12								

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LOG OF WELL/BORING S-65, 300' S

CONTRACTOR: Dell Engineering, Inc.
ADDRESS: 3352 128th Ave, Holland, MI
EQUIPMENT: Hand auger
CREW CHIEF:
DELL OVERSIGHT: CAW
WEATHER:

PROJECT: City of Muskegon
SAF - Area wide
PROJECT No.: 950486/0010
LOCATION: Muskegon, MI
DATE: Started 4/1/97 Finished: 4/1/97
TIME: Started 3:20 pm Finished: 3:40 pm

GROUTING/SEAL

Depth/To	Material/Method
0'-6.5'	natural cuttings

DRILLING METHOD (S) DEPTH
3.25" O.D. Hand Auger 6.5'

REMARKS: Split graphic log indicates fill.
43° 13.953' N, 86° 15.481' W

GROUND SURFACE ELEVATION: ____ ft.

WATER LEVEL BELOW GROUND DURING DRILLING: 5.8 ft.

DEPTH feet	SAMPLE ANALYZED	SAMPLE NUMBER	BLOWS PER 6 INCHES	PID (ppm)	RECOVERY (feet)	DEPTH TO BASE (feet)	GRAPHIC LOG	DESCRIPTIONS AND REMARKS
2						3.8		0'-3.8' Dark brown fine SAND, becoming brown at 2', trace slag, fine gravel and roots, moist to dry.
4						6.5		3.8'-6.5' Orangish-brown fine SAND, becoming tan @ 4.5', trace fine gravel, moist to dry, wet at 5.8'.
6								EOB @ 6.5'.
8								
10								
12								

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 1/Boring 1 (ST1-B1)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	12/16/96
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 13' 975N, 86° 15' 450W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D)
TOTAL DEPTH DRILLED:	8'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	8'	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located approx. 18' northwest from nearby light pole and 10' west from west curb of		
	West Western Ave. (Northeast from old train depot)		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 6"	Sod/topsoil
6" - 1'	Sand, trace concrete pieces, fine, dark brown/black, dry
1 - 2'	Sand with gravel and industrial slag, medium, black, dry
2 - 2½'	Sand, coarse, gray, dry
2½ - 4½'	Gravel with coarse sand and cobbles, gray/brown, dry
4½ - 5'	Woodchips/particles, brown and black, moist
5 - 5½'	Sand, fine, gray, dry
5½ - 8'	Sand, fine, orange/brown, dry, saturation @ 8'

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
2'	0 ppm
4'	0 ppm
ST1-B1 (6')	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 1/Boring 2 (ST1-B2)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	12/16/96
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 13' 946N, 86° 15' 402W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	No Lock/No D
TOTAL DEPTH DRILLED:	8'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	7½'	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located 10' West from nearby 6th Street parking entrance and 6' South from		
	southern curb of 6th Street and 15' Northwest from nearby power pole.		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 6"	Sod/topsoil
6" - 3½'	Sand, fine, black, dry
3½ - 4'	Sand, fine, gray, dry
4 - 4½'	Sand, medium, orange, dry
4½' - 8'	Sand, fine, orange, dry, saturation @ 7½'

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
2'	0 ppm
4'	0 ppm
ST1-B2 (6')	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 1/Boring 3 (ST1-B3)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	12/19/96
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 13' 919N, 86° 15' 380W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D)
TOTAL DEPTH DRILLED:	10'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	9'	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located on Southeast corner of 6th and Clay Street intersection, 12' Northeast from		
	street light, 36' South from power pole on Northeast corner of 6th and Clay.		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 6"	Sod/topsoil
6" - 9'	Sand, fine, brown & black color mix, organic rich, dry - trace concrete pieces @ 6' below
	grade level
9 - 10'	Roots, leaves, tree bark in silt - organic rich soil, black, saturated

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
2'	0 ppm
4'	0 ppm
6'	0 ppm
ST1-B3 (7')	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 1/Boring 4 (ST1-B4)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	1/8/97
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 13' 886N, 86° 15' 361W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	No Lock, No D
TOTAL DEPTH DRILLED:	12'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	NA	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located South side of 6th - Approximately 12' Northwest of 2nd Street light from		
	Seaway Drive and 120' West from Seaway Drive		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 6"	Sod/topsoil
6" - 4'	Sand, fine, orange, dry
4 - 12'	Sand, fine, light tan, dry

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
2'	0 ppm
4'	0 ppm
6'	0 ppm
8'	0 ppm
10'	0 ppm
ST1-B4 (12')	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 2/Boring 1 (ST2-B1)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	12/16/96
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 13' 997N, 86° 15' 422W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	No Lock, No D, GQ=8
TOTAL DEPTH DRILLED:	11½'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	8'	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located approx. 6' North & 4' East from Southeast corner of mark - pack bldg (old Amazon Bldg.)		
	along W. Western Ave. (West side) & 15' Northwest from Northwest corner of Western & Mart St.		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 1"	Vegetation
1" - 6"	Sand, fine, black, dry
6" - 4'	Sand, trace brick and slag, dark orange, dry
4 - 7'	Sand, trace limestone gravel, fine, light brown, dry
7 - 11½'	Sand, fine, light brown, dry, saturation @ 8'

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST2-B1 (6')	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 2/Boring 2 (ST2-B2)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	12/16/96
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 13' 985N, 86° 15' 489W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	No Lock, No D, GQ=5
TOTAL DEPTH DRILLED:	5½'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	3½'	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located approx. 21' East & 12' South from Southwest corner of old Amazon Bldg. and 45'		
	Northeast from large power pole at west end of Mart St.		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 1"	Vegetation
1" - 3'	Sand with brick and industrial slag, fine, black, dry
3 - 3½'	Sand, trace gravel, fine, brown, dry
3½ - 4'	Sand with industrial slag and woodchips, black, saturated
4 - 5½'	Woodchips

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING	
ST2-B2 (3')	0 ppm	Sample submitted for MDNR Ten Metals on 1-6-97
ST2-B2(R) (3')	0 ppm	Re-drill on 3-21-97, Sample submitted on 3-21-97 for PNA's

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 2/Boring 3 (ST2-B3)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	12/16/96
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 13' 963N, 86° 15' 342W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	No Lock, No D, GQ=8
TOTAL DEPTH DRILLED:	8'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	7'	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located 6' North from 2nd power pole in alley going North from 6th Street. 10' Southwest		
	from large tree in alley (East side) between 6th and 5th Street		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 1"	Vegetation
1" - 3'	Sand with industrial slag, black, dry
3 - 3¼'	Sand, fine, light brown, dry
3¼ - 3½'	Sand, fine, gray, dry
3½ - 7'	Sand, fine, orange, dry - glass shards at 6½'
7 - 8'	Sand, fine, light brown, dry

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST2-B3 (6')	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 2/Boring 4 (ST2-B4)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	12/19/96
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 13' 950N, 86° 15' 349W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D)
TOTAL DEPTH DRILLED:	12'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	NA	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located approx. 10' North from nearby street light (west side of Clay Ave.) in front of old fire station and 33' East Northeast from Northeast corner of fire station garage.		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 6"	Sod/topsoil
6" - 1½'	Sand, fine, black and brown, dry
1½ - 12'	Sand, fine, light tan, dry

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST2-B4 (12')	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 3/Boring 1 (ST3-B1)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	12/16/96
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 13' 978N, 86° 15' 233W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	No Lock, No D, GQ=4
TOTAL DEPTH DRILLED:	9'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	9'	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located approx. 6' South and 6' East from Northeast corner of old Amazon Bldg. and 27'		
	South/Southwest from nearby street light along West side W. Western Ave.		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 1"	Vegetation
1 - 3"	Sand, fine, black, dry
3" - 2'	Sand, fine, light brown, dry
2 - 3½'	Sand, trace industrial slag, fine, black and brown, dry
3½ - 4'	Sand, trace silt, mottled black and gray, fine, dry
4 - 6'	Sand, fine, orange, dry
6 - 9'	Sand, fine, brown, dry w/orange/black industrial slag, saturation @ 9'

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST3-B1 (6')	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 3/Boring 2 (ST3-B2)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	12/16/96
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 13' 980N, 86° 15' 273W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	No Lock, No D, GQ=6
TOTAL DEPTH DRILLED:	15½'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	15'	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located on South side of 5th Street - 9' North, 24' East from Northeast corner of old work		
	garage and 17' Northeast from Telephone pole - alley and 5th Street		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 1"	Vegetation
1" - 1'	Sand, fine, black, dry
1 - 2½'	Sand, fine, orange, dry
2½ - 15½'	Sand, fine, light brown, dry, saturation at 15'

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST3-B2 (9')	0 ppm
ST3-B2 (12')	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 4/Boring 1 (ST4-B1)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	12/16/96
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 051N, 86° 15' 322W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D)
TOTAL DEPTH DRILLED:	12'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	12'	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located approx. 30' East from Southeast corner of Walker Arena and 21' Southwest from		
	nearby fire hydrant (west side of Western Ave.)		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 1"	Vegetation
1" - 6"	Sand, fine, black, dry - topsoil
6" - 6'	Sand, trace gravel, brick and concrete pieces, fine, dark brown, dry
6 - 11'	Sand, fine, orange, dry - trace gravel
11 - 12'	Sand, fine, light tan, dry, saturation at 12'

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING	
ST4-B1 (6')	0 ppm	Sample submitted for MDNR Ten Metals on 1-6-97

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 4/Boring 2 (ST4-B2)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	12/16/96
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 012N, 86° 15' 308W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	No Lock, No D, GQ=8
TOTAL DEPTH DRILLED:	12'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	NA	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located approx. 10' due North of 2nd power pole from 5th Street along East side of alley		
	and 10' West/Northwest from nearby large tree		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 1½'	Gravel dress with Industrial slag, black, dry (alleyway road base)
1½ - 3½'	Sand, fine, orange, dry - gradual change to light tan at 3½'
3½ - 8'	Sand, fine, light tan, dry
8 - 12'	Sand, trace gravel, fine, gradual change to orange at 8', dry

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST4-B2 (1')	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 4/Boring 3 (ST4-B3)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	12/17/96
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 060N, 86° 15' 381W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	No Lock, No D, GQ=8
TOTAL DEPTH DRILLED:	1½'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	NA	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	51' feet North/54' West from Northeast corner of old Amazon Bldg. (smaller section of		
	bldg.) and 12' West from 3rd power pole coming from West Western Ave.		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 1½'	Brick and limestone gravel, trace sand, obstructions at 1½'

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST4-B3 (1½')	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 5/Boring 1 (ST5-B1)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	12/17/96
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 103N, 86° 15' 337W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D), GQ=9
TOTAL DEPTH DRILLED:	3¼'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	3'	**GRAVEL PACK INTERVAL:**	NA
REMARKS:	Located approx. 90' West and 15' South from Northwest corner of Walker Arena bldg. 21'		
	Northeast from Walker Arena sign and 36' Southeast from traffic light pole at 4th and		
	Shoreline Dr.		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 2"	Sod/topsoil
2" - 1'	Sand with gravel, fine, black, dry
1 - 3'	Sand with garbage - plastic, aluminum, tin and concrete pieces mixed with woodchips
3 - 3¼'	Sand, fine, light tan, saturated

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING	
ST5-B1 (2')	0 ppm	Sample submitted for MDNR Ten Metals on 1-6-97

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 5/Boring 2 (ST5-B2)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	12/17/96
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 105N, 86° 15' 328W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D)
TOTAL DEPTH DRILLED:	6½'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	6¼'	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located 12' East from Northern most (projecting) entrance of Walker arena and 25' South		
	from lamp pole, 2nd lamp pole from 4th & Shoreline intersection.		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 6"	Sod/topsoil
6" - 2'	Sand with wood embers, some industrial slag & misc. debris, fine, brown/black, dry
2 - 3'	Sand, fine, orange, dry
3 - 6½'	Sand, fine, light tan, dry, saturation at 6¼'

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST5-B2 (1½')	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 5/Boring 3 (ST5-B3)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	12/17/96
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 076N, 86° 15' 311W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D), GQ=7
TOTAL DEPTH DRILLED:	4'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	NA	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located approx. 10' North and 12' East from Northeast corner of Walker Arena Bldg. 36'		
	Northwest from light pole at Western & 4th Ave., Southwest corner		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 6"	Sod/topsoil
6" - 1½'	Sand with gravel and industrial slag, fine, dark brown, dry
1½ - 3'	Sand, fine, light brown, dry
3 - 4'	Brick, trace sand - red brick
	Obstruction - end of boring
	1st attempt - hit power conduit to street light
	2nd attempt - hit possible old walkway at 3' BGL

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST5-B3 (4')	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 5/Boring 4 (ST5-B4)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	1/8/97
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 067N, 86° 15' 280W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D), GQ=7
TOTAL DEPTH DRILLED:	12'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	NA	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located at Northeast corner of 4th and Western - 21' from street light on 4th and Western		
	Right at Southwest corner of Chronicle Bldg.		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 6"	Wood mulch/Landscape cover
6" - 4'	Sand, fine, orange, dry
4 - 8'	Sand, fine, light tan, dry
8 - 10'	Sand, fine, tan/orange, dry
10 - 12'	Sand, fine, light tan, dry

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST5-B4 (12')	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 6/Boring 1 (ST6-B1)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	12/17/96
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 188N, 86° 15' 282W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	No Lock, No D, GQ=8
TOTAL DEPTH DRILLED:	4½'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	4½'	**GRAVEL PACK INTERVAL:**	NA
REMARKS:	Located approx. 90' West from Northwest corner of Holiday Inn parking bldg. - South side		
	3rd St. in ROW, and 12' East from only tree in area, 42' East from 1st power pole along 3rd		
	from shoulder		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 6"	Sod/topsoil
6" - 3½'	Sand, trace industrial slag, fine, black and brown, dry, brick layer at 9"
3½ - 4½'	Sand with industrial slag and glass shards, fine, black, dry, saturation at 4½'

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING	
ST6-B1 (4')	0 ppm	Sample submitted for MDNR Ten Metals on 1-6-97

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 6/Boring 2 (ST6-B2)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	12/17/96
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 184N, 86° 15' 246W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D), GQ=9
TOTAL DEPTH DRILLED:	7'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	NA	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located approx. 3' West of nearby power pole South side of 3rd street and 52' Southwest		
	from Morris and 3rd St. intersection (middle)		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 6"	Sod/topsoil
6" - 7'	Sand, trace gravel, trace industrial slag, trace concrete pieces, fine, dark brown, dry
	Obstruction at 7' - End of boring, 3 attempts for greater depth

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST6-B2 (7')	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 6/Boring 3 (ST6-B3)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	1/8/97
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 147N, 86° 15' 212W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D), GQ=9
TOTAL DEPTH DRILLED:	2'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	NA	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located Southwest corner of Western and 3rd Street - 54' West from Western and 3rd St.		
	intersection, 5' North from Holiday Inn - Harbor Steak House sign.		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 6"	Sod/topsoil
6" - 2'	Sand with industrial slag, contains large slag pieces, fine, black, dry
	Obstruction at 2' - End of boring, 3 attempts for greater depth

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST6-B3 (2')	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 6/Boring 4 (ST6-B4)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	3/19/97
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 119N, 86° 15' 173W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	No Lock, No D, GQ=8
TOTAL DEPTH DRILLED:	6'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	NA	**GRAVEL PACK INTERVAL:**	NA
REMARKS:	Located North side of 3rd Street (by Frauenthal) - 60' East-Northeast from Western &		
	3rd Street sign - entrance South to Muskegon Mall - 10' North from nearby tree - 2nd tree		
	from Western & 3rd Street sign going East.		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 6"	Sod/topsoil
6" - 4'	Sand with yellow brick, some gravel, fine, brown, dry
4 - 6'	Sand, fine, light tan, dry - obstruction at 6' - large construction debris

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST6-B4 (½ - 2')	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 7/Boring 1 (ST7-B1)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	12/17/96
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 190N, 86° 15' 225W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	No Lock, No D, GQ=9
TOTAL DEPTH DRILLED:	12'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	NA	**GRAVEL PACK INTERVAL:**	NA
REMARKS:	Located approx. 21' East and 16' North from Northeast corner of Hume bldg. West ROW of		
	Morris Street, 30' North from 2nd power pole - coming from 3rd St., 21' Southeast from		
	power pole at corner of mall parking		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 6"	Sod/topsoil
6" - 2'	Sand with gravel, fine, dark brown, dry
2 - 6'	Sand, fine, orange, dry
6 - 12'	Sand, fine, light tan, dry

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST7-B1 (12')	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 8/Boring 1 (ST8-B1)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	12/17/96
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 205N, 86° 15' 173W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	No Lock, No D, GQ=9
TOTAL DEPTH DRILLED:	12'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	NA	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located approx. 25' South from 5th power pole going North from intersection of Morris		
	and 3rd Street, West ROW of Morris St. and 2' North from nearby tree.		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 6"	Sod/topsoil
6" - 2½'	Sand, fine, orange, dry
2½ - 12'	Sand, fine, light tan, dry

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST8-B1 (12')	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 8/Boring 2 (ST8-B2)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	12/19/96
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 262N, 86° 15' 263W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D), GQ=9
TOTAL DEPTH DRILLED:	5'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	5'	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located in ROW of Shoreline Dr. 40' West and 30' North from 2nd parking light pole starting		
	from 3rd St. going North to 1st and 115' Northeast from No parking sign along Shoreline		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 6"	Sod/topsoil
6" - 2'	Sand with pea gravel, trace slag, brown and black, dry
2 - 5'	Industrial slag, trace sand and coal, black, dry, saturation at 5'

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST8-B2 (3')	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 9/Boring 1 (ST9-B1)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	12/19/96
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 218N, 86° 15' 166W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	No Lock, No D, GQ=8
TOTAL DEPTH DRILLED:	12'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	NA	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located on West side of Morris: 10' North from 7th power pole along Morris - coming		
	from 3rd St. (North) to 1st St. In Morris ROW, 5' South from nearby tree		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 6"	Sod/topsoil
6" - 12'	Sand, fine, orange, dry - gradual change to light tan at 5' - light tan from 5 - 12'

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST9-B1 (12')	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 9/Boring 2 (ST9-B2)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	12/19/96
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 292N, 86° 15' 240W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D), GQ=9
TOTAL DEPTH DRILLED:	6'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	4½'	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located approx. 40' West and 90' North from 3rd parking lot light along Shoreline Dr.		
	starting at 3rd St. going North to 1st St. 62' Northeast from no parking sign along shoulder		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 6"	Sod/topsoil
6" - 2'	Pea gravel with sand, black, dry
2 - 6'	Industrial slag, trace sand and wood embers, black, dry, saturation at 4½'

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING	
ST9-B2 (3')	0 ppm	Sample submitted for MDNR 10 metals on 1-6-97

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 10/Boring 1 (ST10-B1)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	12/19/96
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 323N, 86° 15' 217W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D), GQ=9
TOTAL DEPTH DRILLED:	7'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	5'	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Near intersection of 1st Street and Shoreline Dr., 40' West and 70' North from corner parking		
	lot light pole, 61' Southeast from 1st Street stop sign, 28' East from fire hydrant, Shoreline & 1st		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 6"	Sod/topsoil
6" - 5'	Sand, fine, orange, dry, saturation at 5'
5 - 6'	Sand with limestone gravel, fine, black, saturated
6 - 7'	Woodchips, trace sand, black, saturated

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST10-B1 (4')	0 ppm
(5')	120 ppm (Saturated)

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 10/Boring 2 (ST10-B2)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	12/19/96
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 313N, 86° 15' 178W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D), GQ=9
TOTAL DEPTH DRILLED:	10½'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	10½'	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located South ROW of 1st Street, 36' North from center parking light pole, North side of mall parking lot (old Michcon property), and 3' Southeast from 1st Street drain		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 6"	Sod/topsoil
6" - 5'	Sand, fine, black and brown mix, dry
5 - 10½'	Sand, fine to medium, light tan, dry, contains concrete pieces, saturation at 10'

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST10-B2 (8')	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 10/Boring 3 (ST10-B3)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	12/19/96
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 284N, 86° 15' 158W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	No Lock, No D, GQ=9
TOTAL DEPTH DRILLED:	12'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	NA	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	South ROW of 1st Street, 1' West from curb of North parking lot entrance (old Michcon		
	property) Muskegon Mall parking area, 4' Northeast from mall parking street light		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 6"	Sod/topsoil
6" - 1½'	Sand with concrete pieces (from construction of new curve), fine, brown, dry
1½ - 4½'	Sand with industrial slag, fine, black, dry
4½ - 6½'	Sand, fine, orange, dry, contains clay pieces
6½ - 8'	Sand, medium to coarse, orange, dry
8 - 12'	Sand, fine, light tan, dry

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING	
ST10-B3 (2')	0 ppm	Sample submitted for MDNR ten metals on 1-6-97

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 11/Boring 1 (ST11-B1)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	12/19/96
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 358N, 86° 15' 192W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D), GQ=8
TOTAL DEPTH DRILLED:	1½'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	NA	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located East ROW of Shoreline Dr, 25' West and 100' North from Southwest corner of		
	Terrace Plaza parking lot, 58' East from no stopping, standing sign		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 6"	Sod/topsoil
6" - 1½'	Sand with large cobbles and concrete, black, dry, obstructions - end of borings
	3 attempts for greater depth

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST11-B1 (1½')	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 11/Boring 2 (ST11-B2)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	12/19/96
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 309N, 86° 15' 063W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D), GQ=9
TOTAL DEPTH DRILLED:	12'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	NA	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located North from 1st Street on East ROW of Morris St., 5' North from West entrance of		
	mall parking lot and 40' South from three hour parking sign East side Morris		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 6"	Sod/topsoil
6" - 1'	Sand with wood embers, fine, black, dry
1 - 1½'	Sand, fine, orange, dry
1½ - 12'	Sand, fine, orange dry - gradual change to light tan at 5', trace fine gravel at 12'

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST11-B2 (12')	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 11/Boring 3 (ST11-B3)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	3/19/97
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 257N, 86° 14' 837W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D), GQ=9
TOTAL DEPTH DRILLED:	12'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	NA	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located Northwest corner of Terrace and Clay Street, 8' West from Clay/Terrace St. light		
	and 8' East from nearby tree		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 6"	Sod/topsoil
6" - 3'	Sand with gravel, some concrete pieces, fine, dark brown, dry
3 - 12'	Sand, fine, light tan, dry

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST11-B3 (½ - 2')	0 ppm
(4')	0 ppm
(8')	0 ppm
(12')	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 12/Boring 1 (ST12-B1)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	12/20/96
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 375N, 86° 15' 115W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D), GQ=8
TOTAL DEPTH DRILLED:	2½'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	NA	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located South ROW of Terrace Street, 22' East from Western most entrance of Terrace		
	Plaza parking lot, 5' South from Terrace curb, 36' Northeast from nearby tree		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 6"	Sod/topsoil
6" - 2½'	Sand with industrial slag, brick, woodchips, concrete pieces and gravel, black, dry
	Obstruction at 2½', end of boring, 3 attempts for greater depth

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING	
ST12-B1 (2½')	0 ppm	Sample submitted for MDNR Ten Metals on 1-6-97

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 12/Boring 2 (ST12-B2)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	12/20/96
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 360N, 86° 15' 082W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D), GQ=8
TOTAL DEPTH DRILLED:	11½'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	11'	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located on South ROW of Terrace St., 20' East from Eastern parking lot entrance of		
	Terrace Plaza and 1' North from fire hydrant		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 6"	Sod/topsoil
6" - 8'	Sand, trace industrial slag, brick and concrete conglomerate, fine, black and tan mix, dry
8 - 11½'	Sand, fine to medium trace gravel, light tan, dry, saturation at 11'

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST12-B2 (3')	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 12/Boring 3 (ST12-B3)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	12/20/96
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 338N, 86° 15' 042W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D), GQ=9
TOTAL DEPTH DRILLED:	12'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	12'	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located approximately 17' South and 10' West from light pole located at intersection of		
	Terrace and Morris Streets and 30' North from three hour parking sign-East side Morris		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 1'	Sod/topsoil
1 - 4'	Sand, fine, orange, dry
4 - 12'	Sand, fine, light tan, dry

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST12-B3 (10')	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 12/Boring 4 (ST12-B4)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	12/31/96
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 329N, 86° 14' 992W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D), GQ=9
TOTAL DEPTH DRILLED:	12'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	12'	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located Southside of Terrace ROW, 30' West from Muskegon malls, Northern parking		
	entrance and 25' East from light pole, 2nd pole from Morris		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 6"	Sod/topsoil
6" - 12'	Sand, fine, orange, dry, light tan at 4', trace gravel at 11 to 12'

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST12-B4 (12')	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 12/Boring 7 (ST12-B7)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	12/31/96
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 323N, 86° 14' 840W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D), GQ=9
TOTAL DEPTH DRILLED:	4'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	NA	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located West side of East Western, North from Terrace St.		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 3½'	Sand with concrete, asphalt, brick, cobbles and misc. debris, fine, brown, dry
3½ - 4'	Sand with industrial slag and woodchips, fine, black, dry - obstructions, end of borings
	4 attempts for greater depth

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING	
ST12-B7 (4')	0 ppm	Sample submitted for MDNR Ten Metals on 1-6-97

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 12/Boring 5 (ST12-B5)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	12/31/96
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 330N, 86° 14' 940W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D), GQ=9
TOTAL DEPTH DRILLED:	12'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	NA	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located Northside of Terrace in ROW, 42' West from 3rd light pole and 48' East from 4th		
	light pole from Western and Terrace intersection, going West from intersection		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 6"	Sod/topsoil
6" - 2'	Sand with misc. debris, plastic, tin, concrete pieces, tree roots, fine, black, dry
2 - 5'	Sand, fine, orange, dry
5 - 12'	Sand, fine, light tan, dry

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST12-B5 (2')	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 12/Boring 6 (ST12-B6)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	12/31/96
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 314N, 86° 14' 908W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D)
TOTAL DEPTH DRILLED:	12'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	NA	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located on Northside Terrace ROW, 4' West from 2nd light post and 78' East from 3rd		
	light pole from Western and Terrace intersection going West		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 6"	Sod/topsoil
6" - 1½'	Sand with industrial slag and concrete, fine, black, dry
1½ - 4'	Sand, trace broken tile and pottery, trace slag and concrete pieces
4 - 12'	Sand, fine, light tan, dry

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING	
ST12-B6 (1½')	0 ppm	Sample submitted for MDNR Ten Metals on 1-6-97

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 12/Boring 8 (ST12-B8)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	3/7/97
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 282N, 86° 14' 773W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D), GQ=8
TOTAL DEPTH DRILLED:	6'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	NA	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located West side of Clay at Northeast corner of Muskegon Autoparts building and 78'		
	South from 1st street light South from Clay and Pine Street intersection.		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 3'	Industrial slag, steel, misc. debris with sand, black, dry
3 - 5'	Sand, fine, orange, dry
5 - 6'	Glass plate

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING	
ST12-B8 (½ - 2')	0 ppm	Sample submitted for MDNR Ten Metals and PNA's on 3-20-97

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 12/Boring 9 (ST12-B9)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	3/7/97
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 220N, 86° 14' 748W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D), GQ=9
TOTAL DEPTH DRILLED:	12'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	NA	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located on East side of southbound US-31, 12' due West from Jerviss Fethke Insurance		
	sign and 62' due North from nearby no parking sign		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 6"	Sod/topsoil
6" - 3½'	Sand with gravel, fine, brown and black, dry
3½ - 12'	Sand, fine, light tan, dry

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST12-B9 (½ - 2')	0 ppm
(6')	0 ppm
(12')	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 13/Boring 1 (ST13-B1)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	1/8/97
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 427N, 86° 15' 020W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D), GQ=9
TOTAL DEPTH DRILLED:	2'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	1½'	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located Southside of railroad tracks by bend: 108' West/Northwest from large power pole		
	coming from Terrace St (5 power pole) going North and 10' South from railroad tracks		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 2'	Industrial slag with brick and gravel, trace sand, fine, black, dry, saturation at 1½'

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING	
ST13-B1 (1')	0 ppm	Sample submitted for MDNR Ten Metals on 3-5-97

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 13/Boring 2 (ST13-B2)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	1/8/97
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 415N, 86° 14' 982W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D), GQ=9
TOTAL DEPTH DRILLED:	2½'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	2'	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located Southside of railroad tracks 92' East from large power pole (line coming from		
	Terrace St. and 10' South from railroad tracks		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 1½'	Industrial slag with sand, fine, black, dry
1½ - 1¾'	Sand, fine, brown/gray, moist
1¾ - 2'	Woodchips
2 - 2½'	Sand, medium, light brown/gray, saturated

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST13-B2 (1')	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 13/Boring 3 (ST13-B3)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	1/8/97
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 398N, 86° 14' 938W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D), GQ=9
TOTAL DEPTH DRILLED:	3'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	2½'	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located 10' South from railroad tracks, 5 power poles East from large power pole,		
	20' Northeast from 5th power pole		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 3'	Sand with industrial slag, rich in organics, black, moist, saturation at 2½'

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST13-B3 (2')	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 13/Boring 4 (ST13-B4)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	1/8/97
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 382N, 86° 14' 897W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D), GQ=9
TOTAL DEPTH DRILLED:	3'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	2½'	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located 5' South from railroad tracks, 7 power poles from large power pole, going East -		
	15' West from 7th power pole		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 1"	Large gravel
1" - 1½'	Industrial slag, cobbles, trace sand, black, dry, 1½' large concrete slab - end of boring
	3 attempts for greater depth

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING	
ST13-B4 (1')	0 ppm	Sample submitted for MDNR Ten Metals on 1-8-97

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 13/Boring 5 (ST13-B5)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	1/8/97
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 367N, 86° 14' 853W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D), GQ=8
TOTAL DEPTH DRILLED:	3'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	3'	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located 15' South from railroad tracks, 8 power poles going East from large (Terrace St.)		
	power pole, 87' East from 8th power pole		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 1½'	Sand with industrial slag and brick, black, dry
1½ - 2'	Sand, light brown, dry
2 - 3'	Sand with industrial slag, trace woodchips, black, dry, saturation at 3'

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST13-B5 (2')	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 13/Boring 6 (ST13-B6)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	1/9/97
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 359N, 86° 14' 821W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D), GQ=9
TOTAL DEPTH DRILLED:	4½'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	4'	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located near 2nd power pole from East Western St. going West, 43' Northeast from 2nd		
	power pole and 35' due South from railroad tracks		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 3'	Sand with brick, concrete, cobbles, black, dry
3 - 3½'	Sand, medium, orange, dry
3½ - 4½'	Wood particles, moist, saturation at 4'

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST13-B6 (2')	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 13/Boring 7 (ST13-B7)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	1/3/97
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 331N, 86° 14' 793W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D), GQ=9
TOTAL DEPTH DRILLED:	4½'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	NA	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located on Southeast corner of E. Western and Pine Streets, 15' Northwest from street		
	sign along Western and 10' Southeast from fire hydrant along Pine Street		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 6"	Sod/topsoil
6" - 1½'	Sand with gravel, brown, dry
1½ - 4'	Sand with concrete, brick, asphalt, furnace brick, fine to medium, brown, dry
	obstructions, end of boring, 4 attempts

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST13-B7 (4')	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 13/Boring 8 (ST13-B8)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	1/3/97
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 300N, 86° 14' 728W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D), GQ=9
TOTAL DEPTH DRILLED:	4'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	NA	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located West side of Clay ROW, 10' West of 1st power pole from intersection of Clay and		
	Pine Streets (going North), 2' North from Northeast corner of Witt budget used car parking lot		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 4'	Sand with foundry steel, tin, brick, concrete, industrial slag, black, dry
	obstructions, end of boring, 3 attempts

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING	
ST13-B8 (4')	0 ppm	Sample submitted for MDNR Ten Metals on 1-6-97

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 13/Boring 9 (ST13-B9)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	1/3/97
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 244N, 86° 14' 695W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D), GQ=9
TOTAL DEPTH DRILLED:	12'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	NA	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located near Northeast corner of intersection Pine and Webster (Northbound 31) streets		
	21' North from corner light pole and 3' North from Pine and Webster street sign		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 5'	Sand, fine, brown and black mix, trace concrete and tile pieces, dry
5 - 5½'	Industrial slag with coal, black, dry
5½ - 10'	Sand, fine, light tan, dry
10 - 10' 1"	Woodchips
10' 1" - 12'	Sand, fine, light tan, dry

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST13-B9 (5')	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 14/Boring 1 (ST14-B1)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	1/3/97
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 353N, 86° 14' 752W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D), GQ=8
TOTAL DEPTH DRILLED:	4'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	NA	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located on East side of East Western ROW, 24' North from 2nd power pole along Western		
	from Western /Pine intersection, 42' South from Southwest corner of Witt Buick Bldg.		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 4'	Sand with gravel, building brick, coal pieces, concrete pieces, fine, dry
	obstructions, end of borings, 3 attempts

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST14-B1 (4')	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 14/Boring 2 (ST14-B2)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	1/3/97
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 262N, 86° 14' 657W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D), GQ=9
TOTAL DEPTH DRILLED:	6'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	NA	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	101' North of 2nd power pole from intersection of Pine and Webster and 54' East from		
	Northeast corner of industrial mill supply bldg.		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 4'	Industrial slag with glass and old plate pieces, brick, black, dry
4' - 4'2"	Woodchips
4'2" - 5'	Sand, fine, black, dry (foundry sand)
5 - 6'	Industrial foundry material - black and white foundry cores, some fire brick, black and white
	dry, obstructions - end of borings, 2 attempts

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST14-B2 (6')	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 14/Boring 3 (ST14-B3)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	3/7/97
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 203N, 86° 14' 613W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D), GQ=9
TOTAL DEPTH DRILLED:	12'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	NA	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located on West side of Northbound BUS-31, 5' East-Southeast from 3rd power pole (going		
	South from Cedar St) and 60' South from nearby no parking sign on West side of BUS-31		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 6"	Vegetation/topsoil
6" - 3'	Sand with gravel, fine, dark brown, dry
3 - 12'	Sand, fine, light tan, dry

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST14-B3 (½ - 2')	0 ppm
(6')	0 ppm
(12')	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 15/Boring 1 (ST15-B1)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	1/9/97
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 378N, 86° 14' 692W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D), GQ=8
TOTAL DEPTH DRILLED:	4'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	3¾'	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located at Northeast corner of Spring and East Western intersection-10' Northwest from		
	nearby fire hydrant and 4' East from nearby power pole at intersection		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 3"	Vegetation/topsoil
3" - 4'	Sand with industrial slag, contains cobbles and woodchips, black, dry-spent sand (foundry),
	saturation at 3¾ to 4' BGL

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING	
ST15-B1 (2')	0 ppm	Sample submitted for MDNR Ten Metals on 3-5-97

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 15/Boring 2 (ST15-B2)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	1/9/97
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 336N, 86° 14' 651W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D), GQ=7
TOTAL DEPTH DRILLED:	5'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	4'	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located Northwest corner of Clay Ave. & Spring St-3' due South from United Body Svc-		
	Southeast corner of bldg-10' due West from edge of Clay St.		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 6"	Vegetation w/limestone gravel
6" - 4'	Sand, fine, light brown and black mix, contains trace slag, dry
4 - 5'	Sand/silt with brick & slag, trace wood particles, black, saturated

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST15-B2 (3')	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 15/Boring 3 (ST15-B3)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	1/9/97
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 292N, 86° 14' 616W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D), GQ=9
TOTAL DEPTH DRILLED:	4'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	2½'	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located Northwest corner of Spring and Webster streets-5' Northeast from street sign-10'		
	West from edge of Webster St.		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 6"	Sod/topsoil
6" - 3'	Sand, trace gravel and industrial slag, black and brown, dry, saturation at 2½'
3 - 4'	Sand, fine, brown, saturated

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST15-B3 (1½')	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 15/Boring 4 (ST15-B4)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	1/3/97
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 262N, 86° 14' 591W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D), GQ=9
TOTAL DEPTH DRILLED:	9'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	8'	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located North side of Spring St.-142' East from intersection of Spring & Webster streets-		
	27' West from nearby power pole		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 6"	Sod/topsoil
6" - 6'	Sand, trace slag and woodchips, brown and black mix, dry
6 - 6'3"	Peat with glass shards and woodchips, black, moist
6'3" - 8'	Woodchips, brown and black, moist
8 - 9'	Sand, trace woodchips, fine, black, saturated

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST15-B4 (6')	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 15/Boring 5 (ST15-B5)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	3/7/97
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 216N, 86° 14' 554W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D), GQ=9
TOTAL DEPTH DRILLED:	12'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	NA	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located on Northwest corner of intersection of Yuba & Spring streets-20' Southwest from		
	Yuba Street stop sign & 70' Northwest from 1st power pole East from US-31 on South side		
LOGGED BY:	Tim Kamp	of Spring Street	

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - ½'	Vegetation/topsoil
½ - 3'	Sand, trace gravel and concrete pieces, brown/black, dry
3 - 5'	Sand, fine, light tan, dry
5 - 12'	Sand, trace fine gravel, light brown/orange, dry
	Natural 3- 12'

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST15-B5 (½ - 2')	0 ppm
6'	0 ppm
12'	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 16/Boring 1 (ST16-B1)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	1/9/97
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 398N, 86° 14' 682W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D), GQ=8
TOTAL DEPTH DRILLED:	7½'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	7'	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located North from East Western and Eastern streets intersection 19' Northeast from fire		
	hydrant & 25' Northwest from Eastern curb		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 6"	Vegetation/topsoil
6" - 3'	Sand, fine, brown and black mix, dry
3 -3½'	Sand, fine, light gray, dry
3½ - 7½'	Sand, fine, orange, dry-one piece of concrete located at 5' BGL-saturation at 7'

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST16-B1 (5')	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 16/Boring 2 (ST16-B2)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	1/9/97
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 380N, 86° 14' 569W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D), GQ=9
TOTAL DEPTH DRILLED:	6½'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	NA	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located Northwest corner/intersection of Cedar & Clay Ave.-12' West/Southwest from power		
	pole at intersection & 4' West from Clay/Cedar Street sign		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 6"	Vegetation/topsoil
6" - 4'	Industrial slag with brick, black, dry
4 - 6½'	Woodchips, brown & black, moist
	Tough going through woodchips-end of boring

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST16-B2 (3')	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 16/Boring 3 (ST16-B3)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	3/7/97
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 415N, 86° 14' 536W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D), GQ=9
TOTAL DEPTH DRILLED:	9'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	8'	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located on Southeast corner of Ottawa & Eastern streets-15' East from Ottawa/Eastern		
	light pole & 15' West from no parking sign located along Eastern		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 6"	Vegetation/topsoil
6" - 3'	Sand, fine, orange, dry
3 - 9'	Sand, fine, light tan, dry, saturation at 8'

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST16-B3 (½ - 2')	0 ppm
6'	0 ppm
9'	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 16/Boring 4 (ST16-B4)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	3/7/97
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 339N, 86° 14' 504W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D), GQ=8
TOTAL DEPTH DRILLED:	2'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	1½'	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located 20' East from Ryerson Creek & 30' South from nearby tree in median of BUS-31		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 2'	Silt, some sand with woodchips and concrete, organic rich, black, moist, saturation at 1½'

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING	
ST16-B4 (1')	0 ppm	Sample submitted for MDNR Ten Metals and PNA's
		on 3-20-97

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 16/Boring 5 (ST16-B5)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	3/7/97
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 234N, 86° 14' 437W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D), GQ=8
TOTAL DEPTH DRILLED:	12'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	NA	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located at Northwest corner of Walton & Cedar street intersection-40' Northwest from 4th		
	power pole going East from Yuba St. along Cedar & 25' Southwest from nearby tree		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 6"	Vegetation/topsoil
6" - 3'	Sand, fine, orange, dry
3 - 12'	Sand, fine, light tan, dry

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST16-B5 (½ - 2')	0 ppm
6'	0 ppm
12'	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 17/Boring 1 (ST17-B1)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	1/9/97
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 455N, 86° 14' 625W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D), GQ=9
TOTAL DEPTH DRILLED:	2'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	NA	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located West side of Western & railroad tracks-65' West from Southwest corner of Muskegon		
	Co. Applicant Testing Ctr bldg-60' Northwest from 4th telephone pole along Western (East side)		
LOGGED BY:	Tim Kamp	starting from Eastern & Western intersection	

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 2'	Industrial slag with black sand (foundry sand), contains brick, gravel & wood-railroad ties
	Obstruction at 2' - 3 attempts

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING	
ST17-B1 (2')	0 ppm	Sample submitted for MDNR Ten Metals

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 17/Boring 2 (ST17-B2)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	1/9/97
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 465N, 86° 14' 501W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D)
TOTAL DEPTH DRILLED:	9'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	8'	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located East side of Ottawa-69' North from nearby old apt bldg-77' Northeast from 3rd power		
	pole-West side of Ottawa-starting from intersection of Ottawa & Eastern		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 6"	Vegetation/topsoil
6" - 1'	Sand, trace gravel, fine, brown, dry
1 - 9'	Sand, fine, orange, dry-gradual change to light tan at 4' saturation at 8'

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST17-B2 (6')	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 17/Boring 3 (ST17-B3)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	4/8/97
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 465N, 86° 14' 501W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D)
TOTAL DEPTH DRILLED:	6'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	NA	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located at Northeast corner/intersection of Eastern Ave & Northbound BUS-31-34' West/		
	Northwest from stop sign & 61' from light pole-located on South side of Eastern Ave.		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 6"	Sod/topsoil
6" - 2½'	Sand, trace slag, gravel & coal, brown, black, dry
2½ - 4'	Sand, trace slag & gravel, brown/tan, dry
4 - 6'	Sand with industrial slag/gravel-dark brown & black dry-½" to 1½" slag pieces at 5 - 6'
	obstructions at 6'-end of boring

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST17-B3 (1')	0 ppm
3'	0 ppm
6'	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 18/Boring 1 (ST18-B1)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	1/15/97
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 501N, 86° 14' 550W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D), GQ=9
TOTAL DEPTH DRILLED:	5'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	NA	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located 60' West/Northwest from 7th power pole along East side of Western starting from		
	intersection of Eastern & Western & 66' North from Rag & Metal Northeast corner property		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 5'	Industrial slag and sand, some gravel, old fire brick, black, dry

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST18-B1 (4')	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 18/Boring 2 (ST18-B2)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	1/9/97
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 497N, 86° 14' 482W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D)
TOTAL DEPTH DRILLED:	9'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	8'	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located East side of Ottawa ROW-78' South from Harley Davison sign-45' East from 5th		
	power pole on West side of Ottawa starting Eastern & Ottawa intersection		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 1'	Sand, trace woodchips, fine, black, dry
1 - 9'	Sand, fine, orange, dry-gradual change to light tan at 4', saturation at 8'

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST18-B2 (6')	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 19/Boring 1 (ST19-B1)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	1/15/97
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 508N, 86° 14' 590W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D), GQ=9
TOTAL DEPTH DRILLED:	2'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	NA	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located 57' West from power pole/sign at Northeast corner intersection of Hall and Webster		
	and 2' East from 3rd fence pole starting from entrance fence of Andres property		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 2'	Industrial slag and sand, large gravel (old sock), misc. debris, black, dry
	Obstructions - end of boring, 3 attempts

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING	
ST19-B1 (2')	0 ppm	Sample submitted for MDNR Ten Metals on 3-5-97

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 19/Boring 2 (ST19-B2)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	1/10/97
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 322N, 86° 14' 459W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D), GQ=9
TOTAL DEPTH DRILLED:	10'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	10'	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located East side of Ottawa ROW-114' North from Harley Davidson sign-84' Northeast from		
	power pole on Northwest corner of Hall and Ottawa intersection		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 1'	Sand with gravel, fine, black, dry
1 - 10'	Sand, fine, orange, dry-grades to very fine light tan sand at 5', saturated at 10'

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST19-B2 (6')	0 ppm
10'	3 ppm (saturated)

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 19/Boring 3 (ST19-B3)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	4/8/97
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 490N, 86° 14' 400W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D), GQ=8
TOTAL DEPTH DRILLED:	6'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	NA	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located on East side of Northbound BUS-31-93' Northeast from 2nd light post North from		
	Eastern Ave & approx. 90' Southeast from 3rd power pole going North from Eastern Ave.		
LOGGED BY:	Tim Kamp along BUS-31		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 6"	Vegetation/topsoil
6" - 1½'	Sand, fine, brown, dry
1½ - 3'	Sand with gravel, black/brown, dry (former Hall Street fill)
3 - 6'	Sand, fine, light tan, dry

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST19-B2 (1½')	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 20/Boring 1 (ST20-B1)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	1/15/97
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 565N, 86° 14' 524W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D), GQ=8
TOTAL DEPTH DRILLED:	1'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	NA	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located West side of western-150' South from Northeast corner of Andres fence-21' West		
	from center of railroad tracks-9' East from Andres fence		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 1'	Industrial slag, sand & bricks, end of boring, 3 attempts, no sample

ANALYTICAL INFORMATION

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 20/Boring 2 (ST20-B2)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	1/10/97
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 553N, 86° 14' 444W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D), GQ=8
TOTAL DEPTH DRILLED:	11'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	11'	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located East side of Ottawa ROW-78' Northeast from 3rd power pole (on West side of Ottawa)		
	from Hall & Ottawa intersection and 66' Southwest from nearby big sign-1st support on sign		
LOGGED BY:	Tim Kamp	1' from Ottawa curb	

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 1'	Sod/topsoil, fine, brown/black, dry
1 - 11'	Sand, fine, orange, dry-grades to very fine light tan sand at 5', saturation at 11'

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST20-B2 (6')	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 21/Boring 2 (ST21-B2)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	1/9/97
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 584N, 86° 14' 422W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D)
TOTAL DEPTH DRILLED:	11½'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	11'	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located East side of Ottawa ROW-12' South of general plumbing supply buildings, Southwest corner and 2' North from nearby power pole		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 1'	Topsoil/sand, fine, black and tan, trace gravel, dry
1 - 11½'	Sand, fine, orange, dry, grades to very fine light tan sand at 4 - 5', saturation at 11'

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST21-B2 (8')	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 22/Boring 1 (ST22-B1)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	3/4/97
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 577N, 86° 14' 557W
DRILLING METHOD:	Portable drill & Hand Auger	**RECEPTION:**	Lock (D), GQ=9
TOTAL DEPTH DRILLED:	6'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	3½'	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located 74' Northwest from 2nd power pole (North from Giddings St), East side of East		
	Western St. and 108' Northwest from light tower located at East side of East Western Ave.		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 3'	Sand with industrial slag, fine, black, dry, contains gravel, brick and concrete pieces (spent sand)
3 - 6'	Sand, fine, brown, dry, saturation at 3½'

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING	
ST22-B1 (½ - 2')	0 ppm	Sample submitted for MDNR Ten Metals & PNA's on 3-5-97

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 22/Boring 2 (ST22-B2)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	1/10/97
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 623N, 86° 14' 404W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D), GQ=9
TOTAL DEPTH DRILLED:	11'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	10½'	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located East side of Ottawa ROW-12' Northwest from Northwest corner of Janitorial Chemical		
	Supply Co. bldg. & 64' Northeast from 3rd power pole (West side of Ottawa) from Giddings &		
LOGGED BY:	Tim Kamp	Ottawa intersection	

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 1'	Sod/topsoil, sand with gravel, black, dry
1 - 11'	Sand, fine, orange, dry-grades to light tan sand, saturation at 10½'

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST22-B2 (8')	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 23/Boring 2 (ST23-B2)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	1/10/97
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 640N, 86° 14' 385W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D)
TOTAL DEPTH DRILLED:	10'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	9'	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located East side of Ottawa ROW-60' due East from North side of Webber Lumber Supply		
	bldg and 30' West from nearby tree		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 6"	Vegetation/topsoil
6" - 4'	Sand, trace gravel, fine, brown/tan, dry
4 - 10'	Sand, fine, light tan, dry, saturation at 9'

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST23-B2 (7')	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 24/Boring 2 (ST24-B2)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	1/10/97
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 680N, 86° 14' 367W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D)
TOTAL DEPTH DRILLED:	10'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	9'	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located on East side of Ottawa ROW-27' West from Northwest corner of nearby pole bldg		
	& 27' Southwest from Southwest corner of nearby home		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 6"	Sod/topsoil
6" - 10'	Sand, fine, orange, dry-grades at 4' to light tan, very fine at 8 - 10', saturation at 9'

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST24-B2 (7')	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 25/Boring 1 (ST25-B1)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	3/4/97
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 705N, 86° 14' 414W
DRILLING METHOD:	Portable drill & Hand Auger	**RECEPTION:**	GQ=9
TOTAL DEPTH DRILLED:	6'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	5'	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located 86' from telephone pole on Southeast corner of Western & Jackson intersection & 72'		
	from power pole support on Southwest corner of Jackson & Western Ave intersection		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 3'	Sand with foundry slag, some gravel, black, dry
3 - 6'	Sand, fine, light tan, dry

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING	
ST25-B1 (½ - 2')	0 ppm	Sample submitted for MDNR Ten Metals on 3-5-97

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 25/Boring 2 (ST25-B2)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	1/10/97
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 712N, 86° 14' 345W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	
TOTAL DEPTH DRILLED:	12'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	11½'	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located on East side of Ottawa ROW-10' from nearby auto sales sign and 77' South from		
	nearby fire hydrant		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 1'	Sod/topsoil, sand, trace gravel, black, dry
1 - 3'	Sand, fine, orange, dry
3 - 12'	Sand, fine, light tan, dry, very fine at 9-12', saturation at 11½'

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST25-B2 (8')	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 26/Boring 2 (ST26-B2)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	1/10/97
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 742N, 86° 14' 387W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D)
TOTAL DEPTH DRILLED:	12'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	11¾'	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located on East side Ottawa ROW-63' Southwest from Southwest corner of Superior		
	Monument building & 75' North from nearby power pole		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - ½'	22A limestone
½ - 1'	Sand, trace gravel, fine, black and tan, dry
1 - 12'	Sand, fine, orange, dry-4 - 9', light tan, 9 - 12' orange/tan - saturation at 11¾'

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST26-B2 (9')	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 27/Boring 1 (ST27-B1)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	3/4/97
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 798N, 86° 14' 383W
DRILLING METHOD:	Portable drill & Hand Auger	**RECEPTION:**	Lock (D), GQ=9
TOTAL DEPTH DRILLED:	6'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	NA	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located 72' Southwest from Northeast corner of Lake Welding bldg. & 140' Southwest from		
	power pole on Southeast corner of Marquette & East Western streets		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 3'	Sand, trace slag & woodchips (foundry sand), some brick & gravel, black, dry
3 - 4'	Sand, fine, orange, dry
4 - 6'	Sand, fine, light tan, saturated

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING	
ST27-B1 (½ - 2')	0 ppm	Sample submitted for MDNR Ten Metals & PNAs on 3-5-97

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 27/Boring 2 (ST27-B2)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	1/10/97
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 781N, 86° 14' 302W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D)
TOTAL DEPTH DRILLED:	12'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	11½'	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located at Southeast corner of Ottawa & Marquette intersection-15' South from nearby		
	fire hydrant & 47' North from nearby power pole that feeds Superior Monument w/electricity		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - ½'	22A Limestone
½ - 1'	Sand, fine, black, dry
1 - 12'	Sand, fine to medium, light tan, dry, saturation at 11½'

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST27-B2 (9')	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 28/Boring 2 (ST28-B2)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	1/21/97
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 813N, 86° 14' 282W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D)
TOTAL DEPTH DRILLED:	11'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	10'	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located on East side of Ottawa ROW-10' South from 2nd power pole starting from Marquette		
	/Ottawa intersection-45' East from Northwest corner of mobile gas station bldg.		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 6"	Vegetation/topsoil
6" - 2'	Sand, fine, dark brown, dry
2 - 7'	Sand, fine, orange, dry
7 - 7¼'	Sand with pea gravel, orange/tan, dry
7¼ - 11'	Sand, fine, light tan, dry, saturation at 10'

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST28-B2 (8')	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 29/Boring 1 (ST29-B1)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	3/4/97
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 905N, 86° 14' 362W
DRILLING METHOD:	Portable drill & Hand auger	**RECEPTION:**	Lock (D), GQ=9
TOTAL DEPTH DRILLED:	3'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	1'	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located 21' from Northwest corner of CSX line shack and 21' from Northeast corner of CSX line shack-North from line shack		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 3'	Industrial slag, trace gravel and steel pieces, black, dry, saturation at 1' BGL

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING	
ST29-B1 (0 - 1')	0 ppm	Sample submitted for MDNR Ten Metals on 3-5-97

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 29/Boring 2 (ST29-B2)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	1/21/97
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 841N, 86° 14' 262W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D)
TOTAL DEPTH DRILLED:	11'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	10'	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located on East side Ottawa ROW-25' South from 3rd power pole starting from Ottawa &		
	Marquette intersection-5' South from nearby speed limit sign		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 6"	Sod/topsoil
6" - 3'	Sand, fine, orange, dry
3 - 11'	Sand, fine, light tan, dry, saturation at 10'

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST29-B2 (8')	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 30/Boring 2 (ST30-B2)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	1/21/97
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 872N, 86° 14' 244W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D)
TOTAL DEPTH DRILLED:	9'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	8½'	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located on East side of Ottawa ROW-103' North from 4th power pole along Ottawa from		
	Marquette intersection-5' South from nearby tree		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 6"	Sod/topsoil
6" - 4'	Sand with wood bark and gravel, trace glass, orange, dry
4 - 9'	Sand, fine, light tan, dry, saturation at 8½'

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST30-B2 (2')	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 31/Boring 2 (ST31-B2)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	1/21/97
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 905N, 86° 14' 226W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D)
TOTAL DEPTH DRILLED:	8'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	7'	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located East side of Ottawa ROW-75' Southwest from Southwest corner of nearby utility		
	garage and 75' north from tree-only tree in the area		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 1'	Gravel with sand-parking lot base
1 - 6'	Sand, fine, orange and black with gravel, trace industrial slag, trace glass shards, dry
6 - 8'	Sand with woodchips, fine, orange, dry, saturation at 7'

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST31-B2 (2')	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 32/Boring 1 (ST32-B1)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	3/4/97
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 995N, 86° 14' 329W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D), GQ=8
TOTAL DEPTH DRILLED:	5'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	1'	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located 91' due West from Northwest corner of Fisher Steel bldg and 24' due East from		
	Eastern most railroad spur		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 1'	Sand with slag and gravel, black, dry
1 - 3'	Sand, orange-tan, fine, saturated
3 - 5'	Industrial slag with sand, black, saturated

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST32-B1 (½')	0 ppm
3½'	12 ppm (saturated)

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 32/Boring 2 (ST32-B2)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	1/21/97
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 930N, 86° 14' 204W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D)
TOTAL DEPTH DRILLED:	7'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	6'	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located East side of Ottawa ROW-3' South from railroad track crossing Ottawa-51' South		
	from abandoned power light-10' East from Ottawa Street curb		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 4'	Sand, trace woodchips, fine, black and orange layering, dry
4 - 7'	Sand, fine, orange/tan, dry

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST32-B2 (4')	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 32/Boring 3 (ST32-B3)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	3/7/97
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 663N, 86° 14' 230W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D), GQ=7
TOTAL DEPTH DRILLED:	6'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	6'	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located on North side of Butler Ave-72' Northeast from power pole at Yuba and Butler Street		
	turn and 51' Northeast from nearby large tree		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 6"	Vegetation/topsoil
6" - 1½'	Sand, fine, orange, dry
1½ - 6'	Sand, fine, light tan, dry, saturation at 6'

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST32-B3 (½ - 2')	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 33/Boring 2 (ST33-B2)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	1/21/97
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 971N, 86° 14' 185W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D)
TOTAL DEPTH DRILLED:	5'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	4'	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located East side of Ottawa ROW-5' South from nearby speed limit sign and 33' West from		
	only large tree in area		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 1½'	Sand with gravel (road dress)
1½ - 5'	Sand, fine, orange/tan, dry, saturation at 4'

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST33-B2 (2')	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 34/Boring 2 (ST34-B2)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	1/21/97
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 001N, 86° 14' 160W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D)
TOTAL DEPTH DRILLED:	6'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	5'	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located East side of Ottawa ROW-5' North from power pole at Northwest corner of Ottawa &		
	Bayou Street intersection-5' East from no outlet sign along Ottawa Street		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 6"	Vegetation/topsoil
6" - 4'	Sand, trace industrial slag, trace brick pieces, fine, black & brown, dry
4 - 6'	Sand, fine, dark brown, dry

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST34-B2 (2')	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 34/Boring 3 (ST34-B3)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	3/7/97
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 978N, 86° 14' 091W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D), GQ=9
TOTAL DEPTH DRILLED:	6½'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	6½'	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located at Northeast corner of Bayou St. & Northbound BUS-31-9' Northwest from stop sign		
	& 66' Northwest from power pole located on South side of Bayou St.-BUS-31 intersection		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - ½'	Vegetation/topsoil
½ - 3½'	Sand, fine, light tan, dry-perched water from 3 - 3½'
3½ - 5½'	Peat with sand, black, moist
5½ - 6½'	Sand, gray-brown, dry, saturation at 6½'

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST34-B3 (½ - 2')	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 34/Boring 4 (ST34-B4)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	3/7/97
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 948N, 86° 14' 027W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D), GQ=9
TOTAL DEPTH DRILLED:	6'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	4'	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located South side of Bayou St.-42' West from gate post on South side of Bayou St. & 40'		
	Northeast from nearby tree		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 6"	Vegetation/topsoil
6" - 3'	Sand, trace gravel, fine, light tan, dry
3 - 5'	Sand with organic matter, fine, light tan, dry, saturation at 4'

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST34-B4 (½ - 2')	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 35/Boring 2 (ST35-B2)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	1/21/97
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 031N, 86° 14' 143W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D)
TOTAL DEPTH DRILLED:	6'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	5'	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located East side of Ottawa ROW-10' from Ottawa curb-20' Northwest from nearby fire		
	hydrant		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 6"	Vegetation/topsoil
6" - 6'	Sand, trace gravel and industrial slag, fine, black & brown, dry, saturation at 5'

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING
ST35-B2 (3')	0 ppm

BORING/WELL LOG DATA

SUPERIOR ENVIRONMENTAL CORP.

PROJECT NO.:	MK1246	**WELL/BORING NO.:**	Station 37/Boring 2 (ST37-B2)
PROJECT:	Muskegon Lakeshore	**DATE DRILLED:**	3/4/97
LOCATION:	Muskegon	**G.P.S. BORING LOCATION:**	43° 14' 058N, 86° 14' 054W
DRILLING METHOD:	3¼" Stainless H.A.	**RECEPTION:**	Lock (D), GQ=8
TOTAL DEPTH DRILLED:	6'	**T.O.C. ELEVATION:**	NA
GROUND ELEVATION:	NA	**SCREEN TYPE/LENGTH:**	NA
GROUT TYPE/QUANTITY:	NA	**SCREENED INTERVAL:**	NA
GROUT INTERVAL(S):	NA	**GRAVEL PACK TYPE:**	NA
DEPTH TO WATER:	6'	**GRAVEL PACK INTERVAL:**	NA
WATER LEVEL ELEVATION:	NA		
REMARKS:	Located 63' North from Northeast corner of city pump house & 51' East from East curb of Ottawa Street		
LOGGED BY:	Tim Kamp		

PHYSICAL DESCRIPTION

DEPTH	FORMATION DESCRIPTION
0 - 1"	Vegetation
1" - ½'	Gravel with sand, brown, dry
½ - 2'	Industrial slag, some cobbles, red/brown, dry
2 - 2½'	Sand, fine, light tan, dry
2½ - 3'	Sand with slag, red, dry
3 - 4'	Slag, brown, dry
4 - 6'	Foundry sand, fine, black, dry, saturation at 6'

ANALYTICAL INFORMATION

SAMPLE INTERVAL	MICROTIP HL200 READING	
ST37-B2 (2')	0 ppm	Sample submitted for MDNR Ten Metals on 3-5-97

APPENDIX B

APPENDIX B

• LABORATORY REPORTS •

WESTERN MICHIGAN
ENVIRONMENTAL SERVICES, INC.

3352 128th Avenue, Holland, Michigan 49424-9263
Phone: 616-399-6070 FAX: 616-399-6185

CLIENT: Dell Engineering, Inc.
3352 128th Avenue
Holland, Michigan 49424

Attn: R. Jack Barr
Re: Muskegon SAF - Area-Wide Eval (950486.10/0002)

DATE: January 15, 1997

ANALYSIS OF: Soil Samples

REPORTED BY: Robert K. Zahray, Laboratory Manager

DATE RECEIVED: Received from client on December 20, 1996.

Sample ID: S-1, 1'-2' Lab ID: 9612251-01 Collected: 12/17/96

TEST	RESULT	UNITS	ANALYZED	BY	METHOD	MDL
Total Solids	81.5	% of sample	12/22/96	JA	APHA 2540 B.	N/A
Acid Digestion, Solid	12/20/96	date digested		JA	EPA 3050	
Arsenic	9.1	mg/kg dry wt.	12/23/96	JA	EPA 7060	0.026
Barium	62	mg/kg dry wt.	12/20/96	MBR	EPA 6010	0.26
Cadmium	0.053	mg/kg dry wt.	01/09/97	JA	EPA 7131	0.0026
Chromium	7.0	mg/kg dry wt.	12/20/96	MBR	EPA 6010	0.26
Copper	20	mg/kg dry wt.	12/20/96	MBR	EPA 6010	0.26
Lead	31	mg/kg dry wt.	12/20/96	MBR	EPA 6010	1.4
Mercury	0.15	mg/kg dry wt.	01/12/97	MBR	EPA 7470	0.016
Selenium	0.70	mg/kg dry wt.	01/09/97	JA	EPA 7740	0.026
Silver	BDL	mg/kg dry wt.	01/14/97	MBR	EPA 6010	0.26
Zinc	28	mg/kg dry wt.	12/20/96	MBR	EPA 6010	0.26

Sample ID: S-3, 30' North, 2'-3' Lab ID: 9612251-02 Collected: 12/17/96

TEST	RESULT	UNITS	ANALYZED	BY	METHOD	MDL
Total Solids	96.0	% of sample	12/22/96	JA	APHA 2540 B.	N/A
Acid Digestion, Solid	12/20/96	date digested		JA	EPA 3050	
Arsenic	0.42	mg/kg dry wt.	12/23/96	JA	EPA 7060	0.026
Barium	5.0	mg/kg dry wt.	12/20/96	MBR	EPA 6010	0.26
Cadmium	BDL	mg/kg dry wt.	01/09/97	JA	EPA 7131	0.0026
Chromium	1.3	mg/kg dry wt.	12/20/96	MBR	EPA 6010	0.26
Copper	1.6	mg/kg dry wt.	12/20/96	MBR	EPA 6010	0.26
Lead	2.2	mg/kg dry wt.	12/20/96	MBR	EPA 6010	1.4
Mercury	BDL	mg/kg dry wt.	01/12/97	MBR	EPA 7470	0.016
Selenium	0.022	mg/kg dry wt.	01/09/97	JA	EPA 7740	0.026
Silver	BDL	mg/kg dry wt.	01/14/97	MBR	EPA 6010	0.26
Zinc	4.9	mg/kg dry wt.	12/20/96	MBR	EPA 6010	0.26

BDL = Below Detection Limit
MDL = Method Detection Limit

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Sample ID: S-5, 30' North, 2'-3' Lab ID: 9612251-03 Collected: 12/17/96

TEST	RESULT	UNITS	ANALYZED	BY	METHOD	MDL
Total Solids	82.9	% of sample	12/22/96	JA	APHA 2540 B.	N/A
Acid Digestion, Solid	12/20/96	date digested		JA	EPA 3050	
Arsenic	9.6	mg/kg dry wt.	12/23/96	JA	EPA 7060	0.026
Barium	45	mg/kg dry wt.	12/20/96	MBR	EPA 6010	0.26
Cadmium	2.7	mg/kg dry wt.	12/20/96	MBR	EPA 6010	0.26
Chromium	14	mg/kg dry wt.	12/20/96	MBR	EPA 6010	0.26
Copper	59	mg/kg dry wt.	12/20/96	MBR	EPA 6010	0.26
Lead	9.6	mg/kg dry wt.	01/14/97	MBR	EPA 6010	1.3
Mercury	0.077	mg/kg dry wt.	01/12/97	MBR	EPA 7470	0.016
Selenium	0.27	mg/kg dry wt.	01/09/97	JA	EPA 7740	0.026
Silver	BDL	mg/kg dry wt.	01/14/97	MBR	EPA 6010	0.26
Zinc	250	mg/kg dry wt.	01/14/97	MBR	EPA 6010	0.26
Poly Aromatic Hydrocarbons					EPA 8270	
Acenaphthene	BDL	µg/kg dry wt	12/31/96	LD		330
Acenaphthylene	BDL	µg/kg dry wt	12/31/96	LD		330
Anthracene	BDL	µg/kg dry wt	12/31/96	LD		330
Benzo(a)anthracene	780	µg/kg dry wt	12/31/96	LD		330
Benzo(b)fluoranthene	750	µg/kg dry wt	12/31/96	LD		330
Benzo(k)fluoranthene	760	µg/kg dry wt	12/31/96	LD		330
Benzo(ghi)perylene	BDL	µg/kg dry wt	12/31/96	LD		1,200
Benzo(a)pyrene	620	µg/kg dry wt	12/31/96	LD		330
Chrysene	1,000	µg/kg dry wt	12/31/96	LD		330
Dibenzo(a,h)anthracene	BDL	µg/kg dry wt	12/31/96	LD		1,200
Fluoranthene	1,400	µg/kg dry wt	12/31/96	LD		330
Fluorene	BDL	µg/kg dry wt	12/31/96	LD		330
Indeno(1,2,3-cd)pyrene	BDL	µg/kg dry wt	12/31/96	LD		1,200
Naphthalene	BDL	µg/kg dry wt	12/31/96	LD		330
Phenanthrene	1,500	µg/kg dry wt	12/31/96	LD		330
Pyrene	1,100	µg/kg dry wt	12/31/96	LD		330
Soxhlet Extraction for PAH	12/27/96	prep. date		LD	EPA 3540	
Total Solids	79.4	% of sample	12/28/96	LD	APHA 2540 B.	

Sample ID: S-7, 2'-3' Lab ID: 9612251-04 Collected: 12/17/96

TEST	RESULT	UNITS	ANALYZED	BY	METHOD	MDL
Total Solids	77.7	% of sample	12/22/96	JA	APHA 2540 B.	N/A
Acid Digestion, Solid	12/20/96	date digested		JA	EPA 3050	
Arsenic	8.3	mg/kg dry wt.	12/23/96	JA	EPA 7060	0.026
Barium	44	mg/kg dry wt.	12/20/96	MBR	EPA 6010	0.26
Cadmium	0.076	mg/kg dry wt.	01/09/97	JA	EPA 7131	0.0026
Chromium	7.3	mg/kg dry wt.	12/20/96	MBR	EPA 6010	0.26
Copper	26	mg/kg dry wt.	12/20/96	MBR	EPA 6010	0.26
Lead	77	mg/kg dry wt.	01/14/97	MBR	EPA 6010	1.3
Mercury	0.059	mg/kg dry wt.	01/12/97	MBR	EPA 7470	0.016
Selenium	BDL	mg/kg dry wt.	01/09/97	JA	EPA 7740	0.026
Silver	BDL	mg/kg dry wt.	01/14/97	MBR	EPA 6010	0.26
Zinc	93	mg/kg dry wt.	12/20/96	MBR	EPA 6010	0.26

BDL = Below Detection Limit
MDL = Method Detection Limit

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Sample ID: S-9, 1.5'-2.5' Lab ID: 9612251-05 Collected: 12/17/96

TEST	RESULT	UNITS	ANALYZED	BY	METHOD	MDL
Total Solids	55.1	% of sample	12/22/96	JA	APHA 2540 B.	N/A
Acid Digestion, Solid	12/20/96	date digested		JA	EPA 3050	
Arsenic	16	mg/kg dry wt.	12/23/96	JA	EPA 7060	0.026
Barium	210	mg/kg dry wt.	12/20/96	MBR	EPA 6010	0.26
Cadmium	8.1	mg/kg dry wt.	12/20/96	MBR	EPA 6010	0.26
Chromium	13	mg/kg dry wt.	12/20/96	MBR	EPA 6010	0.26
Copper	59	mg/kg dry wt.	12/20/96	MBR	EPA 6010	0.26
Lead	150	mg/kg dry wt.	12/20/96	MBR	EPA 6010	1.4
Mercury	0.86	mg/kg dry wt.	01/12/97	MBR	EPA 7470	0.016
Selenium	0.56	mg/kg dry wt.	01/09/97	JA	EPA 7740	0.026
Silver	BDL	mg/kg dry wt.	01/14/97	MBR	EPA 6010	0.26
Zinc	280	mg/kg dry wt.	01/14/97	MBR	EPA 6010	0.26
Poly Aromatic Hydrocarbons					EPA 8270	
Acenaphthene	BDL	µg/kg dry wt	12/31/96	LD		330
Acenaphthylene	BDL	µg/kg dry wt	12/31/96	LD		330
Anthracene	BDL	µg/kg dry wt	12/31/96	LD		330
Benzo(a)anthracene	920	µg/kg dry wt	12/31/96	LD		330
Benzo(b)fluoranthene	940	µg/kg dry wt	12/31/96	LD		330
Benzo(k)fluoranthene	820	µg/kg dry wt	12/31/96	LD		330
Benzo(ghi)perylene	BDL	µg/kg dry wt	12/31/96	LD		1,400
Benzo(a)pyrene	840	µg/kg dry wt	12/31/96	LD		330
Chrysene	1,200	µg/kg dry wt	12/31/96	LD		330
Dibenzo(a,h)anthracene	BDL	µg/kg dry wt	12/31/96	LD		1,400
Fluoranthene	2,100	µg/kg dry wt	12/31/96	LD		330
Fluorene	BDL	µg/kg dry wt	12/31/96	LD		330
Indeno(1,2,3-cd)pyrene	BDL	µg/kg dry wt	12/31/96	LD		1,400
Naphthalene	520	µg/kg dry wt	12/31/96	LD		330
Phenanthrene	1,600	µg/kg dry wt	12/31/96	LD		330
Pyrene	1,900	µg/kg dry wt	12/31/96	LD		330
Soxhlet Extraction for PAH	12/27/96	prep. date		LD	EPA 3540	
Total Solids	79.6	% of sample		LD	APHA 2540 B.	

Sample ID: S-11, 30' North, 1'-2' Lab ID: 9612251-06 Collected: 12/18/96

TEST	RESULT	UNITS	ANALYZED	BY	METHOD	MDL
Total Solids	90.2	% of sample	12/22/96	JA	APHA 2540 B.	N/A
Acid Digestion, Solid	12/20/96	date digested		JA	EPA 3050	
Arsenic	0.87	mg/kg dry wt.	12/23/96	JA	EPA 7060	0.026
Barium	58	mg/kg dry wt.	12/20/96	MBR	EPA 6010	0.26
Cadmium	0.018	mg/kg dry wt.	01/09/97	JA	EPA 7131	0.0026
Chromium	2.2	mg/kg dry wt.	12/20/96	MBR	EPA 6010	0.26
Copper	2.6	mg/kg dry wt.	12/20/96	MBR	EPA 6010	0.26
Lead	3.7	mg/kg dry wt.	12/20/96	MBR	EPA 6010	1.4
Mercury	BDL	mg/kg dry wt.	01/12/97	MBR	EPA 7470	0.016
Selenium	0.049	mg/kg dry wt.	01/09/97	JA	EPA 7740	0.026
Silver	BDL	mg/kg dry wt.	01/14/97	MBR	EPA 6010	0.26
Zinc	24	mg/kg dry wt.	12/20/96	MBR	EPA 6010	0.26

BDL = Below Detection Limit
MDL = Method Detection Limit

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Sample ID: S-13, 60' North, 2'-3' Lab ID: 9612251-07 Collected: 12/18/96

TEST	RESULT	UNITS	ANALYZED	BY	METHOD	MDL
Total Solids	92.9	% of sample	12/22/96	JA	APHA 2540 B.	N/A
Acid Digestion, Solid	12/20/96	date digested		JA	EPA 3050	
Arsenic	7.0	mg/kg dry wt.	12/23/96	JA	EPA 7060	0.026
Barium	29	mg/kg dry wt.	12/20/96	MBR	EPA 6010	0.26
Cadmium	BDL	mg/kg dry wt.	01/09/97	JA	EPA 7131	0.0026
Chromium	5.5	mg/kg dry wt.	12/20/96	MBR	EPA 6010	0.26
Copper	66	mg/kg dry wt.	12/20/96	MBR	EPA 6010	0.26
Lead	20	mg/kg dry wt.	12/20/96	MBR	EPA 6010	1.4
Mercury	0.073	mg/kg dry wt.	01/12/97	MBR	EPA 7470	0.016
Selenium	0.59	mg/kg dry wt.	01/09/97	JA	EPA 7740	0.026
Silver	BDL	mg/kg dry wt.	01/14/97	MBR	EPA 6010	0.26
Zinc	13	mg/kg dry wt.	12/20/96	MBR	EPA 6010	0.26
Poly Aromatic Hydrocarbons					EPA 8270	
Acenaphthene	BDL	µg/kg dry wt	12/31/96	LD		330
Acenaphthylene	BDL	µg/kg dry wt	12/31/96	LD		330
Anthracene	BDL	µg/kg dry wt	12/31/96	LD		330
Benzo(a)anthracene	BDL	µg/kg dry wt	12/31/96	LD		330
Benzo(b)fluoranthene	BDL	µg/kg dry wt	12/31/96	LD		330
Benzo(k)fluoranthene	BDL	µg/kg dry wt	12/31/96	LD		330
Benzo(ghi)perylene	BDL	µg/kg dry wt	12/31/96	LD		1,000
Benzo(a)pyrene	BDL	µg/kg dry wt	12/31/96	LD		330
Chrysene	BDL	µg/kg dry wt	12/31/96	LD		330
Dibenzo(a,h)anthracene	BDL	µg/kg dry wt	12/31/96	LD		1,000
Fluoranthene	BDL	µg/kg dry wt	12/31/96	LD		330
Fluorene	BDL	µg/kg dry wt	12/31/96	LD		330
Indeno(1,2,3-cd)pyrene	BDL	µg/kg dry wt	12/31/96	LD		1,000
Naphthalene	940	µg/kg dry wt	12/31/96	LD		330
Phenanthrene	910	µg/kg dry wt	12/31/96	LD		330
Pyrene	BDL	µg/kg dry wt	12/31/96	LD		330
Soxhlet Extraction for PAH	12/27/96	prep. date		LD	EPA 3540	
Total Solids	87.7	% of sample	12/28/96	LD	APHA 2540 B.	

Sample ID: S-15, 60' North, 3'-4' Lab ID: 9612251-08 Collected: 12/18/96

TEST	RESULT	UNITS	ANALYZED	BY	METHOD	MDL
Total Solids	96.1	% of sample	12/22/96	JA	APHA 2540 B.	N/A
Acid Digestion, Solid	12/20/96	date digested		JA	EPA 3050	
Arsenic	0.66	mg/kg dry wt.	12/23/96	JA	EPA 7060	0.026
Barium	7.3	mg/kg dry wt.	12/20/96	MBR	EPA 6010	0.26
Cadmium	BDL	mg/kg dry wt.	01/09/97	JA	EPA 7131	0.0026
Chromium	2.4	mg/kg dry wt.	12/20/96	MBR	EPA 6010	0.26
Copper	1.9	mg/kg dry wt.	12/20/96	MBR	EPA 6010	0.26
Lead	2.2	mg/kg dry wt.	12/20/96	MBR	EPA 6010	1.4
Mercury	BDL	mg/kg dry wt.	01/12/97	MBR	EPA 7470	0.016
Selenium	BDL	mg/kg dry wt.	01/09/97	JA	EPA 7740	0.026
Silver	BDL	mg/kg dry wt.	01/14/97	MBR	EPA 6010	0.26
Zinc	6.3	mg/kg dry wt.	12/20/96	MBR	EPA 6010	0.26

BDL = Below Detection Limit
MDL = Method Detection Limit

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Phone: 616-399-6070 FAX: 616-399-6185

CLIENT SAMPLE -- CHAIN OF CUSTODY FORM

Project Name:	Muskegon SAF - Area-wide Evaluation 950486.10/0002
Name of Sampler:	RJB

ESI # 9612251	Date	Time	Sample Matrix	Sample ID	No. Cont.	Analyses Requested
-7	12/18/96	10:18am	S	S-13, 60' North, 2-3'	1	~~See ARF~~ Mich 10 + PAHs
-8	"	11:22am	S	S-15, 60' North, 3-4'	1	Mich 10 metals.
-6	"	8:50am	"	S-11, 30' North, 1-2'	1	"
-5	12/17/96	1:50pm	"	S-9, 1.5-2.5'	1	" , PAHs
-4	"	11:02am	"	S-7, 2-3'	1	Mich 10 Metals
-3	"	10:20am	"	S-5, 30' North, 2-3'	1	Mich 10 Metals, PAHs
-2	"	3:00pm	"	S-3, 30' North, 2-3'	1	Mich 10 Metals
-1	"	2:38pm	"	S-1, 1-2'	1	"

Remarks:

Samples Relinquished By:	Samples Transported By:	Samples Received By:
RJB	RJB	[signature]
Affiliation: Dell	Affiliation: Dell	Affiliation: W.M.E.S.I.
Date: 12/20/96 Time: 11:40am	Date: 12/20/96 Time: 11:40am	Date: 12/20/96 Time: 1140

SAMPLE MATRIX CODES:

W = Water
GW = Groundwater
SW = Surface Water
WW = Wastewater
WST = Waste
S = Soil
O = Other

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MAR 12 1997
DELL
ENGINEERING

CLIENT: Dell Engineering, Inc.
3352 128th Avenue
Holland, Michigan 49424

Attn: Tom O'Connell
Re: Muskegon SAF (950486.10/0002)

DATE: March 11, 1997

ANALYSIS OF: Soil Samples

REPORTED BY: Robert K. Zahray, Laboratory Manager

DATE RECEIVED: Received from client on February 21, 1997.

Sample ID: S-17, 0.5'-1.5' Lab ID: 9702213-01 Collected: 02/20/97

TEST	RESULT	UNITS	ANALYZED	BY	METHOD	MDL
Total Solids	90.1	% of sample	02/22/97	MBR	APHA 2540 B.	
Acid Digestion, Solid	02/21/97	date digested		MBR	EPA 3050	
Arsenic	3.3	mg/kg dry wt.	03/11/97	JA	EPA 7060	0.039
Barium	44	mg/kg dry wt.	02/25/97	MBR	EPA 6010	0.39
Cadmium	0.030	mg/kg dry wt.	03/04/97	JA	EPA 7131	0.0039
Chromium	4.6	mg/kg dry wt.	02/25/97	MBR	EPA 6010	0.39
Copper	20	mg/kg dry wt.	02/25/97	MBR	EPA 6010	0.39
Lead	320	mg/kg dry wt.	03/06/97	MBR	EPA 6010	2.0
Mercury	0.15	mg/kg dry wt.	02/25/97	DPM	EPA 7470	0.018
Selenium	0.28	mg/kg dry wt.	03/05/97	JA	EPA 7740	0.039
Silver	BDL	mg/kg dry wt.	02/25/97	MBR	EPA 6010	0.39
Zinc	40	mg/kg dry wt.	02/25/97	MBR	EPA 6010	0.39

Sample ID: S-19, 1.0'-2.0' Lab ID: 9702213-02 Collected: 02/20/97

TEST	RESULT	UNITS	ANALYZED	BY	METHOD	MDL
Total Solids	94.7	% of sample	02/22/97	MBR	APHA 2540 B.	
Acid Digestion, Solid	02/21/97	date digested		MBR	EPA 3050	
Arsenic	0.77	mg/kg dry wt.	03/11/97	JA	EPA 7060	0.039
Barium	8.7	mg/kg dry wt.	02/25/97	MBR	EPA 6010	0.39
Cadmium	0.034	mg/kg dry wt.	03/04/97	JA	EPA 7131	0.0039
Chromium	2.2	mg/kg dry wt.	02/25/97	MBR	EPA 6010	0.39
Copper	2.9	mg/kg dry wt.	02/25/97	MBR	EPA 6010	0.39
Lead	5.8	mg/kg dry wt.	02/25/97	MBR	EPA 6010	2.0
Mercury	BDL	mg/kg dry wt.	02/25/97	DPM	EPA 7470	0.018
Selenium	0.041	mg/kg dry wt.	03/05/97	JA	EPA 7740	0.039
Silver	BDL	mg/kg dry wt.	02/25/97	MBR	EPA 6010	0.39
Zinc	15	mg/kg dry wt.	02/25/97	MBR	EPA 6010	0.39
Poly Aromatic Hydrocarbons					EPA 8270	
Acenaphthene	BDL	µg/kg dry wt	03/04/97	LD		330
Acenaphthylene	BDL	µg/kg dry wt	03/04/97	LD		330
Anthracene	BDL	µg/kg dry wt	03/04/97	LD		330
Benzo(a)anthracene	BDL	µg/kg dry wt	03/04/97	LD		330
Benzo(b)fluoranthene	BDL	µg/kg dry wt	03/04/97	LD		330
Benzo(k)fluoranthene	BDL	µg/kg dry wt	03/04/97	LD		330
Benzo(ghi)perylene	BDL	µg/kg dry wt	03/04/97	LD		330
Benzo(a)pyrene	BDL	µg/kg dry wt	03/04/97	LD		330

BDL = Below Detection Limit
MDL = Method Detection Limit

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Sample ID: S-19, 1.0'-2.0' Lab ID: 9702213-02 Collected: 02/20/97

TEST	RESULT	UNITS	ANALYZED	BY	METHOD	MDL
Poly Aromatic Hydrocarbons					EPA 8270	
Chrysene	BDL	µg/kg dry wt	03/04/97	LD		330
Dibenzo(a,h)anthracene	BDL	µg/kg dry wt	03/04/97	LD		330
Fluoranthene	BDL	µg/kg dry wt	03/04/97	LD		330
Fluorene	BDL	µg/kg dry wt	03/04/97	LD		330
Indeno(1,2,3-cd)pyrene	BDL	µg/kg dry wt	03/04/97	LD		330
Naphthalene	BDL	µg/kg dry wt	03/04/97	LD		330
Phenanthrene	BDL	µg/kg dry wt	03/04/97	LD		330
Pyrene	BDL	µg/kg dry wt	03/04/97	LD		330
Soxhlet Extraction for PAH	02/27/97	prep. date		HL	EPA 3540	

Sample ID: S-21. 0.0'-1.0' Lab ID: 9702213-03 Collected: 02/20/97

TEST	RESULT	UNITS	ANALYZED	BY	METHOD	MDL
Total Solids	86.4	% of sample	02/22/97	MBR	APHA 2540 B.	
Acid Digestion, Solid	02/21/97	date digested		MBR	EPA 3050	
Arsenic	3.4	mg/kg dry wt.	03/11/97	JA	EPA 7060	0.039
Barium	38	mg/kg dry wt.	02/25/97	MBR	EPA 6010	0.39
Cadmium	0.067	mg/kg dry wt.	03/04/97	JA	EPA 7131	0.0039
Chromium	3.9	mg/kg dry wt.	02/25/97	MBR	EPA 6010	0.39
Copper	45	mg/kg dry wt.	02/25/97	MBR	EPA 6010	0.39
Lead	99	mg/kg dry wt.	02/25/97	MBR	EPA 6010	2.0
Mercury	1.0	mg/kg dry wt.	03/05/97	DPM	EPA 7470	0.03
Selenium	0.61	mg/kg dry wt.	03/05/97	JA	EPA 7740	0.039
Silver	BDL	mg/kg dry wt.	02/25/97	MBR	EPA 6010	0.39
Zinc	150	mg/kg dry wt.	02/25/97	MBR	EPA 6010	0.39

Sample ID: S-23, 0.0'-1.0' Lab ID: 9702213-04 Collected: 02/20/97

TEST	RESULT	UNITS	ANALYZED	BY	METHOD	MDL
Total Solids	89.9	% of sample	02/22/97	MBR	APHA 2540 B.	
Acid Digestion, Solid	02/21/97	date digested		MBR	EPA 3050	
Arsenic	2.1	mg/kg dry wt.	03/11/97	JA	EPA 7060	0.039
Barium	31	mg/kg dry wt.	02/25/97	MBR	EPA 6010	0.39
Cadmium	0.028	mg/kg dry wt.	03/04/97	JA	EPA 7131	0.0039
Chromium	3.0	mg/kg dry wt.	02/25/97	MBR	EPA 6010	0.39
Copper	15	mg/kg dry wt.	02/25/97	MBR	EPA 6010	0.39
Lead	35	mg/kg dry wt.	02/25/97	MBR	EPA 6010	2.0
Mercury	0.05	mg/kg dry wt.	02/25/97	DPM	EPA 7470	0.018
Selenium	0.21	mg/kg dry wt.	03/05/97	JA	EPA 7740	0.039
Silver	BDL	mg/kg dry wt.	02/25/97	MBR	EPA 6010	0.39
Zinc	31	mg/kg dry wt.	02/25/97	MBR	EPA 6010	0.39

BDL = Below Detection Limit
MDL = Method Detection Limit

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9702213

CLIENT SAMPLE -- CHAIN OF CUSTODY FORM

Project Name:	Muskegon SAF - Area-wide 950486.10/0002
Name of Sampler:	RJB / CAW

ESI # 9702213	Date	Time	Sample Matrix	Sample ID	No. Cont.	Analyses Requested
-1	2/20/97	1:40pm	S	S-17, 0.5-1.5	1	See ARF
		~~1:45pm~~		~~S-18, 0.5-1.5'~~		
-2		2:20pm		S-19, 1, 2'		
		~~2:20pm~~		~~S-20, 0-1'~~		
-3		2:45pm		S-21, 0-1		
		~~2:45pm~~		~~S-22, 2-3'~~		
-4		3:15pm		S-23, 0-1		
		~~3:15pm~~		~~S-24, 0-1'~~		

Remarks:

Samples Relinquished By:	Samples Transported By:	Samples Received By:
RJB	RJB	P. J. Cold
Affiliation: Dell	Affiliation: Dell	Affiliation: W.M.E.S.I.
Date: 2/21/97 Time: 10:50am	Date: 2/21/97 Time: 10:50am	Date: 2/21/97 Time: 1050

SAMPLE MATRIX CODES:

W = Water
GW = Groundwater
SW = Surface Water
WW = Wastewater
WST = Waste
S = Soil
O = Other

WESTERN MICHIGAN
ENVIRONMENTAL SERVICES, INC.

3352 128th Avenue, Holland, Michigan 49424-9263
Phone: 616-399-6070 FAX: 616-399-6185

MAR 19 1997
DELL ENGINEERING

CLIENT: Dell Engineering, Inc.
3352 128th Avenue
Holland, Michigan 49424

Attn: Tom O'Connell
Re: Muskegon SAF - Area-Wide (950486.05)

DATE: March 18, 1997

ANALYSIS OF: Soil Samples

REPORTED BY: Robert K. Zahray, Laboratory Manager

DATE RECEIVED: Received from client on February 27, 1997.

Sample ID: S-3, 200' South, 2'-3' Lab ID: 9702269-01 Collected: 02/25/97

TEST	RESULT	UNITS	ANALYZED	BY	METHOD	MDL
Total Solids	94.9	% of sample	03/06/97	DPM	APHA 2540 B.	
Acid Digestion, Solid	03/05/97	date digested		JA	EPA 3050	
Arsenic	0.064	mg/kg dry wt.	03/11/97	JA	EPA 7060	0.030
Barium	4.0	mg/kg dry wt.	03/14/97	MBR	EPA 6010	0.28
Cadmium	0.018	mg/kg dry wt.	03/17/97	JA	EPA 7131	0.0030
Chromium	0.38	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.28
Copper	0.36	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.28
Lead	0.30	mg/kg dry wt.	03/14/97	JA	EPA 7421	0.030
Mercury	BDL	mg/kg dry wt.	03/05/97	DPM	EPA 7470	0.022
Selenium	BDL	mg/kg dry wt.	03/05/97	JA	EPA 7740	0.030
Silver	BDL	mg/kg dry wt.	03/14/97	MBR	EPA 6010	0.28
Zinc	4.7	mg/kg dry wt.	03/11/97	MBR	EPA 6010	0.28

Sample ID: S-12, 200' S., 2.5'-3.5' Lab ID: 9702269-02 Collected: 02/25/97

TEST	RESULT	UNITS	ANALYZED	BY	METHOD	MDL
Total Solids	92.6	% of sample	03/06/97	DPM	APHA 2540 B.	
Acid Digestion, Solid	03/05/97	date digested		JA	EPA 3050	
Arsenic	0.14	mg/kg dry wt.	03/11/97	JA	EPA 7060	0.030
Barium	5.6	mg/kg dry wt.	03/11/97	MBR	EPA 6010	0.28
Cadmium	0.0052	mg/kg dry wt.	03/17/97	JA	EPA 7131	0.0030
Chromium	1.1	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.28
Copper	0.87	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.28
Lead	1.3	mg/kg dry wt.	03/14/97	MBR	EPA 6010	1.4
Mercury	BDL	mg/kg dry wt.	03/05/97	DPM	EPA 7470	0.022
Selenium	0.044	mg/kg dry wt.	03/05/97	JA	EPA 7740	0.030
Silver	BDL	mg/kg dry wt.	03/14/97	MBR	EPA 6010	0.28
Zinc	2.0	mg/kg dry wt.	03/14/97	MBR	EPA 6010	0.28

BDL = Below Detection Limit
MDL = Method Detection Limit

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Sample ID: S-8, 200' South, 3'-4' Lab ID: 9702269-03 Collected: 02/25/97

TEST	RESULT	UNITS	ANALYZED	BY	METHOD	MDL
Total Solids	90.4	% of sample	03/06/97	DPM	APHA 2540 B.	
Acid Digestion, Solid	03/05/97	date digested		JA	EPA 3050	
Arsenic	0.69	mg/kg dry wt.	03/11/97	JA	EPA 7060	0.030
Barium	14	mg/kg dry wt.	03/14/97	MBR	EPA 6010	0.28
Cadmium	0.37	mg/kg dry wt.	03/14/97	MBR	EPA 6010	0.28
Chromium	2.6	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.28
Copper	4.9	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.28
Lead	19	mg/kg dry wt.	03/14/97	MBR	EPA 6010	1.4
Mercury	0.084	mg/kg dry wt.	03/05/97	DPM	EPA 7470	0.022
Selenium	BDL	mg/kg dry wt.	03/11/97	JA	EPA 7740	0.030
Silver	BDL	mg/kg dry wt.	03/14/97	MBR	EPA 6010	0.28
Zinc	22	mg/kg dry wt.	03/14/97	MBR	EPA 6010	0.28
Poly Aromatic Hydrocarbons					EPA 8270	
Acenaphthene	BDL	µg/kg dry wt	03/09/97	LD		330
Acenaphthylene	BDL	µg/kg dry wt	03/09/97	LD		330
Anthracene	BDL	µg/kg dry wt	03/09/97	LD		330
Benzo(a)anthracene	600	µg/kg dry wt	03/09/97	LD		330
Benzo(b)fluoranthene	370	µg/kg dry wt	03/09/97	LD		330
Benzo(k)fluoranthene	390	µg/kg dry wt	03/09/97	LD		330
Benzo(ghi)perylene	BDL	µg/kg dry wt	03/09/97	LD		1,300
Benzo(a)pyrene	480	µg/kg dry wt	03/09/97	LD		330
Chrysene	BDL	µg/kg dry wt	03/09/97	LD		1,300
Dibenzo(a,h)anthracene	BDL	µg/kg dry wt	03/09/97	LD		1,300
Fluoranthene	1,500	µg/kg dry wt	03/09/97	LD		330
Fluorene	BDL	µg/kg dry wt	03/09/97	LD		330
Indeno(1,2,3-cd)pyrene	BDL	µg/kg dry wt	03/09/97	LD		1,300
Naphthalene	BDL	µg/kg dry wt	03/09/97	LD		330
Phenanthrene	730	µg/kg dry wt	03/09/97	LD		330
Pyrene	1,300	µg/kg dry wt	03/09/97	LD		330
Soxhlet Extraction for PAH	03/03/97	prep. date		HL	EPA 3540	
Total Solids	90.8	% of sample		HL	APHA 2540 B.	

Sample ID: S-25, 3'-4' Lab ID: 9702269-04 Collected: 02/21/97

TEST	RESULT	UNITS	ANALYZED	BY	METHOD	MDL
Total Solids	93.1	% of sample	03/07/97	DPM	APHA 2540 B.	
Acid Digestion, Solid	03/05/97	date digested		JA	EPA 3050	
Arsenic	0.86	mg/kg dry wt.	03/11/97	JA	EPA 7060	0.030
Barium	14	mg/kg dry wt.	03/14/97	MBR	EPA 6010	0.28
Cadmium	0.49	mg/kg dry wt.	03/14/97	MBR	EPA 6010	0.28
Chromium	2.7	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.28
Copper	9.5	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.28
Lead	33	mg/kg dry wt.	03/14/97	MBR	EPA 6010	0.28
Mercury	0.20	mg/kg dry wt.	03/05/97	DPM	EPA 7470	0.022
Selenium	0.13	mg/kg dry wt.	03/11/97	JA	EPA 7740	0.030
Silver	BDL	mg/kg dry wt.	03/14/97	MBR	EPA 6010	0.28
Zinc	23	mg/kg dry wt.	03/14/97	MBR	EPA 6010	0.28

BDL = Below Detection Limit
MDL = Method Detection Limit

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Sample ID: S-27, 3'5'-4.0' Lab ID: 9702269-05 Collected: 02/21/97

TEST	RESULT	UNITS	ANALYZED	BY	METHOD	MDL
Total Solids	82.3	% of sample	03/07/97	DPM	APHA 2540 B.	
Acid Digestion, Solid	03/05/97	date digested		JA	EPA 3050	
Arsenic	0.99	mg/kg dry wt.	03/13/97	JA	EPA 7060	0.030
Barium	13	mg/kg dry wt.	03/14/97	MBR	EPA 6010	0.28
Cadmium	0.69	mg/kg dry wt.	03/11/97	MBR	EPA 6010	0.28
Chromium	3.6	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.28
Copper	10	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.28
Lead	11	mg/kg dry wt.	03/14/97	MBR	EPA 6010	0.28
Mercury	BDL	mg/kg dry wt.	03/05/97	DPM	EPA 7470	0.022
Selenium	BDL	mg/kg dry wt.	03/11/97	JA	EPA 7740	0.030
Silver	BDL	mg/kg dry wt.	03/14/97	MBR	EPA 6010	0.28
Zinc	95	mg/kg dry wt.	03/14/97	MBR	EPA 6010	0.28

Sample ID: S-29, 2'-3' Lab ID: 9702269-06 Collected: 02/21/97

TEST	RESULT	UNITS	ANALYZED	BY	METHOD	MDL
Total Solids	94.3	% of sample	03/07/97	DPM	APHA 2540 B.	
Acid Digestion, Solid	03/05/97	date digested		JA	EPA 3050	
Arsenic	0.68	mg/kg dry wt	03/13/97	JA	EPA 7060	0.030
Barium	17	mg/kg dry wt.	03/14/97	MBR	EPA 6010	0.28
Cadmium	0.52	mg/kg dry wt.	03/11/97	MBR	EPA 6010	0.28
Chromium	5.6	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.28
Copper	5.3	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.28
Lead	3.7	mg/kg dry wt.	03/14/97	MBR	EPA 6010	1.4
Mercury	BDL	mg/kg dry wt.	03/05/97	DPM	EPA 7470	0.022
Selenium	0.071	mg/kg dry wt.	03/11/97	JA	EPA 7740	0.030
Silver	BDL	mg/kg dry wt.	03/14/97	MBR	EPA 6010	0.28
Zinc	11	mg/kg dry wt.	03/14/97	MBR	EPA 6010	0.28
Poly Aromatic Hydrocarbons					EPA 8270	
Acenaphthene	BDL	µg/kg dry wt	03/09/97	LD		330
Acenaphthylene	BDL	µg/kg dry wt	03/09/97	LD		330
Anthracene	BDL	µg/kg dry wt	03/09/97	LD		330
Benzo(a)anthracene	BDL	µg/kg dry wt	03/09/97	LD		330
Benzo(b)fluoranthene	BDL	µg/kg dry wt	03/09/97	LD		330
Benzo(k)fluoranthene	BDL	µg/kg dry wt	03/09/97	LD		330
Benzo(ghi)perylene	BDL	µg/kg dry wt	03/09/97	LD		330
Benzo(a)pyrene	BDL	µg/kg dry wt	03/09/97	LD		330
Chrysene	BDL	µg/kg dry wt	03/09/97	LD		330
Dibenzo(a,h)anthracene	BDL	µg/kg dry wt	03/09/97	LD		330
Fluoranthene	BDL	µg/kg dry wt	03/09/97	LD		330
Fluorene	BDL	µg/kg dry wt	03/09/97	LD		330
Indeno(1,2,3-cd)pyrene	BDL	µg/kg dry wt	03/09/97	LD		330
Naphthalene	BDL	µg/kg dry wt	03/09/97	LD		330
Phenanthrene	BDL	µg/kg dry wt	03/09/97	LD		330
Pyrene	BDL	µg/kg dry wt	03/09/97	LD		330
Soxhlet Extraction for PAH	03/03/97	prep. date		HL	EPA 3540	
Total Solids	93.3	% of sample			APHA 2540 B.	

BDL = Below Detection Limit
MDL = Method Detection Limit

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Sample ID: S-31, 2'-3' Lab ID: 9702269-07 Collected: 02/21/97

TEST	RESULT	UNITS	ANALYZED	BY	METHOD	MDL
Total Solids	82.7	% of sample	03/11/97	DPM	APHA 2540 B.	
Acid Digestion, Solid	03/05/97	date digested		JA	EPA 3050	
Arsenic	BDL	mg/kg dry wt.	03/13/97	JA	EPA 7060	0.030
Barium	43	mg/kg dry wt.	03/14/97	MBR	EPA 6010	0.28
Cadmium	BDL	mg/kg dry wt.	03/11/97	MBR	EPA 6010	0.28
Chromium	0.69	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.28
Copper	21	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.28
Lead	27	mg/kg dry wt.	03/14/97	MBR	EPA 6010	0.28
Mercury	0.19	mg/kg dry wt.	03/05/97	DPM	EPA 7470	0.022
Selenium	BDL	mg/kg dry wt.	03/05/97	JA	EPA 7740	0.030
Silver	BDL	mg/kg dry wt.	03/14/97	MBR	EPA 6010	0.28
Zinc	70	mg/kg dry wt.	03/14/97	MBR	EPA 6010	0.28

Sample ID: S-33, 1'-2' Lab ID: 9702269-08 Collected: 02/21/97

TEST	RESULT	UNITS	ANALYZED	BY	METHOD	MDL
Total Solids	79.3	% of sample	03/11/97	DPM	APHA 2540 B.	
Acid Digestion, Solid	03/05/97	date digested		JA	EPA 3050	
Arsenic	3.0	mg/kg dry wt.	03/13/97	JA	EPA 7060	0.030
Barium	39	mg/kg dry wt.	03/14/97	MBR	EPA 6010	0.28
Cadmium	1.4	mg/kg dry wt.	03/11/97	MBR	EPA 6010	0.28
Chromium	8.7	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.28
Copper	26	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.28
Lead	36	mg/kg dry wt.	03/14/97	MBR	EPA 6010	0.28
Mercury	0.039	mg/kg dry wt.	03/05/97	DPM	EPA 7470	0.022
Selenium	0.16	mg/kg dry wt.	03/17/97	JA	EPA 7740	0.030
Silver	BDL	mg/kg dry wt.	03/14/97	MBR	EPA 6010	0.28
Zinc	37	mg/kg dry wt.	03/14/97	MBR	EPA 6010	0.28

Sample ID: S-35, 2'-3' Lab ID: 9702269-09 Collected: 02/21/97

TEST	RESULT	UNITS	ANALYZED	BY	METHOD	MDL
Total Solids	86.4	% of sample	03/11/97	DPM	APHA 2540 B.	
Acid Digestion, Solid	03/05/97	date digested		JA	EPA 3050	
Arsenic	1.3	mg/kg dry wt.	03/13/97	JA	EPA 7060	0.030
Barium	43	mg/kg dry wt.	03/14/97	MBR	EPA 6010	0.28
Cadmium	1.4	mg/kg dry wt.	03/14/97	MBR	EPA 6010	0.28
Chromium	9.2	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.28
Copper	21	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.28
Lead	31	mg/kg dry wt.	03/14/97	MBR	EPA 6010	0.28
Mercury	0.12	mg/kg dry wt.	03/13/97	DPM	EPA 7470	0.022
Selenium	0.14	mg/kg dry wt.	03/17/97	JA	EPA 7740	0.030
Silver	BDL	mg/kg dry wt.	03/14/97	MBR	EPA 6010	0.28
Zinc	53	mg/kg dry wt.	03/14/97	MBR	EPA 6010	0.28

BDL = Below Detection Limit
MDL = Method Detection Limit

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ENVIRONMENTAL SERVICES, INC.

3352 128th Avenue, Holland, Michigan 49424-9263
Phone: 616-399-6070 FAX: 616-399-6185

CLIENT SAMPLE -- CHAIN OF CUSTODY FORM

Project Name:	Muskegon SAF Area Wide Evaluation 950486.10/0002
Name of Sampler:	RJB/CAW

ESI # 9702269	Date	Time	Sample Matrix	Sample ID	No. Cont.	Analyses Requested
-4	2/24/97	12:00pm	S	S-25, 3-4'	1	See ARF
	~~"~~	~~1200pm~~	~~"~~	~~S-26, 4.5-5.5~~	~~"~~	~~"~~
-5	"	1235pm	"	S-27, 3.5-4'	"	"
	~~"~~	~~12:40pm~~	~~"~~	~~S-28, 2-3~~	~~"~~	~~"~~
-6	"	2:20pm	"	S-29, 2-3'	"	"
	~~"~~	~~2:25pm~~	~~"~~	~~S-30, 1.5-2.5~~	~~"~~	~~"~~
-7	"	3:00pm	"	S-31, 2'-3'	"	"
	~~"~~	~~3:10pm~~	~~"~~	~~S-32, 1.5-2.5~~	~~"~~	~~"~~
-8	"	3:40pm	"	S-33, 1-2'	"	"
	~~"~~	~~3:45pm~~	~~"~~	~~S-34, 0-1'~~	~~"~~	~~"~~
-9	"		"	S-35, 2-3'		
	~~"~~	~~4:15pm~~	~~"~~	~~S-36, 2'~~	~~"~~	
-1	2/25/97	—	"	S-3, 200' South, 2-3'	"	"
-3	↓	—	"	S-8, " , 3-4'	"	"
-2	↓	—	"	S-12, " , 2.5-3.5'	"	"

Remarks:

Samples Relinquished By:	Samples Transported By:	Samples Received By:
RJB	RJB	P. Calder
Affiliation: Dell	Affiliation: Dell	Affiliation: W.M.E.S.I.
Date: 2/27/97 Time: 10:30am	Date: 2/27/97 Time: 10:30am	Date: 2/27/97 Time: 1035

SAMPLE MATRIX CODES:

W = Water
GW = Groundwater
SW = Surface Water
WW = Wastewater
WST = Waste
S = Soil
O = Other

WESTERN MICHIGAN
ENVIRONMENTAL SERVICES, INC.

3352 128th Avenue, Holland, Michigan 49424-9263
Phone: 616-399-6070 FAX: 616-399-6185

MAR 25 1997
DELL ENGINEERING

CLIENT: Dell Engineering, Inc.
3352 128th Avenue
Holland, Michigan 49424

Attn: Chad Weber
Re: City of Muskegon SAF (950486.01/0004)

DATE: March 25, 1997

ANALYSIS OF: Soil Samples

REPORTED BY: Robert K. Zahray, Laboratory Manager

DATE RECEIVED: Received from client on March 11, 1997.

Sample ID: S-37, 1.0'-2.0' Lab ID: 9703096-01 Collected: 03/07/97

TEST	RESULT	UNITS	ANALYZED	BY	METHOD	MDL
Total Solids	87.8	% of sample	03/13/97	DPM	APHA 2540 B.	
Acid Digestion, Solid	03/12/97	date digested		JA	EPA 3050	
Arsenic	2.1	mg/kg dry wt.	03/21/97	JA	EPA 7060	0.038
Barium	25	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Cadmium	1.3	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Chromium	6.0	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Copper	24	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Lead	16	mg/kg dry wt.	03/17/97	MBR	EPA 6010	1.9
Mercury	BDL	mg/kg dry wt.	03/13/97	DPM	EPA 7470	0.019
Selenium	BDL	mg/kg dry wt.	03/21/97	JA	EPA 7740	0.38
Silver	BDL	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Zinc	18	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Poly Aromatic Hydrocarbons					EPA 8270	
Acenaphthene	BDL	µg/kg dry wt	03/20/97	LD		330
Acenaphthylene	BDL	µg/kg dry wt	03/20/97	LD		330
Anthracene	BDL	µg/kg dry wt	03/20/97	LD		330
Benzo(a)anthracene	BDL	µg/kg dry wt	03/20/97	LD		330
Benzo(b)fluoranthene	BDL	µg/kg dry wt	03/20/97	LD		330
Benzo(k)fluoranthene	BDL	µg/kg dry wt	03/20/97	LD		330
Benzo(ghi)perylene	BDL	µg/kg dry wt	03/20/97	LD		330
Benzo(a)pyrene	BDL	µg/kg dry wt	03/20/97	LD		330
Chrysene	BDL	µg/kg dry wt	03/20/97	LD		330
Dibenzo(a,h)anthracene	BDL	µg/kg dry wt	03/20/97	LD		330
Fluoranthene	BDL	µg/kg dry wt	03/20/97	LD		330
Fluorene	BDL	µg/kg dry wt	03/20/97	LD		330
Indeno(1,2,3-cd)pyrene	BDL	µg/kg dry wt	03/20/97	LD		330
Naphthalene	BDL	µg/kg dry wt	03/20/97	LD		330
Phenanthrene	BDL	µg/kg dry wt	03/20/97	LD		330
Pyrene	BDL	µg/kg dry wt	03/20/97	LD		330
Soxhlet Extraction for PAH	03/13/97	prep. date		HL	EPA 3540	

BDL = Below Detection Limit
MDL = Method Detection Limit

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Sample ID: S-38, 2.0'-3.0' Lab ID: 9703096-02 Collected: 03/07/97

TEST	RESULT	UNITS	ANALYZED	BY	METHOD	MDL
Total Solids	89.8	% of sample	03/13/97	DPM	APHA 2540 B.	
Acid Digestion, Solid	03/12/97	date digested		JA	EPA 3050	
Arsenic	2.0	mg/kg dry wt.	03/21/97	JA	EPA 7060	0.038
Barium	26	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Cadmium	1.0	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Chromium	7.9	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Copper	17	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Lead	12	mg/kg dry wt.	03/17/97	MBR	EPA 6010	1.9
Mercury	0.021	mg/kg dry wt.	03/13/97	DPM	EPA 7470	0.019
Selenium	BDL	mg/kg dry wt.	03/21/97	JA	EPA 7740	0.38
Silver	BDL	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Zinc	34	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38

Sample ID: S-39, 1.0'-1.5' Lab ID: 9703096-03 Collected: 03/07/97

TEST	RESULT	UNITS	ANALYZED	BY	METHOD	MDL
Total Solids	89.2	% of sample	03/13/97	DPM	APHA 2540 B.	
Acid Digestion, Solid	03/12/97	date digested		JA	EPA 3050	
Arsenic	4.0	mg/kg dry wt.	03/21/97	JA	EPA 7060	0.038
Barium	50	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Cadmium	2.0	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Chromium	12	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Copper	32	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Lead	83	mg/kg dry wt.	03/17/97	MBR	EPA 6010	1.9
Mercury	0.048	mg/kg dry wt.	03/13/97	DPM	EPA 7470	0.019
Selenium	0.86	mg/kg dry wt.	03/21/97	JA	EPA 7740	0.38
Silver	BDL	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Zinc	140	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38

Sample ID: S-40, 2.5'-3.5' Lab ID: 9703096-04 Collected: 03/10/97

TEST	RESULT	UNITS	ANALYZED	BY	METHOD	MDL
Total Solids	91.7	% of sample	03/13/97	DPM	APHA 2540 B.	
Acid Digestion, Solid	03/12/97	date digested		JA	EPA 3050	
Arsenic	2.0	mg/kg dry wt.	03/21/97	JA	EPA 7060	0.038
Barium	22	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Cadmium	0.95	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Chromium	4.5	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Copper	15	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Lead	15	mg/kg dry wt.	03/17/97	MBR	EPA 6010	1.9
Mercury	0.020	mg/kg dry wt.	03/13/97	DPM	EPA 7470	0.019
Selenium	0.57	mg/kg dry wt.	03/21/97	JA	EPA 7740	0.38
Silver	BDL	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Zinc	19	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38

BDL = Below Detection Limit
MDL = Method Detection Limit

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Sample ID: S-41, 1.0'-2.0' Lab ID: 9703096-05 Collected: 03/10/97

TEST	RESULT	UNITS	ANALYZED	BY	METHOD	MDL
Total Solids	85.5	% of sample	03/13/97	DPM	APHA 2540 B.	
Acid Digestion, Solid	03/12/97	date digested		JA	EPA 3050	
Arsenic	3.4	mg/kg dry wt.	03/21/97	JA	EPA 7060	0.038
Barium	18	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Cadmium	0.91	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Chromium	24	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Copper	75	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Lead	55	mg/kg dry wt.	03/17/97	MBR	EPA 6010	1.9
Mercury	0.043	mg/kg dry wt.	03/13/97	DPM	EPA 7470	0.019
Selenium	BDL	mg/kg dry wt.	03/21/97	JA	EPA 7740	0.38
Silver	BDL	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Zinc	17	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38

Sample ID: S-42, 2.0'-2.5' Lab ID: 9703096-06 Collected: 03/10/97

TEST	RESULT	UNITS	ANALYZED	BY	METHOD	MDL
Total Solids	90.0	% of sample	03/13/97	DPM	APHA 2540 B.	
Acid Digestion, Solid	03/12/97	date digested		JA	EPA 3050	
Arsenic	4.6	mg/kg dry wt.	03/21/97	JA	EPA 7060	0.038
Barium	51	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Cadmium	4.6	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Chromium	24	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Copper	75	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Lead	360	mg/kg dry wt.	03/19/97	MBR	EPA 6010	1.9
Mercury	0.021	mg/kg dry wt.	03/13/97	DPM	EPA 7470	0.019
Selenium	0.42	mg/kg dry wt.	03/21/97	JA	EPA 7740	0.38
Silver	BDL	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Zinc	97	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38

Sample ID: S-43, 3.0'-4.0' Lab ID: 9703096-07 Collected: 03/10/97

TEST	RESULT	UNITS	ANALYZED	BY	METHOD	MDL
Total Solids	92.1	% of sample	03/14/97	DPM	APHA 2540 B.	
Acid Digestion, Solid	03/12/97	date digested		JA	EPA 3050	
Arsenic	0.95	mg/kg dry wt.	03/21/97	JA	EPA 7060	0.038
Barium	7.8	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Cadmium	1.1	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Chromium	6.0	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Copper	8.4	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Lead	22	mg/kg dry wt.	03/17/97	MBR	EPA 6010	1.9
Mercury	0.035	mg/kg dry wt.	03/13/97	DPM	EPA 7470	0.019
Selenium	BDL	mg/kg dry wt.	03/21/97	JA	EPA 7740	0.38
Silver	BDL	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Zinc	11	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38

BDL = Below Detection Limit
MDL = Method Detection Limit

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Sample ID: S-44, 3.0'-4.0' Lab ID: 9703096-08 Collected: 03/10/97

TEST	RESULT	UNITS	ANALYZED	BY	METHOD	MDL
Total Solids	93.8	% of sample	03/14/97	DPM	APHA 2540 B.	
Acid Digestion, Solid	03/12/97	date digested		JA	EPA 3050	
Arsenic	2.3	mg/kg dry wt.	03/21/97	JA	EPA 7060	0.038
Barium	7.9	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Cadmium	1.8	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Chromium	7.4	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Copper	10	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Lead	16	mg/kg dry wt.	03/17/97	MBR	EPA 6010	1.9
Mercury	0.032	mg/kg dry wt.	03/13/97	DPM	EPA 7470	0.019
Selenium	BDL	mg/kg dry wt.	03/21/97	JA	EPA 7740	0.38
Silver	BDL	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Zinc	26	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Poly Aromatic Hydrocarbons					EPA 8270	
Acenaphthene	BDL	µg/kg dry wt	03/20/97	LD		330
Acenaphthylene	BDL	µg/kg dry wt	03/20/97	LD		330
Anthracene	BDL	µg/kg dry wt	03/20/97	LD		330
Benzo(a)anthracene	BDL	µg/kg dry wt	03/20/97	LD		330
Benzo(b)fluoranthene	BDL	µg/kg dry wt	03/20/97	LD		330
Benzo(k)fluoranthene	BDL	µg/kg dry wt	03/20/97	LD		330
Benzo(ghi)perylene	BDL	µg/kg dry wt	03/20/97	LD		330
Benzo(a)pyrene	BDL	µg/kg dry wt	03/20/97	LD		330
Chrysene	BDL	µg/kg dry wt	03/20/97	LD		330
Dibenzo(a,h)anthracene	BDL	µg/kg dry wt	03/20/97	LD		330
Fluoranthene	BDL	µg/kg dry wt	03/20/97	LD		330
Fluorene	BDL	µg/kg dry wt	03/20/97	LD		330
Indeno(1,2,3-cd)pyrene	BDL	µg/kg dry wt	03/20/97	LD		330
Naphthalene	BDL	µg/kg dry wt	03/20/97	LD		330
Phenanthrene	BDL	µg/kg dry wt	03/20/97	LD		330
Pyrene	BDL	µg/kg dry wt	03/20/97	LD		330
Soxhlet Extraction for PAH	03/13/97	prep. date		HL	EPA 3540	

Sample ID: S-45, 4.5'-5.0' Lab ID: 9703096-09 Collected: 03/10/97

TEST	RESULT	UNITS	ANALYZED	BY	METHOD	MDL
Total Solids	92.5	% of sample	03/14/97	DPM	APHA 2540 B.	
Acid Digestion, Solid	03/12/97	date digested		JA	EPA 3050	
Arsenic	1.5	mg/kg dry wt.	03/21/97	JA	EPA 7060	0.038
Barium	7.1	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Cadmium	1.5	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Chromium	3.3	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Copper	23	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Lead	15	mg/kg dry wt.	03/17/97	MBR	EPA 6010	1.9
Mercury	BDL	mg/kg dry wt.	03/13/97	DPM	EPA 7470	0.019
Selenium	BDL	mg/kg dry wt.	03/21/97	JA	EPA 7740	0.38
Silver	BDL	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Zinc	22	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38

BDL = Below Detection Limit
MDL = Method Detection Limit

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Sample ID: S-46, 1.0'-2.0' Lab ID: 9703096-10 Collected: 03/10/97

TEST	RESULT	UNITS	ANALYZED	BY	METHOD	MDL
Total Solids	87.1	% of sample	03/14/97	DPM	APHA 2540 B.	
Acid Digestion, Solid	03/12/97	date digested		JA	EPA 3050	
Arsenic	7.0	mg/kg dry wt.	03/21/97	JA	EPA 7060	0.038
Barium	47	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Cadmium	11	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Chromium	11	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Copper	34	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Lead	52	mg/kg dry wt.	03/17/97	MBR	EPA 6010	1.9
Mercury	0.12	mg/kg dry wt.	03/13/97	DPM	EPA 7470	0.019
Selenium	BDL	mg/kg dry wt.	03/21/97	JA	EPA 7740	0.38
Silver	BDL	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Zinc	120	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38

Sample ID: S-47, 1.0'-2.0' Lab ID: 9703096-11 Collected: 03/10/97

TEST	RESULT	UNITS	ANALYZED	BY	METHOD	MDL
Total Solids	93.4	% of sample	03/14/97	DPM	APHA 2540 B.	
Acid Digestion, Solid	03/12/97	date digested		JA	EPA 3050	
Arsenic	1.5	mg/kg dry wt.	03/21/97	JA	EPA 7060	0.038
Barium	25	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Cadmium	0.94	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Chromium	5.0	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Copper	21	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Lead	27	mg/kg dry wt.	03/17/97	MBR	EPA 6010	1.9
Mercury	0.030	mg/kg dry wt.	03/13/97	DPM	EPA 7470	0.019
Selenium	BDL	mg/kg dry wt.	03/21/97	JA	EPA 7740	0.38
Silver	BDL	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Zinc	27	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38

Sample ID: S-48, 1.0'-1.5' Lab ID: 9703096-12 Collected: 03/10/97

TEST	RESULT	UNITS	ANALYZED	BY	METHOD	MDL
Total Solids	92.9	% of sample	03/14/97	DPM	APHA 2540 B.	
Acid Digestion, Solid	03/12/97	date digested		JA	EPA 3050	
Arsenic	2.7	mg/kg dry wt.	03/21/97	JA	EPA 7060	0.038
Barium	26	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Cadmium	1.4	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Chromium	5.8	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Copper	24	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Lead	61	mg/kg dry wt.	03/17/97	MBR	EPA 6010	1.9
Mercury	0.045	mg/kg dry wt.	03/13/97	DPM	EPA 7470	0.019
Selenium	0.47	mg/kg dry wt.	03/21/97	JA	EPA 7740	0.38
Silver	BDL	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Zinc	76	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38

BDL = Below Detection Limit
MDL = Method Detection Limit

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Sample ID: S-49, 1.0'-2.0' Lab ID: 9703096-13 Collected: 03/10/97

TEST	RESULT	UNITS	ANALYZED	BY	METHOD	MDL
Total Solids	92.7	% of sample	03/14/97	DPM	APHA 2540 B.	
Acid Digestion, Solid	03/12/97	date digested		JA	EPA 3050	
Arsenic	1.8	mg/kg dry wt.	03/21/97	JA	EPA 7060	0.038
Barium	23	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Cadmium	26	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Chromium	4.3	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Copper	20	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Lead	72	mg/kg dry wt.	03/17/97	MBR	EPA 6010	1.9
Mercury	0.10	mg/kg dry wt.	03/13/97	DPM	EPA 7470	0.019
Selenium	BDL	mg/kg dry wt.	03/21/97	JA	EPA 7740	0.38
Silver	BDL	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Zinc	47	mg/kg dry wt.	03/17/97	MBR	EPA 6010	0.38
Poly Aromatic Hydrocarbons					EPA 8270	
Acenaphthene	BDL	µg/kg dry wt	03/20/97	LD		330
Acenaphthylene	BDL	µg/kg dry wt	03/20/97	LD		330
Anthracene	BDL	µg/kg dry wt	03/20/97	LD		330
Benzo(a)anthracene	1,000	µg/kg dry wt	03/20/97	LD		330
Benzo(b)fluoranthene	1,100	µg/kg dry wt	03/20/97	LD		330
Benzo(k)fluoranthene	1,000	µg/kg dry wt	03/20/97	LD		330
Benzo(ghi)perylene	580	µg/kg dry wt	03/20/97	LD		330
Benzo(a)pyrene	1,000	µg/kg dry wt	03/20/97	LD		330
Chrysene	1,100	µg/kg dry wt	03/20/97	LD		330
Dibenzo(a,h)anthracene	BDL	µg/kg dry wt	03/20/97	LD		330
Fluoranthene	1,800	µg/kg dry wt	03/20/97	LD		330
Fluorene	BDL	µg/kg dry wt	03/20/97	LD		330
Indeno(1,2,3-cd)pyrene	590	µg/kg dry wt	03/20/97	LD		330
Naphthalene	350	µg/kg dry wt	03/20/97	LD		330
Phenanthrene	1,300	µg/kg dry wt	03/20/97	LD		330
Pyrene	1,500	µg/kg dry wt	03/20/97	LD		330
Soxhlet Extraction for PAH	03/13/97	prep. date		HL	EPA 3540	

BDL = Below Detection Limit
MDL = Method Detection Limit

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9703096

CLIENT SAMPLE -- CHAIN OF CUSTODY FORM

Project Name: City of Muskegon - SAF (Area Wide) 950486.10/0002

Name of Sampler: Chad Weber & Kurt Van Appledorn

ESI # 9703096	Date	Time	Sample Matrix	Sample ID	No. Cont.	Analyses Requested
-1	3-7-97	0920	Soil	S-37, 1'-2'	1	MI 10-Metals + PAH
-2	↓	0955	↓	S-38, 2'-3'	1	↓
-3	↓	1040	↓	S-39, 1'-1.5'	1	↓
-4	3-10-97	1005	↓	S-40, 2.5'-3.5'	1	↓
-5	↓	1017	↓	S-41, 1'-2'	1	↓
-6	↓	1125	↓	S-42, 2'-2.5'	1	↓
-7	↓	1110	↓	S-43, 3'-4'	1	↓
-8	↓	1310	↓	S-44, 3'-4'	1	↓ + PAH
-9	↓	1415	↓	S-45, 4.5-5'	1	↓
-10	↓	1335	↓	S-46, 1'-2'	1	↓
-11	↓	1435	↓	S-47, 1'-2'	1	↓
-12	↓	1500	↓	S-48, 1'-1.5'	1	↓
-13	↓	1505	↓	S-49, 1'-2'	1	↓ + PAH

Remarks: Samples stored in Dell cooler prior to submittal.

Samples Relinquished By:	Samples Transported By:	Samples Received By:
[illegible]		[illegible]
Affiliation: Dell	Affiliation:	Affiliation: WMESI
Date: 3-11-97 Time: 1040	Date: Time:	Date: 3/11/97 Time: 1040

SAMPLE MATRIX CODES:

W = Water
GW = Groundwater
SW = Surface Water
WW = Wastewater
WST = Waste
S = Soil
O = Other

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RECEIVED
APR 30 1997
DELL ENGINEERING

CLIENT: Dell Engineering, Inc.
3352 128th Avenue
Holland, Michigan 49424

Attn: Chad Weber
Re: Muskegon SAF -- Area Wide (950486.10/0004)

DATE: April 29, 1997

ANALYSIS OF: Soil Samples

REPORTED BY: Robert K. Zahray, Laboratory Manager

DATE RECEIVED: Received from client on April 16, 1997.

Sample ID: S-17, 3'-4' Lab ID: 9704196-01 Collected: 04/14/97

TEST	RESULT	UNITS	ANALYZED	BY	METHOD	MDL
Total Solids	95.4	% of sample	04/21/97	DPM	APHA 2540 B.	
Acid Digestion, Solid	04/17/97	date digested		JA	EPA 3050	
Arsenic	0.47	mg/kg dry wt.	04/29/97	JA	EPA 7060	0.025
Barium	8.0	mg/kg dry wt.	04/17/97	MBR	EPA 6010	0.25
Cadmium	0.29	mg/kg dry wt.	04/17/97	MBR	EPA 6010	0.25
Chromium	1.7	mg/kg dry wt.	04/17/97	MBR	EPA 6010	0.25
Copper	1.9	mg/kg dry wt.	04/17/97	MBR	EPA 6010	0.25
Lead	4.0	mg/kg dry wt.	04/17/97	MBR	EPA 6010	1.2
Mercury	BDL	mg/kg dry wt.	04/18/97	MBR	EPA 7470	0.0091
Selenium	BDL	mg/kg dry wt.	04/20/97	JA	EPA 7740	0.025
Silver	BDL	mg/kg dry wt.	04/17/97	MBR	EPA 6010	0.25
Zinc	6.2	mg/kg dry wt.	04/17/97	MBR	EPA 6010	0.25

Sample ID: S-23, 3.5'-4' Lab ID: 9704196-02 Collected: 04/14/97

TEST	RESULT	UNITS	ANALYZED	BY	METHOD	MDL
Total Solids	84.3	% of sample	04/21/97	DPM	APHA 2540 B.	
Acid Digestion, Solid	04/17/97	date digested		JA	EPA 3050	
Arsenic	1.3	mg/kg dry wt.	04/29/97	JA	EPA 7060	0.025
Barium	7.1	mg/kg dry wt.	04/17/97	MBR	EPA 6010	0.25
Cadmium	0.31	mg/kg dry wt.	04/17/97	MBR	EPA 6010	0.25
Chromium	2.2	mg/kg dry wt.	04/17/97	MBR	EPA 6010	0.25
Copper	3.9	mg/kg dry wt.	04/17/97	MBR	EPA 6010	0.25
Lead	5.3	mg/kg dry wt.	04/17/97	MBR	EPA 6010	1.2
Mercury	BDL	mg/kg dry wt.	04/18/97	MBR	EPA 7470	0.0091
Selenium	0.12	mg/kg dry wt.	04/20/97	JA	EPA 7740	0.025
Silver	BDL	mg/kg dry wt.	04/17/97	MBR	EPA 6010	0.25
Zinc	6.4	mg/kg dry wt.	04/17/97	MBR	EPA 6010	0.25

BDL = Below Detection Limit
MDL = Method Detection Limit

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CLIENT SAMPLE -- CHAIN OF CUSTODY FORM

Project Name: City of Muskegon SAF - Area Wide 950486.10

Name of Sampler: Chad Weber & Tom O'Connell

ESI # 9704196	Date	Time	Sample Matrix	Sample ID	No. Cont.	Analyses Requested
-1	4-14-97	1330	Soil	S-17, 3'-4'	1	Metals
-2	4-14-97	1345	Soil	S-23, 3.5'-4'	1	"

Remarks: Samples stored in Dell Cooler prior to submittal

Samples Relinquished By:	Samples Transported By:	Samples Received By:
[illegible]		T.B. [illegible]
Affiliation: Dell	Affiliation:	Affiliation: WMESI
Date: 4-16-97 Time: 1625	Date: Time:	Date: 04/16/97 Time: 1645

SAMPLE MATRIX CODES:

W = Water
GW = Groundwater
SW = Surface Water
WW = Wastewater
WST = Waste
S = Soil
O = Other

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RECEIVED
APR 09 1997
DELL ENGINEERING

CLIENT: Dell Engineering, Inc.
3352 128th Avenue
Holland, Michigan 49424

Attn: Chad Weber
Re: City of Muskegon SAF/AreaWide (950486.10)

DATE: April 9, 1997

ANALYSIS OF: Soil Samples

REPORTED BY: Robert K. Zahray (TBB)
Robert K. Zahray, Laboratory Manager

DATE RECEIVED: Received from client on March 28, 1997.

Sample ID: S-38, 4'-5' Lab ID: 9703301-01 Collected: 03/26/97

TEST	RESULT	UNITS	ANALYZED	BY	METHOD	MDL
Total Solids	97.0	% of sample	04/02/97	JA	APHA 2540 B.	
Acid Digestion, Solid	04/01/97	date digested		JA	EPA 3050	
Arsenic	0.54	mg/kg dry wt.	04/03/97	JA	EPA 7060	0.032
Barium	3.7	mg/kg dry wt.	04/02/97	MBR	EPA 6010	0.32
Cadmium	0.011	mg/kg dry wt.	04/03/97	JA	EPA 7131	0.0032
Chromium	2.3	mg/kg dry wt.	04/02/97	MBR	EPA 6010	0.32
Copper	1.0	mg/kg dry wt.	04/02/97	MBR	EPA 6010	0.32
Lead	0.082	mg/kg dry wt.	04/02/97	JA	EPA 7421	0.032
Mercury	BDL	mg/kg dry wt.	04/03/97	DPM	EPA 7470	0.020
Selenium	BDL	mg/kg dry wt.	04/08/97	MBR	EPA 7740	0.032
Silver	BDL	mg/kg dry wt.	04/02/97	MBR	EPA 6010	0.32
Zinc	4.4	mg/kg dry wt.	04/02/97	MBR	EPA 6010	0.32

Sample ID: S-46, 3'-4' Lab ID: 9703301-02 Collected: 03/26/97

TEST	RESULT	UNITS	ANALYZED	BY	METHOD	MDL
Total Solids	95.6	% of sample	04/02/97	JA	APHA 2540 B.	
Acid Digestion, Solid	04/01/97	date digested		JA	EPA 3050	
Arsenic	0.59	mg/kg dry wt.	04/03/97	JA	EPA 7060	0.032
Barium	5.5	mg/kg dry wt.	04/02/97	MBR	EPA 6010	0.32
Cadmium	0.021	mg/kg dry wt.	04/03/97	JA	EPA 7131	0.0032
Chromium	2.0	mg/kg dry wt.	04/02/97	MBR	EPA 6010	0.32
Copper	0.81	mg/kg dry wt.	04/02/97	MBR	EPA 6010	0.32
Lead	0.15	mg/kg dry wt.	04/02/97	JA	EPA 7421	0.032
Mercury	BDL	mg/kg dry wt.	04/03/97	DPM	EPA 7470	0.020
Selenium	0.096	mg/kg dry wt.	04/08/97	MBR	EPA 7740	0.032
Silver	BDL	mg/kg dry wt.	04/02/97	MBR	EPA 6010	0.32
Zinc	5.4	mg/kg dry wt.	04/02/97	MBR	EPA 6010	0.32

BDL = Below Detection Limit
MDL = Method Detection Limit

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9703301

CLIENT SAMPLE -- CHAIN OF CUSTODY FORM

Project Name: City of Muskegon SAF - Area Wide

Name of Sampler: Chad Weber

ESI # 9703301	Date	Time	Sample Matrix	Sample ID	No. Cont.	Analyses Requested
-2	3-26-97	920	Soil	S-46, 3'-4'	1	MI-10 Metals
-1	3-26-97	1000	Soil	S-38, 4'-5'	1	" "

Remarks: Samples stored in Dell cooler prior to submittal.

Samples Relinquished By:	Samples Transported By:	Samples Received By:
[signature]		[signature]
Affiliation: Dell	Affiliation:	Affiliation: WMESI
Date: 3-28-97 Time: 1500	Date: Time:	Date: 3/28/97 Time: 1505

SAMPLE MATRIX CODES:

W = Water
GW = Groundwater
SW = Surface Water
WW = Wastewater
WST = Waste
S = Soil
O = Other

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RECEIVED
APR 07 1997
DELL ENGINEERING

CLIENT: Dell Engineering, Inc.
3352 128th Avenue
Holland, Michigan 49424

Attn: Chad Weber
Re: City of Muskegon SAF - A/W (950486.10)

DATE: April 7, 1997

ANALYSIS OF: Soil Samples

REPORTED BY: Robert K. Zahray, Laboratory Manager

DATE RECEIVED: Received from client on March 20, 1997.

Sample ID: S-51, 0.5'-1.5' Lab ID: 9703215-01 Collected: 03/17/97

TEST	RESULT	UNITS	ANALYZED	BY	METHOD	MDL
Total Solids	90.6	% of sample	03/26/97	JA	APHA 2540 B.	
Acid Digestion, Solid	03/25/97	date digested		JA	EPA 3050	
Arsenic	2.7	mg/kg dry wt.	03/25/97	JA	EPA 7060	0.033
Barium	640	mg/kg dry wt.	03/31/97	MBR	EPA 6010	0.29
Cadmium	2.5	mg/kg dry wt.	03/27/97	MBR	EPA 6010	0.29
Chromium	13	mg/kg dry wt.	03/27/97	MBR	EPA 6010	0.29
Copper	47	mg/kg dry wt.	03/27/97	MBR	EPA 6010	0.29
Lead	240	mg/kg dry wt.	03/31/97	MBR	EPA 6010	1.5
Mercury	0.041	mg/kg dry wt.	03/27/97	MBR	EPA 7470	0.021
Selenium	0.33	mg/kg dry wt.	03/25/97	JA	EPA 7740	0.033
Silver	BDL	mg/kg dry wt.	03/26/97	MBR	EPA 6010	0.29
Zinc	240	mg/kg dry wt.	03/31/97	MBR	EPA 6010	0.29

Sample ID: S-52, 1'-2' Lab ID: 9703215-02 Collected: 03/17/97

TEST	RESULT	UNITS	ANALYZED	BY	METHOD	MDL
Total Solids	92.0	% of sample	03/26/97	JA	APHA 2540 B.	
Acid Digestion, Solid	03/25/97	date digested		JA	EPA 3050	
Arsenic	0.98	mg/kg dry wt.	03/25/97	JA	EPA 7060	0.033
Barium	23	mg/kg dry wt.	03/26/97	MBR	EPA 6010	0.29
Cadmium	0.80	mg/kg dry wt.	03/27/97	MBR	EPA 6010	0.29
Chromium	3.9	mg/kg dry wt.	03/27/97	MBR	EPA 6010	0.29
Copper	8.6	mg/kg dry wt.	03/27/97	MBR	EPA 6010	0.29
Lead	15	mg/kg dry wt.	03/27/97	MBR	EPA 6010	1.5
Mercury	BDL	mg/kg dry wt.	03/27/97	MBR	EPA 7470	0.021
Selenium	0.068	mg/kg dry wt.	03/25/97	JA	EPA 7740	0.033
Silver	BDL	mg/kg dry wt.	03/26/97	MBR	EPA 6010	0.29
Zinc	24	mg/kg dry wt.	03/27/97	MBR	EPA 6010	0.29

BDL = Below Detection Limit
MDL = Method Detection Limit

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Sample ID: S-53, 2'-3' Lab ID: 9703215-03 Collected: 03/17/97

TEST	RESULT	UNITS	ANALYZED	BY	METHOD	MDL
Total Solids	90.1	% of sample	03/26/97	JA	APHA 2540 B.	
Acid Digestion, Solid	03/25/97	date digested		JA	EPA 3050	
Arsenic	2.6	mg/kg dry wt.	03/25/97	JA	EPA 7060	0.033
Barium	47	mg/kg dry wt.	03/26/97	MBR	EPA 6010	0.29
Cadmium	2.3	mg/kg dry wt.	03/27/97	MBR	EPA 6010	0.29
Chromium	10	mg/kg dry wt.	03/27/97	MBR	EPA 6010	0.29
Copper	45	mg/kg dry wt.	03/27/97	MBR	EPA 6010	0.29
Lead	120	mg/kg dry wt.	03/27/97	MBR	EPA 6010	1.5
Mercury	0.077	mg/kg dry wt.	03/27/97	MBR	EPA 7470	0.021
Selenium	0.12	mg/kg dry wt.	03/25/97	JA	EPA 7740	0.033
Silver	BDL	mg/kg dry wt.	03/26/97	MBR	EPA 6010	0.29
Zinc	97	mg/kg dry wt.	03/27/97	MBR	EPA 6010	0.29
Poly Aromatic Hydrocarbons					EPA 8270	
Acenaphthene	BDL	µg/kg dry wt	04/02/97	HL		330
Acenaphthylene	440	µg/kg dry wt	04/02/97	HL		330
Anthracene	600	µg/kg dry wt	04/02/97	HL		330
Benzo(a)anthracene	2,700	µg/kg dry wt	04/02/97	HL		330
Benzo(b)fluoranthene	2,000	µg/kg dry wt	04/02/97	HL		330
Benzo(k)fluoranthene	2,000	µg/kg dry wt	04/02/97	HL		330
Benzo(ghi)perylene	1,300	µg/kg dry wt	04/02/97	HL		330
Benzo(a)pyrene	2,400	µg/kg dry wt	04/02/97	HL		330
Chrysene	2,700	µg/kg dry wt	04/02/97	HL		330
Dibenzo(a,h)anthracene	860	µg/kg dry wt	04/02/97	HL		330
Fluoranthene	3,800	µg/kg dry wt	04/02/97	HL		330
Fluorene	BDL	µg/kg dry wt	04/02/97	HL		330
Indeno(1,2,3-cd)pyrene	1,500	µg/kg dry wt	04/02/97	HL		330
Naphthalene	1,200	µg/kg dry wt	04/02/97	HL		330
Phenanthrene	2,800	µg/kg dry wt	04/02/97	HL		330
Pyrene	2,700	µg/kg dry wt	04/02/97	HL		330
Soxhlet Extraction for PAH	03/25/97	prep. date		HL	EPA 3540	
Total Solids	89.9	% of sample		HL	APHA 2540 B.	

Sample ID: S-54, 1'-2' Lab ID: 9703215-04 Collected: 03/17/97

TEST	RESULT	UNITS	ANALYZED	BY	METHOD	MDL
Total Solids	94.1	% of sample	03/26/97	JA	APHA 2540 B.	
Acid Digestion, Solid	03/25/97	date digested		JA	EPA 3050	
Arsenic	2.1	mg/kg dry wt.	03/25/97	JA	EPA 7060	0.033
Barium	27	mg/kg dry wt.	03/26/97	MBR	EPA 6010	0.29
Cadmium	1.6	mg/kg dry wt.	03/27/97	MBR	EPA 6010	0.29
Chromium	5.2	mg/kg dry wt.	03/27/97	MBR	EPA 6010	0.29
Copper	26	mg/kg dry wt.	03/27/97	MBR	EPA 6010	0.29
Lead	49	mg/kg dry wt.	03/27/97	MBR	EPA 6010	1.5
Mercury	0.083	mg/kg dry wt.	03/27/97	MBR	EPA 7470	0.021
Selenium	0.17	mg/kg dry wt.	03/25/97	JA	EPA 7740	0.033
Silver	BDL	mg/kg dry wt.	03/26/97	MBR	EPA 6010	0.29
Zinc	77	mg/kg dry wt.	03/27/97	MBR	EPA 6010	0.29

Sample ID: S-54, 125' South, 1'-2' Lab ID: 9703215-05 Collected: 03/18/97

TEST	RESULT	UNITS	ANALYZED	BY	METHOD	MDL
Total Solids	95.0	% of sample	03/26/97	JA	APHA 2540 B.	
Acid Digestion, Solid	03/25/97	date digested		JA	EPA 3050	
Arsenic	0.83	mg/kg dry wt.	03/25/97	JA	EPA 7060	0.033
Barium	20	mg/kg dry wt.	03/26/97	MBR	EPA 6010	0.29
Cadmium	0.61	mg/kg dry wt.	03/27/97	MBR	EPA 6010	0.29
Chromium	4.5	mg/kg dry wt.	03/27/97	MBR	EPA 6010	0.29

BDL = Below Detection Limit
MDL = Method Detection Limit

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Sample ID: S-54, 125' South, 1'-2' Lab ID: 9703215-05 Collected: 03/18/97

TEST	RESULT	UNITS	ANALYZED	BY	METHOD	MDL
Copper	3.2	mg/kg dry wt.	03/27/97	MBR	EPA 6010	0.29
Lead	28	mg/kg dry wt.	03/27/97	MBR	EPA 6010	1.5
Mercury	0.025	mg/kg dry wt.	03/27/97	MBR	EPA 7470	0.021
Selenium	BDL	mg/kg dry wt.	03/25/97	JA	EPA 7740	0.033
Silver	BDL	mg/kg dry wt.	03/26/97	MBR	EPA 6010	0.29
Zinc	15	mg/kg dry wt.	03/27/97	MBR	EPA 6010	0.29

Sample ID: S-55, 1'-2' Lab ID: 9703215-06 Collected: 03/17/97

TEST	RESULT	UNITS	ANALYZED	BY	METHOD	MDL
Total Solids	91.6	% of sample	03/26/97	JA	APHA 2540 B.	
Acid Digestion, Solid	03/25/97	date digested		JA	EPA 3050	
Arsenic	1.0	mg/kg dry wt.	03/25/97	JA	EPA 7060	0.033
Barium	16	mg/kg dry wt.	03/26/97	MBR	EPA 6010	0.29
Cadmium	0.56	mg/kg dry wt.	03/27/97	MBR	EPA 6010	0.29
Chromium	2.4	mg/kg dry wt.	03/27/97	MBR	EPA 6010	0.29
Copper	13	mg/kg dry wt.	03/27/97	MBR	EPA 6010	0.29
Lead	28	mg/kg dry wt.	03/27/97	MBR	EPA 6010	1.5
Mercury	0.17	mg/kg dry wt.	03/27/97	MBR	EPA 7470	0.021
Selenium	0.11	mg/kg dry wt.	03/25/97	JA	EPA 7740	0.033
Silver	BDL	mg/kg dry wt.	03/26/97	MBR	EPA 6010	0.29
Zinc	28	mg/kg dry wt.	03/27/97	MBR	EPA 6010	0.29

Sample ID: S-56, 85' South, 1'-2' Lab ID: 9703215-07 Collected: 03/17/97

TEST	RESULT	UNITS	ANALYZED	BY	METHOD	MDL
Total Solids	94.9	% of sample	03/26/97	JA	APHA 2540 B.	
Acid Digestion, Solid	03/25/97	date digested		JA	EPA 3050	
Arsenic	1.5	mg/kg dry wt.	03/25/97	JA	EPA 7060	0.033
Barium	30	mg/kg dry wt.	03/26/97	MBR	EPA 6010	0.29
Cadmium	0.69	mg/kg dry wt.	03/27/97	MBR	EPA 6010	0.29
Chromium	5.1	mg/kg dry wt.	03/27/97	MBR	EPA 6010	0.29
Copper	7.2	mg/kg dry wt.	03/27/97	MBR	EPA 6010	0.29
Lead	35	mg/kg dry wt.	03/27/97	MBR	EPA 6010	1.5
Mercury	0.042	mg/kg dry wt.	03/27/97	MBR	EPA 7470	0.021
Selenium	BDL	mg/kg dry wt.	03/25/97	JA	EPA 7740	0.033
Silver	BDL	mg/kg dry wt.	03/26/97	MBR	EPA 6010	0.29
Zinc	34	mg/kg dry wt.	03/27/97	MBR	EPA 6010	0.29

Sample ID: S-57, 80' South, 1'-2' Lab ID: 9703215-08 Collected: 03/17/97

TEST	RESULT	UNITS	ANALYZED	BY	METHOD	MDL
Total Solids	91.0	% of sample	03/26/97	JA	APHA 2540 B.	
Acid Digestion, Solid	03/25/97	date digested		JA	EPA 3050	
Arsenic	0.94	mg/kg dry wt.	03/25/97	JA	EPA 7060	0.033
Barium	13	mg/kg dry wt.	03/27/97	MBR	EPA 6010	0.29
Cadmium	0.62	mg/kg dry wt.	03/27/97	MBR	EPA 6010	0.29
Chromium	3.9	mg/kg dry wt.	03/27/97	MBR	EPA 6010	0.29
Copper	5.7	mg/kg dry wt.	03/27/97	MBR	EPA 6010	0.29
Lead	13	mg/kg dry wt.	03/27/97	MBR	EPA 6010	1.5
Mercury	0.026	mg/kg dry wt.	03/27/97	MBR	EPA 7470	0.021
Selenium	0.039	mg/kg dry wt.	03/25/97	JA	EPA 7740	0.033
Silver	BDL	mg/kg dry wt.	03/27/97	MBR	EPA 6010	0.29
Zinc	18	mg/kg dry wt.	03/27/97	MBR	EPA 6010	0.29

BDL = Below Detection Limit
MDL = Method Detection Limit

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Sample ID: S-58, 1.5'-2.5' Lab ID: 9703215-09 Collected: 03/17/97

TEST	RESULT	UNITS	ANALYZED	BY	METHOD	MDL
Total Solids	88.0	% of sample	03/26/97	JA	APHA 2540 B.	
Acid Digestion, Solid	03/25/97	date digested		JA	EPA 3050	
Arsenic	3.0	mg/kg dry wt.	03/25/97	JA	EPA 7060	0.033
Barium	65	mg/kg dry wt.	03/26/97	MBR	EPA 6010	0.29
Cadmium	2.3	mg/kg dry wt.	03/27/97	MBR	EPA 6010	0.29
Chromium	9.4	mg/kg dry wt.	03/27/97	MBR	EPA 6010	0.29
Copper	57	mg/kg dry wt.	03/27/97	MBR	EPA 6010	0.29
Lead	250	mg/kg dry wt.	03/31/97	MBR	EPA 6010	1.5
Mercury	0.085	mg/kg dry wt.	03/27/97	MBR	EPA 7470	0.021
Selenium	0.072	mg/kg dry wt.	03/25/97	JA	EPA 7740	0.033
Silver	BDL	mg/kg dry wt.	03/26/97	MBR	EPA 6010	0.29
Zinc	200	mg/kg dry wt.	03/31/97	MBR	EPA 6010	0.29
Poly Aromatic Hydrocarbons					EPA 8270	
Acenaphthene	1,600	µg/kg dry wt	04/02/97	HL		330
Acenaphthylene	BDL	µg/kg dry wt	04/02/97	HL		330
Anthracene	3,700	µg/kg dry wt	04/02/97	HL		330
Benzo(a)anthracene	7,400	µg/kg dry wt	04/02/97	HL		330
Benzo(b)fluoranthene	4,900	µg/kg dry wt	04/02/97	HL		330
Benzo(k)fluoranthene	3,800	µg/kg dry wt	04/02/97	HL		330
Benzo(ghi)perylene	3,200	µg/kg dry wt	04/02/97	HL		330
Benzo(a)pyrene	5,600	µg/kg dry wt	04/02/97	HL		330
Chrysene	6,800	µg/kg dry wt	04/02/97	HL		330
Dibenzo(a,h)anthracene	1,800	µg/kg dry wt	04/02/97	HL		330
Fluoranthene	13,000	µg/kg dry wt	04/02/97	HL		330
Fluorene	2,100	µg/kg dry wt	04/02/97	HL		330
Indeno(1,2,3-cd)pyrene	3,500	µg/kg dry wt	04/02/97	HL		330
Naphthalene	1,300	µg/kg dry wt	04/02/97	HL		330
Phenanthrene	12,000	µg/kg dry wt	04/02/97	HL		330
Pyrene	11,000	µg/kg dry wt	04/02/97	HL		330
Soxhlet Extraction for PAH	03/25/97	prep. date		HL	EPA 3540	
Total Solids	87.7	% of sample		HL	APHA 2540 B.	

Sample ID: S-59, 2'-3' Lab ID: 9703215-10 Collected: 03/18/97

TEST	RESULT	UNITS	ANALYZED	BY	METHOD	MDL
Total Solids	92.0	% of sample	03/26/97	JA	APHA 2540 B.	
Acid Digestion, Solid	03/25/97	date digested		JA	EPA 3050	
Arsenic	0.73	mg/kg dry wt.	03/25/97	JA	EPA 7060	0.033
Barium	12	mg/kg dry wt.	03/26/97	MBR	EPA 6010	0.29
Cadmium	0.61	mg/kg dry wt.	03/27/97	MBR	EPA 6010	0.29
Chromium	2.8	mg/kg dry wt.	03/27/97	MBR	EPA 6010	0.29
Copper	5.0	mg/kg dry wt.	03/27/97	MBR	EPA 6010	0.29
Lead	8.5	mg/kg dry wt.	03/27/97	MBR	EPA 6010	1.5
Mercury	0.056	mg/kg dry wt.	03/27/97	MBR	EPA 7470	0.021
Selenium	0.049	mg/kg dry wt.	03/25/97	JA	EPA 7740	0.033
Silver	BDL	mg/kg dry wt.	03/26/97	MBR	EPA 6010	0.29
Zinc	16	mg/kg dry wt.	03/27/97	MBR	EPA 6010	0.29

Sample ID: S-60, 3'-4' Lab ID: 9703215-11 Collected: 03/18/97

TEST	RESULT	UNITS	ANALYZED	BY	METHOD	MDL
Total Solids	90.6	% of sample	03/26/97	JA	APHA 2540 B.	
Acid Digestion, Solid	03/25/97	date digested		JA	EPA 3050	
Arsenic	3.8	mg/kg dry wt.	03/25/97	JA	EPA 7060	0.033
Barium	52	mg/kg dry wt.	03/26/97	MBR	EPA 6010	0.29
Cadmium	3.7	mg/kg dry wt.	03/27/97	MBR	EPA 6010	0.29
Chromium	41	mg/kg dry wt.	03/27/97	MBR	EPA 6010	0.29

BDL = Below Detection Limit
MDL = Method Detection Limit

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Sample ID: S-60, 3'-4' Lab ID: 9703215-11 Collected: 03/18/97

TEST	RESULT	UNITS	ANALYZED	BY	METHOD	MDL
Copper	200	mg/kg dry wt.	03/31/97	MBR	EPA 6010	0.29
Lead	29	mg/kg dry wt.	03/27/97	MBR	EPA 6010	1.5
Mercury	0.056	mg/kg dry wt.	03/27/97	MBR	EPA 7470	0.021
Selenium	0.040	mg/kg dry wt.	03/25/97	JA	EPA 7740	0.033
Silver	BDL	mg/kg dry wt.	03/26/97	MBR	EPA 6010	0.29
Zinc	44	mg/kg dry wt.	03/27/97	MBR	EPA 6010	0.29

Sample ID: S-61, 1'-2' Lab ID: 9703215-12 Collected: 03/18/97

TEST	RESULT	UNITS	ANALYZED	BY	METHOD	MDL
Total Solids	87.0	% of sample	03/26/97	JA	APHA 2540 B.	
Acid Digestion, Solid	03/25/97	date digested		JA	EPA 3050	
Arsenic	4.8	mg/kg dry wt.	03/25/97	JA	EPA 7060	0.033
Barium	53	mg/kg dry wt.	03/26/97	MBR	EPA 6010	0.29
Cadmium	2.9	mg/kg dry wt.	03/27/97	MBR	EPA 6010	0.29
Chromium	8.8	mg/kg dry wt.	03/27/97	MBR	EPA 6010	0.29
Copper	28	mg/kg dry wt.	03/27/97	MBR	EPA 6010	0.29
Lead	66	mg/kg dry wt.	03/27/97	MBR	EPA 6010	1.5
Mercury	0.55	mg/kg dry wt.	03/27/97	MBR	EPA 7470	0.021
Selenium	0.20	mg/kg dry wt.	03/25/97	JA	EPA 7740	0.033
Silver	BDL	mg/kg dry wt.	03/26/97	MBR	EPA 6010	0.29
Zinc	87	mg/kg dry wt.	03/27/97	MBR	EPA 6010	0.29

Sample ID: S-62, 2'-3' Lab ID: 9703215-13 Collected: 03/18/97

TEST	RESULT	UNITS	ANALYZED	BY	METHOD	MDL
Total Solids	82.7	% of sample	03/26/97	JA	APHA 2540 B.	
Acid Digestion, Solid	03/25/97	date digested		JA	EPA 3050	
Arsenic	1.2	mg/kg dry wt.	03/25/97	JA	EPA 7060	0.033
Barium	26	mg/kg dry wt.	03/26/97	MBR	EPA 6010	0.29
Cadmium	25	mg/kg dry wt.	03/27/97	MBR	EPA 6010	0.29
Chromium	5.0	mg/kg dry wt.	03/27/97	MBR	EPA 6010	0.29
Copper	24	mg/kg dry wt.	03/27/97	MBR	EPA 6010	0.29
Lead	57	mg/kg dry wt.	03/27/97	MBR	EPA 6010	1.5
Mercury	0.076	mg/kg dry wt.	03/27/97	MBR	EPA 7470	0.021
Selenium	0.24	mg/kg dry wt.	03/25/97	JA	EPA 7740	0.033
Silver	BDL	mg/kg dry wt.	03/26/97	MBR	EPA 6010	0.29
Zinc	77	mg/kg dry wt.	03/27/97	MBR	EPA 6010	0.29

Sample ID: S-63, 170' South, 1'-2' Lab ID: 9703215-14 Collected: 03/19/97

TEST	RESULT	UNITS	ANALYZED	BY	METHOD	MDL
Total Solids	74.0	% of sample	03/26/97	JA	APHA 2540 B.	
Acid Digestion, Solid	03/25/97	date digested		JA	EPA 3050	
Arsenic	2.9	mg/kg dry wt.	03/25/97	JA	EPA 7060	0.033
Barium	99	mg/kg dry wt.	03/27/97	MBR	EPA 6010	0.29
Cadmium	10	mg/kg dry wt.	03/27/97	MBR	EPA 6010	0.29
Chromium	68	mg/kg dry wt.	03/27/97	MBR	EPA 6010	0.29
Copper	180	mg/kg dry wt.	03/31/97	MBR	EPA 6010	0.29
Lead	340	mg/kg dry wt.	03/31/97	MBR	EPA 6010	1.5
Mercury	0.20	mg/kg dry wt.	03/27/97	MBR	EPA 7470	0.021
Selenium	0.33	mg/kg dry wt.	03/25/97	JA	EPA 7740	0.033
Silver	BDL	mg/kg dry wt.	03/27/97	MBR	EPA 6010	0.29
Zinc	700	mg/kg dry wt.	03/31/97	MBR	EPA 6010	0.29

BDL = Below Detection Limit
MDL = Method Detection Limit

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Sample ID: S-63, 170' South, 1'-2' Lab ID: 9703215-14 Collected: 03/19/97

TEST	RESULT	UNITS	ANALYZED	BY	METHOD	MDL
Poly Aromatic Hydrocarbons					EPA 8270	
Acenaphthene	BDL	µg/kg dry wt	04/02/97	HL		330
Acenaphthylene	BDL	µg/kg dry wt	04/02/97	HL		330
Anthracene	BDL	µg/kg dry wt	04/02/97	HL		330
Benzo(a)anthracene	1,100	µg/kg dry wt	04/02/97	HL		330
Benzo(b)fluoranthene	1,100	µg/kg dry wt	04/02/97	HL		330
Benzo(k)fluoranthene	1,000	µg/kg dry wt	04/02/97	HL		330
Benzo(ghi)perylene	580	µg/kg dry wt	04/02/97	HL		330
Benzo(a)pyrene	910	µg/kg dry wt	04/02/97	HL		330
Chrysene	1,200	µg/kg dry wt	04/02/97	HL		330
Dibenzo(a,h)anthracene	380	µg/kg dry wt	04/02/97	HL		330
Fluoranthene	1,800	µg/kg dry wt	04/02/97	HL		330
Fluorene	BDL	µg/kg dry wt	04/02/97	HL		330
Indeno(1,2,3-cd)pyrene	650	µg/kg dry wt	04/02/97	HL		330
Naphthalene	2,300	µg/kg dry wt	04/02/97	HL		330
Phenanthrene	1,700	µg/kg dry wt	04/02/97	HL		330
Pyrene	1,100	µg/kg dry wt	04/02/97	HL		330
Soxhlet Extraction for PAH	03/25/97	prep. date		HL	EPA 3540	
Total Solids	03/25/97	% of sample		HL	APHA 2540 B.	

Sample ID: S-64, 1'-2' Lab ID: 9703215-15 Collected: 03/18/97

TEST	RESULT	UNITS	ANALYZED	BY	METHOD	MDL
Total Solids	84.4	% of sample	03/26/97	JA	APHA 2540 B.	
Acid Digestion, Solid	03/25/97	date digested		JA	EPA 3050	
Arsenic	3.4	mg/kg dry wt.	03/25/97	JA	EPA 7060	0.033
Barium	40	mg/kg dry wt.	03/27/97	MBR	EPA 6010	0.29
Cadmium	2.0	mg/kg dry wt.	03/27/97	MBR	EPA 6010	0.29
Chromium	7.5	mg/kg dry wt.	03/27/97	MBR	EPA 6010	0.29
Copper	27	mg/kg dry wt.	03/27/97	MBR	EPA 6010	0.29
Lead	49	mg/kg dry wt.	03/27/97	MBR	EPA 6010	1.5
Mercury	0.12	mg/kg dry wt.	03/27/97	MBR	EPA 7470	0.021
Selenium	0.24	mg/kg dry wt.	03/25/97	JA	EPA 7740	0.033
Silver	BDL	mg/kg dry wt.	03/27/97	MBR	EPA 6010	0.29
Zinc	78	mg/kg dry wt.	03/27/97	MBR	EPA 6010	0.29

Sample ID: S-65, 1'-2' Lab ID: 9703215-16 Collected: 03/19/97

TEST	RESULT	UNITS	ANALYZED	BY	METHOD	MDL
Total Solids	81.4	% of sample	03/26/97	JA	APHA 2540 B.	
Acid Digestion, Solid	03/25/97	date digested		JA	EPA 3050	
Arsenic	4.1	mg/kg dry wt.	03/25/97	JA	EPA 7060	0.033
Barium	40	mg/kg dry wt.	03/26/97	MBR	EPA 6010	0.29
Cadmium	2.3	mg/kg dry wt.	03/27/97	MBR	EPA 6010	0.29
Chromium	5.7	mg/kg dry wt.	03/27/97	MBR	EPA 6010	0.29
Copper	22	mg/kg dry wt.	03/27/97	MBR	EPA 6010	0.29
Lead	26	mg/kg dry wt.	03/27/97	MBR	EPA 6010	1.5
Mercury	0.17	mg/kg dry wt.	03/27/97	MBR	EPA 7470	0.021
Selenium	0.18	mg/kg dry wt.	03/25/97	JA	EPA 7740	0.033
Silver	BDL	mg/kg dry wt.	03/26/97	MBR	EPA 6010	0.29
Zinc	29	mg/kg dry wt.	03/27/97	MBR	EPA 6010	0.29

BDL = Below Detection Limit
MDL = Method Detection Limit

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ENVIRONMENTAL SERVICES, INC.

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Phone: 616-399-6070 FAX: 616-399-6185

9703215

CLIENT SAMPLE -- CHAIN OF CUSTODY FORM

Project Name: Muskegon SAF - Area Wide - 950486.10

Name of Sampler: Chad Weber & Kurt VanAppledorn

ESI # 9703215	Date	Time	Sample Matrix	Sample ID	No. Cont.	Analyses Requested
-1	3-17-97	1000	Soil	S-51, 0.5'-1.5'	1	MI-10 metals
-2	3-17-97	1005		S-52, 1'-2'		"
	3-18-97	925		S-52 South, 2'-3'		held
-3	3-17-97	1117		S-53, 2'-3'		metals + PAH
	3-18-97	940		S-53 south, 1'-2'		held
-4	3-17-97	1115		S-54, 1'-2'		metals
-5	3-18-97	1020		S-54 125 South, 1'-2'		"
-6	3-17-97	1320		S-55, 1'-2'		"
	3-17-97	1140		S-55 south, 1'-1.5'		held
	3-17-97	1410		S-56, 2'-3'		held
-7	3-17-97	1405		S-56 85' South, 1'-2'		metals
	3-17-97	1510		S-57, 1'-2'		held
-8	3-17-97	1500		S-57 80' South, 1'-2'		metals
-9	3-17-97	1555		S-58, 1.5'-2.5'		" + PAH
	3-17-97	1535		S-58 South, 3'-3.7'		held
-10	3-18-97	1110		S-59, 2'-3'		metals
	3-19-97	1530		S-59 South, 5'-6'		held
-11	3-18-97	1155		S-60, 3'-4'		metals
	3-19-97	1410		S-60 south, 2'-2.5'		held

Remarks: "held" samples were retained by Dell

-5 on paperwork, no sample submitted; called CAW 3/20/97 @15:40 pjc
CAW brought sample in at @16:30 3/20/97 pjc

Samples Relinquished By:	Samples Transported By:	Samples Received By:
Chad Weber		P. J. Cold
Affiliation: Dell	Affiliation:	Affiliation: Lumesi
Date: 3-20-97 Time: 12:25	Date: Time:	Date: 3/20/97 Time: 1225

SAMPLE MATRIX CODES:

W = Water
GW = Groundwater
SW = Surface Water
WW = Wastewater
WST = Waste
S = Soil
O = Other

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Phone: 616-399-6070 FAX: 616-399-6185

9703215

CLIENT SAMPLE -- CHAIN OF CUSTODY FORM

Project Name: Muskegon SAF - Area Wide - 950486.10

Name of Sampler: Chad Weber

ESI # 9703215	Date	Time	Sample Matrix	Sample ID	No. Cont.	Analyses Requested
-12	3-18-97	1400	Soil	S-61, 1'-2'	1	MI-10 Metals
	3-19-97	1335		S-61 South, 3'-4'		held
-13	3-18-97	1440		S-62, 2'-3'		metals
	3-19-97	1210		S-62 South, 1'-2'		held
	3-18-97	1500		S-63, 1'-1.5'		"
-14	3-19-97	1135		S-63 150' South, 1'-2'		metals + PAH
-15	3-18-97	1525		S-64, 1'-2'		"
	3-19-97	1040		S-64 South, 1'-2'		held
	3-19-97	1045		S-64 South, 4'-5'		"
-16	3-19-97	950		S-65, 1'-2'		metals
	3-19-97	1015		S-65 150' South, 2'-3'		held

Remarks: See pg 1

Samples Relinquished By:	Samples Transported By:	Samples Received By:
[illegible]		[illegible]
Affiliation: DEQ	Affiliation:	Affiliation: WMES
Date: 3-20-97 Time: 12:25	Date: Time:	Date: 3/20/97 Time: 1225

SAMPLE MATRIX CODES:

W = Water
GW = Groundwater
SW = Surface Water
WW = Wastewater
WST = Waste
S = Soil
O = Other

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Phone: 616-399-6070 FAX: 616-399-6185

MAR 31 1997
DELL ENGINEERING

CLIENT: Dell Engineering, Inc.
3352 128th Avenue
Holland, Michigan 49424

Attn: Chad Weber
Re: Muskegon SAF - Area Wide (950486.10/0004)

DATE: March 31, 1997

ANALYSIS OF: Soil Samples

REPORTED BY: Robert K. Zahray, Laboratory Manager

DATE RECEIVED: Received from client on March 13, 1997.

Sample ID: S-48, 175' South, 6'-7' Lab ID: 9703134-01 Collected: 03/12/97

TEST	RESULT	UNITS	ANALYZED	BY	METHOD	MDL
Total Solids	96.3	% of sample	03/21/97	DPM	APHA 2540 B.	
Acid Digestion, Solid	03/17/97	date digested		JA	EPA 3050	
Arsenic	0.68	mg/kg dry wt.	03/21/97	JA	EPA 7060	0.026
Barium	6.7	mg/kg dry wt.	03/19/97	MBR	EPA 6010	0.26
Cadmium	0.025	mg/kg dry wt.	03/25/97	JA	EPA 7131	0.0026
Chromium	8.1	mg/kg dry wt.	03/19/97	MBR	EPA 6010	0.26
Copper	2.2	mg/kg dry wt.	03/19/97	MBR	EPA 6010	0.26
Lead	BDL	mg/kg dry wt.	03/19/97	JA	EPA 7421	0.026
Mercury	BDL	mg/kg dry wt.	03/21/97	DPM	EPA 7470	0.021
Selenium	BDL	mg/kg dry wt.	03/21/97	JA	EPA 7740	0.026
Silver	BDL	mg/kg dry wt.	03/19/97	MBR	EPA 6010	0.26
Zinc	8.0	mg/kg dry wt.	03/19/97	MBR	EPA 6010	0.26

Sample ID: S-50, 130' South, 2'-3' Lab ID: 9703134-02 Collected: 03/11/97

TEST	RESULT	UNITS	ANALYZED	BY	METHOD	MDL
Total Solids	90.5	% of sample	03/21/97	DPM	APHA 2540 B.	
Acid Digestion, Solid	03/17/97	date digested		JA	EPA 3050	
Arsenic	1.2	mg/kg dry wt.			EPA 7060	0.026
Barium	31	mg/kg dry wt.	03/19/97	MBR	EPA 6010	0.26
Cadmium	1.2	mg/kg dry wt.	03/19/97	MBR	EPA 6010	0.26
Chromium	8.6	mg/kg dry wt.	03/19/97	MBR	EPA 6010	0.26
Copper	10	mg/kg dry wt.	03/19/97	MBR	EPA 6010	0.26
Lead	34	mg/kg dry wt.	03/19/97	MBR	EPA 6010	0.26
Mercury	0.086	mg/kg dry wt.	03/21/97	DPM	EPA 7470	0.021
Selenium	0.068	mg/kg dry wt.	03/21/97	JA	EPA 7740	0.026
Silver	BDL	mg/kg dry wt.	03/19/97	MBR	EPA 6010	0.26
Zinc	36	mg/kg dry wt.	03/19/97	MBR	EPA 6010	0.26

BDL = Below Detection Limit
MDL = Method Detection Limit

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CLIENT SAMPLE -- CHAIN OF CUSTODY FORM

Project Name: City of Muskegon SAF - Area Wide 950486.10

Name of Sampler: Chad Weber

ESI # 9703134	Date	Time	Sample Matrix	Sample ID	No. Cont.	Analyses Requested
	3-11-97	240pm	Soil	S-50, 1'-2'	1	(held)
-2	"	325pm		S-50, 130' South, 2'-3'	1	MI 10-Metals
	3-12-97	930am		S-46, 300' South, 2'-3'	1	(held)
		1025am		S-47, 225' South, 3'-4'	1	
		1045am		S-47, 275' South, 1'-2'	1	
-1		1110 am		S-48, 175' South, 6'-7'	1	MI 10- Metals
		1155am		S-49, 115' South, 1'-2'	1	(held)
		215 pm		S-49, 170' South, 1'-2'	1	
		217 pm		S-49, 170' South, 5'-6'	1	
		250 pm		S-49, 275' South, 1'-2'	1	

Remarks: - Samples stored in Dell cooler prior to lab submittal
- samples indicated "held" were not submitted to WMESI

Samples Relinquished By:	Samples Transported By:	Samples Received By:
[signature]		[signature]
Affiliation: Dell	Affiliation:	Affiliation: WMESI
Date: 3-13-97 Time: 1:40pm	Date: Time:	Date: 3/13/97 Time: 1340

SAMPLE MATRIX CODES:

W = Water
GW = Groundwater
SW = Surface Water
WW = Wastewater
WST = Waste
S = Soil
O = Other

TRACE Analytical Laboratories, Inc.
2241 Black Creek Road • Muskegon, MI 49444-2673 • Phone 616-773-5998 • Fax 616-773-6537

RECEIVED MAR 3 1 1997

March 28, 1997

Mr. Matt Czerniak
Superior Environmental Corporation
2201 Wolf Lake Road
Muskegon, MI 49442-4845

RE: Trace ID R289

COPY

Dear Mr. Czerniak:

Enclosed are the analytical results associated with your Muskegon Lakeshore project. Project.

This information was examined through Trace's validation process to ensure that all requirements for quality and completeness were satisfied. Every practical effort was made to meet the detection level specifications for this work. However, if there are exceptions, they will be noted at the bottom of the appropriate report page.

Thank you for working with Trace. If you have questions regarding this data, please contact Laura Yeck, our project manager.

Sincerely,

Ray V. Buhl for

Greg Rademacher
VP & General Manager

GR/glm
Enclosures

TRACE Analytical Laboratories, Inc.
2241 Black Creek Road • Muskegon, MI 49444-2673 • Phone 616-773-5998 • Fax 616-773-6537

Mr. Matt Czerniak
Superior Environmental Corporation
2201 Wolf Lake Road
Muskegon, MI 49442-4845

TRACE ID:	R289-01
REPORT DATE:	03/28/97
ANALYSIS DATE:	03/26/97
EXTRACTION DATE:	03/25/97
ANALYST:	avl
D.L. MULTIPLIER:	4.57

CLIENT ID: Muskegon Lakeshore Project

SAMPLE DATE:	03/21/97
SAMPLE RECEIVED:	03/21/97
SAMPLE TYPE:	Soil
SAMPLER:	tk

SAMPLE ID: ST2 B2 (3')

EPA 8270 Polynuclear Aromatic Hydrocarbons	RESULTS (mg/kg)
Naphthalene	0.57
2-Methylnaphthalene	0.50
Acenaphthylene	* < 0.38
Acenaphthene	1.2
Fluorene	0.88
Phenanthrene	8.6
Anthracene	2.0
Fluoranthene	8.7
Pyrene	9.1
Benzo[a]anthracene	4.1
Chrysene	4.2
Benzo[b]fluoranthene	6.0
Benzo[k]fluoranthene	2.0
Benzo[a]pyrene	4.3
Indeno[1,2,3-cd]pyrene	2.3
Dibenzo[a,h]anthracene	0.53
Benzo[g,h,i]perylene	1.7

* Reporting limits for this sample were elevated due to a post extraction dilution required based on matrix interferences present in the sample and due to a sample matrix which prevented the sample from being concentrated to the necessary final volume.

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Mr. Matt Czerniak
Superior Environmental Corporation
2201 Wolf Lake Road
Muskegon, MI 49442-4845

TRACE ID:	R289-02
REPORT DATE:	03/28/97
ANALYSIS DATE:	03/26/97
EXTRACTION DATE:	03/25/97
ANALYST:	avl
D.L. MULTIPLIER:	4.29

CLIENT ID: Muskegon Lakeshore Project

SAMPLE DATE:	03/21/97
SAMPLE RECEIVED:	03/21/97
SAMPLE TYPE:	Soil
SAMPLER:	tk

SAMPLE ID: ST6 B1 (4')

EPA 8270 Polynuclear Aromatic Hydrocarbons	RESULTS (mg/kg)
Naphthalene	* < 0.36
2-Methylnaphthalene	* < 0.36
Acenaphthylene	* < 0.36
Acenaphthene	* < 0.36
Fluorene	* < 0.36
Phenanthrene	0.39
Anthracene	* < 0.36
Fluoranthene	0.61
Pyrene	0.60
Benzo[a]anthracene	* < 0.36
Chrysene	* < 0.36
Benzo[b]fluoranthene	0.42
Benzo[k]fluoranthene	* < 0.36
Benzo[a]pyrene	* < 0.36
Indeno[1,2,3-cd]pyrene	* < 0.36
Dibenzo[a,h]anthracene	* < 0.36
Benzo[g,h,i]perylene	* < 0.36

* Reporting limits for this sample were elevated due to a post extraction dilution required based on matrix interferences present in the sample and due to a sample matrix which prevented the sample from being concentrated to the necessary final volume.

TRACE
Analytical Laboratories, Inc.
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Phone 616-773-5998 • Fax 616-773-6537

ANALYTICAL SERVICES AUTHORIZATION
CHAIN-OF-CUSTODY RECORD

3/28
HPN 1958

TRACE ID NO. R2289

PLEASE COMPLETE STEPS 1 THRU 3. TRACE PERSONNEL WILL COMPLETE SECTIONS SHADED BLUE.

STEP 1 Report Results To

Client Name: SUPERIOR ENV.
Contact Person: MATT CZERNIAK
Mailing Address: 2201 WOLF LAKE RD
City, State, Zip Code: MUSK. MI.
Phone: 1-800-669-0699 Fax:
Client Job Name/No.: MUSKEGON LAKESHORE PROJECT
Trace Quote No.: Purchase Order No.:
Sampled By: TOM VAMP

For Use by TRACE Personnel Only

Logged By: Checked By:
Sample Condition Upon Receipt: Acceptable Other (Specify below)
Cooler Temp. (°C): 4°C pH Checked: Yes No
Volatiles Preserved: Yes No Metals FF: Yes No Pres: Yes No

Step 2 Sample Identification / Request for Analytical Services

Regulatory Requirements
- MERA TMDLs ☐
- RCRA ☐
- NPDES ☐
- Drinking Water ☐
- Other:

Turnaround Requirements
- Standard ☒
- * 5 Day (RUSH) ☐
- * 2-4 Day (RUSH) ☐
- * 24 Hour (RUSH) ☐
- * Requires prior approval

Matrix Key
- S = Soil
- W = Water
- O = Oil
- SL = Sludge
- A = Air
- X = Other

ANALYSIS REQUESTED

TRACE NO.	DATE TAKEN	TIME TAKEN	METALS FIELD FILTERED	VOLATILES PRESERVED	CLIENT SAMPLE ID	MATRIX	NUMBER OF CONTAINERS	PNA	REMARKS	Possible Health Hazard
01	3/21				ST2B2(3') STATION 2 BORING 2 @3'	S	1	X		
02	3/21				ST6B1(4') STATION 6 BORING 1 @4'	S	1	X		

STEP 3 Chain-of-Custody

Item #	RELEASED BY	RECEIVED BY	DATE	TIME	Item #	RELEASED BY	RECEIVED BY	DATE	TIME
#142	1) [signature]	K. Yard	3-21-97	3:15		2)			
	3)					4)			

In executing this agreement, the Client acknowledges acceptance of the terms of the agreement as listed on the reverse side.

TRACE Analytical Laboratories, Inc.
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RECEIVED APR 0 2 1997

March 28, 1997

Mr. Matt Czerniak
Superior Environmental Corporation
2201 Wolf Lake Road
Muskegon, MI 49442-4845

RE: Trace ID R278

COPY

Dear Mr. Czerniak:

Enclosed are the analytical results associated with your Project #MK1246, Muskegon Lakeshore Project.

This information was examined through Trace's validation process to ensure that all requirements for quality and completeness were satisfied. Every practical effort was made to meet the detection level specifications for this work. However, if there are exceptions, they will be noted at the bottom of the appropriate report page.

Thank you for working with Trace. If you have questions regarding this data, please contact Laura Yeck, our project manager.

Sincerely,

Ray V. Bell for

Greg Rademacher
VP & General Manager

GR/glm
Enclosures

TRACE Analytical Laboratories, Inc.
2241 Black Creek Road • Muskegon, MI 49444-2673 • Phone 616-773-5998 • Fax 616-773-6537

Mr. Matt Czerniak
Superior Environmental Corporation
2201 Wolf Lake Road
Muskegon, MI 49442

TRACE ID: R278-01
REPORT DATE: 03/28/97
ANALYST: ck/dc

CLIENT ID: Project #MK1246
Muskegon Lakeshore Project

SAMPLE ID: ST16 B4 (1')

SAMPLE DATE: 03/07/97
SAMPLE RECEIVED: 03/20/97
SAMPLE TYPE: Soil
SAMPLER: tk

TOTAL METALS	RESULTS (mg/kg)	ANALYZED	METHOD NUMBERS
Barium	110	03/27/97	EPA 6010A
Cadmium	1.2	03/27/97	EPA 6010A
Chromium	12	03/27/97	EPA 6010A
Copper	49	03/27/97	EPA 6010A
Lead	240	03/27/97	EPA 6010A
Zinc	250	03/27/97	EPA 6010A
Arsenic	6.3	03/27/97	EPA 7060A
Selenium	<0.50 [1]	03/27/97	EPA 7740
Silver	<0.50 [2]	03/27/97	EPA 7761
Mercury	<0.100	03/26/97	EPA 7471A

[1] The matrix spike and matrix spike duplicate recoveries were out of control low. All positive results and reporting limits for this analyte in the non-spiked version of the sample must be considered estimated.

[2] The matrix spike duplicate recovery was out of control low, resulting in an out of control RPD result between the matrix spike and the matrix spike duplicate. All positive results and reporting limits for this analyte in the non-spiked version of the sample must be considered estimated.

TRACE Analytical Laboratories, Inc.
2241 Black Creek Road • Muskegon, MI 49444-2673 • Phone 616-773-5998 • Fax 616-773-6537

Mr. Matt Czerniak
Superior Environmental Corporation
2201 Wolf Lake Road
Muskegon, MI 49442

TRACE ID: R278-02
REPORT DATE: 03/28/97
ANALYST: ck/dc

CLIENT ID: Project #MK1246
Muskegon Lakeshore Project

SAMPLE ID: ST12 B8 (1/2-2')

SAMPLE DATE: 03/07/97
SAMPLE RECEIVED: 03/20/97
SAMPLE TYPE: Soil
SAMPLER: tk

TOTAL METALS	RESULTS (mg/kg)	ANALYZED	METHOD NUMBERS
Barium	49	03/27/97	EPA 6010A
Cadmium	2.0	03/27/97	EPA 6010A
Chromium	8.9	03/27/97	EPA 6010A
Copper	130	03/27/97	EPA 6010A
Lead	340	03/27/97	EPA 6010A
Zinc	130	03/27/97	EPA 6010A
Arsenic	3.4	03/27/97	EPA 7060A
Selenium	<0.50	03/27/97	EPA 7740
Silver	2.1	03/27/97	EPA 7761
Mercury	3.2	03/26/97	EPA 7471A

TRACE Analytical Laboratories, Inc.
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Mr. Matt Czerniak
Superior Environmental Corporation
2201 Wolf Lake Road
Muskegon, MI 49442-4845

TRACE ID:	R278-01
REPORT DATE:	03/28/97
ANALYSIS DATE:	03/26/97
EXTRACTION DATE:	03/21/97
ANALYST:	avl
D.L. MULTIPLIER:	3.29

CLIENT ID: Project #MK1246
Muskegon Lakeshore Project

SAMPLE ID: ST16 B4 (1')

SAMPLE DATE:	03/07/97
SAMPLE RECEIVED:	03/20/97
SAMPLE TYPE:	Soil
SAMPLER:	tk

EPA 8270 Polynuclear Aromatic Hydrocarbons	RESULTS (mg/kg)
Naphthalene	< 0.33
2-Methylnaphthalene	< 0.33
Acenaphthylene	< 0.33
Acenaphthene	< 0.33
Fluorene	< 0.33
Phenanthrene	< 0.33
Anthracene	< 0.33
Fluoranthene	0.47
Pyrene	0.43
Benzo[a]anthracene	< 0.33
Chrysene	< 0.33
Benzo[b]fluoranthene	0.35
Benzo[k]fluoranthene	< 0.33
Benzo[a]pyrene	< 0.33
Indeno[1,2,3-cd]pyrene	< 0.33
Dibenzo[a,h]anthracene	< 0.33
Benzo[g,h,i]perylene	< 0.33

TRACE Analytical Laboratories, Inc.
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Mr. Matt Czemiak
Superior Environmental Corporation
2201 Wolf Lake Road
Muskegon, MI 49442-4845

TRACE ID:	R278-02
REPORT DATE:	03/28/97
ANALYSIS DATE:	03/26/97
EXTRACTION DATE:	03/21/97
ANALYST:	avl
D.L. MULTIPLIER:	2.15

CLIENT ID: Project #MK1246
Muskegon Lakeshore Project

SAMPLE ID: ST12 B8 (1/2-2')

SAMPLE DATE:	03/07/97
SAMPLE RECEIVED:	03/20/97
SAMPLE TYPE:	Soil
SAMPLER:	tk

EPA 8270 Polynuclear Aromatic Hydrocarbons	RESULTS (mg/kg)
Naphthalene	< 0.33
2-Methylnaphthalene	< 0.33
Acenaphthylene	< 0.33
Acenaphthene	< 0.33
Fluorene	< 0.33
Phenanthrene	0.39
Anthracene	< 0.33
Fluoranthene	0.66
Pyrene	0.56
Benzo[a]anthracene	< 0.33
Chrysene	< 0.33
Benzo[b]fluoranthene	0.45
Benzo[k]fluoranthene	< 0.33
Benzo[a]pyrene	< 0.33
Indeno[1,2,3-cd]pyrene	< 0.33
Dibenzo[a,h]anthracene	< 0.33
Benzo[g,h,i]perylene	< 0.33

HPN 1944 R278

Superior ENVIRONMENTAL CORP

CHAIN-OF-CUSTODY RECORD

PROJECT NO. MK1246

DATE 3-20-97 PAGE NO. 1

SUPERIOR ENVIRONMENTAL CORP. • 2201 WOLF LAKE ROAD • MUSKEGON, MI 49442-4845 • 616-788-5558 FAX 788-5450

PROJECT NAME: Muskegon Lakeshore Project

PROJECT LOCATION: Muskegon

PROJECT CONTACT:

PROJECT TELEPHONE NO.:

CLIENT'S REPRESENTATIVE:

PROJECT MANAGER/SUPERVISOR: Matt Czerniak

RECEIVED APR 02 1997

ITEM NO.	PROJECT SAMPLE NUMBER	DATE	TIME	COMP	GRAB	SAMPLE DESCRIPTION (INCLUDE MATRIX AND POINT OF SAMPLE)	NUMBER OF CONTAINERS	MDNR TEN METALS	PNA'S	REMARKS
1	ST16B4(1')	3/7			X	Soil STATION 16/Boring 4 @ 1' BGL	2408	X	X	
2	ST12B8(1-2')	3/7			X	Soil STATION 12/Boring 8 @ 1-2'	1402	X	X	
3										
4										
5										
6										
7										
8										
9										
10										

TRANSFER NUMBER	ITEM NUMBER	TRANSFERS RELINQUISHED BY	TRANSFERS ACCEPTED BY	DATE	TIME
1	#1 & 2	SEC Storage / Timothy	K Gard	3/20	0920
2					
3					
4					

LABORATORY: TRACE

TURNAROUND REQUIRED: Normal

RUSH:

SAMPLER'S SIGNATURE: Timothy Kemp

PROFESSIONAL ENVIRONMENTAL SERVICES

TRACE Analytical Laboratories, Inc.
2241 Black Creek Road • Muskegon, MI 49444-2673 • Phone 616-773-5998 • Fax 616-773-6537

RECEIVED JAN 3 0 1997

January 22, 1997

Mr. Matt Czerniak
Superior Environmental Corporation
2201 Wolf Lake Road
Muskegon, MI 49442-4845

RE: Trace ID Q879

Dear Mr. Czerniak:

COPY

Enclosed are the amended reports associated with your Project #MK1246, Muskegon Lakeshore. Per your request, the project number has been changed to MK1246. The sample ID for Q879-01 and the sample dates for Q879-06 and Q879-07 have been corrected.

This information was examined through Trace's validation process to ensure that all requirements for quality and completeness were satisfied. Every practical effort was made to meet the detection level specifications for this work. However, if there are exceptions, they will be noted at the bottom of the appropriate report page.

Thank you for working with Trace. If you have questions regarding this data, please contact Laura Yeck, our project manager.

Sincerely,

Ray V. Buhl for

Greg Rademacher
VP & General Manager

GR/lay
Enclosures

TRACE Analytical Laboratories, Inc.
2241 Black Creek Road • Muskegon, MI 49444-2673 • Phone 616-773-5998 • Fax 616-773-6537

Mr. Matt Czerniak
Superior Environmental Corporation
2201 Wolf Lake Road
Muskegon, MI 49442-4845

TRACE ID: Q879-01
AMENDED: 01/28/97

CLIENT ID: Proj. #1246
Muskegon Lakeshore

SAMPLE ID: ST2 B2(3')

SAMPLE DATE: 12/16/96
SAMPLE RECEIVED: 01/06/97
SAMPLE TYPE: Soil
SAMPLER: tk

TOTAL METALS	RESULTS (mg/kg)	ANALYST	ANALYZED	METHOD NUMBERS
Silver	<0.50	pb	01/21/97	EPA 7761
Arsenic	* 4.0	dc	01/20/97	EPA 7060A
Barium	66	dc	01/15/97	EPA 6010A
Cadmium	** 0.30	dc/pb	01/18/97	EPA 7131A
Chromium	8.8	dc	01/15/97	EPA 6010A
Copper	20	dc	01/15/97	EPA 6010A
Lead	*** 59	dc	01/15/97	EPA 6010A
Mercury	0.15	pb	01/15/97	EPA 7471A
Selenium	<0.50	dj	01/16/97	EPA 7740
Zinc	46	dc	01/15/97	EPA 6010A

* The matrix spike duplicate recovery was out of control low, resulting in an out of control RPD result between the matrix spike and the matrix spike duplicate. All positive results and detection limits for this analyte in the non-spiked version of the sample must be considered estimated.

** The matrix spike duplicate recovery was out of control high, resulting in an out of control RPD result between the matrix spike and the matrix spike duplicate. All positive results for this analyte in the non-spiked version of the sample must be considered estimated.

*** The matrix spike and matrix spike duplicate recoveries were out of control high. The relative percent difference between the matrix spike and matrix spike duplicate was also out of control. All positive results for this analyte in non-spiked version of the sample must be considered estimated.

TRACE Analytical Laboratories, Inc.
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Mr. Matt Czerniak
Superior Environmental Corporation
2201 Wolf Lake Road
Muskegon, MI 49442-4845

TRACE ID: Q879-02
AMENDED: 01/28/97

CLIENT ID: Proj. #1246
Muskegon Lakeshore

SAMPLE ID: ST4 B1(6')

SAMPLE DATE: 12/16/96
SAMPLE RECEIVED: 01/06/97
SAMPLE TYPE: Soil
SAMPLER: tk

TOTAL METALS	RESULTS (mg/kg)	ANALYST	ANALYZED	METHOD NUMBERS
Silver	<0.50	pb	01/21/97	EPA 7761
Arsenic	2.5	pb	01/20/97	EPA 7060A
Barium	63	dc	01/15/97	EPA 6010A
Cadmium	0.25	dc/pb	01/18/97	EPA 7131A
Chromium	6.3	dc	01/15/97	EPA 6010A
Copper	80	dc	01/15/97	EPA 6010A
Lead	890	dc	01/15/97	EPA 6010A
Mercury	0.29	pb	01/15/97	EPA 7471A
Selenium	<0.50	dj	01/16/97	EPA 7740
Zinc	77	dc	01/15/97	EPA 6010A

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Mr. Matt Czerniak
Superior Environmental Corporation
2201 Wolf Lake Road
Muskegon, MI 49442-4845

TRACE ID: Q879-03
AMENDED: 01/28/97

CLIENT ID: Proj. #1246
Muskegon Lakeshore

SAMPLE ID: ST5 B1(2')

SAMPLE DATE: 12/17/96
SAMPLE RECEIVED: 01/06/97
SAMPLE TYPE: Soil
SAMPLER: tk

TOTAL METALS	RESULTS (mg/kg)	ANALYST	ANALYZED	METHOD NUMBERS
Silver	<0.50	pb	01/21/97	EPA 7761
Arsenic	1.8	pb	01/20/97	EPA 7060A
Barium	62	dc	01/15/97	EPA 6010A
Cadmium	0.39	dc/pb	01/18/97	EPA 7131A
Chromium	12	dc	01/15/97	EPA 6010A
Copper	26	dc	01/15/97	EPA 6010A
Lead	56	dc	01/15/97	EPA 6010A
Mercury	0.15	pb	01/15/97	EPA 7471A
Selenium	<0.50	dj	01/16/97	EPA 7740
Zinc	72	dc	01/15/97	EPA 6010A

TRACE Analytical Laboratories, Inc.
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Mr. Matt Czerniak
Superior Environmental Corporation
2201 Wolf Lake Road
Muskegon, MI 49442-4845

TRACE ID: Q879-04
AMENDED: 01/28/97

CLIENT ID: Proj. #1246
Muskegon Lakeshore

SAMPLE ID: ST6,B1(4')

SAMPLE DATE: 12/17/96
SAMPLE RECEIVED: 01/06/97
SAMPLE TYPE: Soil
SAMPLER: tk

TOTAL METALS	RESULTS (mg/kg)	ANALYST	ANALYZED	METHOD NUMBERS
Silver	<0.50	pb	01/21/97	EPA 7761
Arsenic	10	dc	01/20/97	EPA 7060A
Barium	41	dc	01/15/97	EPA 6010A
Cadmium	0.78	dc	01/15/97	EPA 6010A
Chromium	11	dc	01/15/97	EPA 6010A
Copper	41	dc	01/15/97	EPA 6010A
Lead	230	dc	01/15/97	EPA 6010A
Mercury	1.0	pb	01/15/97	EPA 7471A
Selenium	<0.50	dj	01/16/97	EPA 7740
Zinc	150	dc	01/15/97	EPA 6010A

TRACE Analytical Laboratories, Inc.
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Mr. Matt Czerniak
Superior Environmental Corporation
2201 Wolf Lake Road
Muskegon, MI 49442-4845

TRACE ID: Q879-05
AMENDED: 01/28/97

CLIENT ID: Proj. #1246
Muskegon Lakeshore

SAMPLE ID: ST9 B2(3')

SAMPLE DATE: 12/19/96
SAMPLE RECEIVED: 01/06/97
SAMPLE TYPE: Soil
SAMPLER: tk

TOTAL METALS	RESULTS (mg/kg)	ANALYST	ANALYZED	METHOD NUMBERS
Silver	<0.50	pb	01/21/97	EPA 7761
Arsenic	6.4	dc	01/20/97	EPA 7060A
Barium	48	dc	01/15/97	EPA 6010A
Cadmium	1.2	dc	01/15/97	EPA 6010A
Chromium	8.1	dc	01/15/97	EPA 6010A
Copper	32	dc	01/15/97	EPA 6010A
Lead	54	dc	01/15/97	EPA 6010A
Mercury	0.10	pb	01/15/97	EPA 7471A
Selenium	0.81	dj	01/16/97	EPA 7740
Zinc	82	dc	01/15/97	EPA 6010A

TRACE Analytical Laboratories, Inc.
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Mr. Matt Czerniak
Superior Environmental Corporation
2201 Wolf Lake Road
Muskegon, MI 49442-4845

TRACE ID: Q879-06
AMENDED: 01/28/97

CLIENT ID: Proj. #1246
Muskegon Lakeshore

SAMPLE ID: ST12 B1(2.5')

SAMPLE DATE: 12/20/96
SAMPLE RECEIVED: 01/06/97
SAMPLE TYPE: Soil
SAMPLER: tk

TOTAL METALS	RESULTS (mg/kg)	ANALYST	ANALYZED	METHOD NUMBERS
Silver	<0.50	pb	01/21/97	EPA 7761
Arsenic	5.7	dc	01/20/97	EPA 7060A
Barium	40	dc	01/15/97	EPA 6010A
Cadmium	2.0	dc	01/15/97	EPA 6010A
Chromium	100	dc	01/15/97	EPA 6010A
Copper	110	dc	01/15/97	EPA 6010A
Lead	51	dc	01/15/97	EPA 6010A
Mercury	<0.10	pb	01/15/97	EPA 7471A
Selenium	<0.50	dj	01/16/97	EPA 7740
Zinc	160	dc	01/15/97	EPA 6010A

TRACE Analytical Laboratories, Inc.
2241 Black Creek Road • Muskegon, MI 49444-2673 • Phone 616-773-5998 • Fax 616-773-6537

Mr. Matt Czerniak
Superior Environmental Corporation
2201 Wolf Lake Road
Muskegon, MI 49442-4845

TRACE ID: Q879-07
AMENDED: 01/28/97

CLIENT ID: Proj. #1246
Muskegon Lakeshore

SAMPLE ID: ST12 B6(1.5')

SAMPLE DATE: 12/31/96
SAMPLE RECEIVED: 01/06/97
SAMPLE TYPE: Soil
SAMPLER: tk

TOTAL METALS	RESULTS (mg/kg)	ANALYST	ANALYZED	METHOD NUMBERS
Silver	<0.50	pb	01/21/97	EPA 7761
Arsenic	0.88	pb	01/20/97	EPA 7060A
Barium	22	dc	01/15/97	EPA 6010A
Cadmium	0.18	dc/pb	01/18/97	EPA 7131A
Chromium	3.6	dc	01/15/97	EPA 6010A
Copper	9.6	dc	01/15/97	EPA 6010A
Lead	43	dc	01/15/97	EPA 6010A
Mercury	0.21	pb	01/15/97	EPA 7471A
Selenium	<0.50	dj	01/16/97	EPA 7740
Zinc	28	dc	01/15/97	EPA 6010A

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Mr. Matt Czerniak
Superior Environmental Corporation
2201 Wolf Lake Road
Muskegon, MI 49442-4845

TRACE ID: Q879-08
AMENDED: 01/28/97

CLIENT ID: Proj. #1246
Muskegon Lakeshore

SAMPLE ID: ST12 B7(4')

SAMPLE DATE: 12/31/96
SAMPLE RECEIVED: 01/06/97
SAMPLE TYPE: Soil
SAMPLER: tk

TOTAL METALS	RESULTS (mg/kg)	ANALYST	ANALYZED	METHOD NUMBERS
Silver	<0.50	pb	01/21/97	EPA 7761
Arsenic	5.6	dc	01/20/97	EPA 7060A
Barium	45	dc	01/15/97	EPA 6010A
Cadmium	22	dc	01/15/97	EPA 6010A
Chromium	31	dc	01/15/97	EPA 6010A
Copper	51	dc	01/15/97	EPA 6010A
Lead	150	dc	01/15/97	EPA 6010A
Mercury	<0.10	pb	01/15/97	EPA 7471A
Selenium	<0.50	dj	01/16/97	EPA 7740
Zinc	150	dc	01/15/97	EPA 6010A

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Mr. Matt Czerniak
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2201 Wolf Lake Road
Muskegon, MI 49442-4845

TRACE ID: Q879-09
AMENDED: 01/28/97

CLIENT ID: Proj. #1246
Muskegon Lakeshore

SAMPLE ID: ST13 B8(4')

SAMPLE DATE: 01/03/97
SAMPLE RECEIVED: 01/06/97
SAMPLE TYPE: Soil
SAMPLER: tk

TOTAL METALS	RESULTS (mg/kg)	ANALYST	ANALYZED	METHOD NUMBERS
Silver	<0.50	pb	01/21/97	EPA 7761
Arsenic	1.4	pb	01/20/97	EPA 7060A
Barium	32	dc	01/15/97	EPA 6010A
Cadmium	0.88	dc	01/15/97	EPA 6010A
Chromium	14	dc	01/15/97	EPA 6010A
Copper	29	dc	01/15/97	EPA 6010A
Lead	150	dc	01/15/97	EPA 6010A
Mercury	0.10	pb	01/15/97	EPA 7471A
Selenium	<0.50	dj	01/16/97	EPA 7740
Zinc	120	dc	01/15/97	EPA 6010A

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Mr. Matt Czerniak
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Muskegon, MI 49442-4845

TRACE ID: Q879-10
AMENDED: 01/28/97

CLIENT ID: Proj. #1246
Muskegon Lakeshore

SAMPLE ID: ST14 B2(6')

SAMPLE DATE: 01/03/97
SAMPLE RECEIVED: 01/06/97
SAMPLE TYPE: Soil
SAMPLER: tk

TOTAL METALS	RESULTS (mg/kg)	ANALYST	ANALYZED	METHOD NUMBERS
Silver	<0.50	pb	01/21/97	EPA 7761
Arsenic	3.7	dc	01/20/97	EPA 7060A
Barium	120	dc	01/15/97	EPA 6010A
Cadmium	0.38	dc/pb	01/18/97	EPA 7131A
Chromium	16	dc	01/15/97	EPA 6010A
Copper	37	dc	01/15/97	EPA 6010A
Lead	200	dc	01/15/97	EPA 6010A
Mercury	0.78	pb	01/15/97	EPA 7471A
Selenium	0.62	dj	01/16/97	EPA 7740
Zinc	110	dc	01/15/97	EPA 6010A

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Mr. Matt Czerniak
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TRACE ID: Q879-11
AMENDED: 01/28/97

CLIENT ID: Proj. #1246
Muskegon Lakeshore

SAMPLE ID: ST10 B3(2')

SAMPLE DATE: 12/19/96
SAMPLE RECEIVED: 01/06/97
SAMPLE TYPE: Soil
SAMPLER: tk

TOTAL METALS	RESULTS (mg/kg)	ANALYST	ANALYZED	METHOD NUMBERS
Silver	<0.50	pb	01/21/97	EPA 7761
Arsenic	1.2	pb	01/20/97	EPA 7060A
Barium	16	dc	01/15/97	EPA 6010A
Cadmium	0.24	dc/pb	01/18/97	EPA 7131A
Chromium	4.9	dc	01/15/97	EPA 6010A
Copper	11	dc	01/15/97	EPA 6010A
Lead	37	dc	01/15/97	EPA 6010A
Mercury	<0.10	pb	01/15/97	EPA 7471A
Selenium	<0.50	dj	01/16/97	EPA 7740
Zinc	30	dc	01/15/97	EPA 6010A

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RECEIVED MAR 1 3 1997

March 12, 1997

Mr. Matt Czerniak
Superior Environmental Corporation
2201 Wolf Lake Road
Muskegon, MI 49442-4845

RE: Trace ID R208

Dear Mr. Czerniak:

Enclosed are the analytical results associated with your Project #MK1246, Muskegon Lakeshore Project.

This information was examined through Trace's validation process to ensure that all requirements for quality and completeness were satisfied. Every practical effort was made to meet the detection level specifications for this work. However, if there are exceptions, they will be noted at the bottom of the appropriate report page.

Thank you for working with Trace. If you have questions regarding this data, please contact Laura Yeck, our project manager.

Sincerely,

Greg Rademacher
VP & General Manager

GR/glm
Enclosures

COPY

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Mr. Matt Czemiak
Superior Environmental Corporation
2201 Wolf Lake Road
Muskegon, MI 49442-4845

TRACE ID:	R208-06
REPORT DATE:	03/12/97
ANALYSIS DATE:	03/11/97
EXTRACTION DATE:	03/11/97
ANALYST:	avl
D.L. MULTIPLIER:	5.53

CLIENT ID: Project #MK1246
Muskegon Lakeshore Project

SAMPLE ID: St 22 B1 (1/2-2')

SAMPLE DATE:	03/04/97
SAMPLE RECEIVED:	03/05/97
SAMPLE TYPE:	Soil
SAMPLER:	tk

EPA 8270 Polynuclear Aromatic Hydrocarbons	RESULTS (mg/kg)
Naphthalene	* < 0.46
2-Methylnaphthalene	* < 0.46
Acenaphthylene	* < 0.46
Acenaphthene	* < 0.46
Fluorene	* < 0.46
Phenanthrene	0.69
Anthracene	* < 0.46
Fluoranthene	0.86
Pyrene	0.87
Benzo[a]anthracene	* < 0.46
Chrysene	0.52
Benzo[b]fluoranthene	0.82
Benzo[k]fluoranthene	* < 0.46
Benzo[a]pyrene	0.48
Indeno[1,2,3-cd]pyrene	* < 0.46
Dibenzo[a,h]anthracene	* < 0.46
Benzo[g,h,i]perylene	* < 0.46

* Reporting limits for this sample were elevated due to a post extraction dilution required based on matrix interferences present in the sample.

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Mr. Matt Czemiak
Superior Environmental Corporation
2201 Wolf Lake Road
Muskegon, MI 49442-4845

TRACE ID:	R208-08
REPORT DATE:	03/12/97
ANALYSIS DATE:	03/12/97
EXTRACTION DATE:	03/10/97
ANALYST:	avl
D.L. MULTIPLIER:	6.77

CLIENT ID: Project #MK1246
Muskegon Lakeshore Project

SAMPLE ID: St 27 B1 (1/2-2')

SAMPLE DATE:	03/04/97
SAMPLE RECEIVED:	03/05/97
SAMPLE TYPE:	Soil
SAMPLER:	tk

EPA 8270 Polynuclear Aromatic Hydrocarbons	RESULTS (mg/kg)
Naphthalene	3.5
2-Methylnaphthalene	1.3
Acenaphthylene	0.68
Acenaphthene	2.7
Fluorene	2.4
Phenanthrene	17
Anthracene	4.0
Fluoranthene	16
Pyrene	14
Benzo[a]anthracene	5.6
Chrysene	4.8
Benzo[b]fluoranthene	7.1
Benzo[k]fluoranthene	2.4
Benzo[a]pyrene	5.3
Indeno[1,2,3-cd]pyrene	2.5
Dibenzo[a,h]anthracene	* < 0.56
Benzo[g,h,i]perylene	2.2

* Reporting limits for this sample were elevated due to a post extraction dilution required based on matrix interferences present in the sample.

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Mr. Matt Czemiak
Superior Environmental Corporation
2201 Wolf Lake Road
Muskegon, MI 49442-4845

TRACE ID:	R208-10
REPORT DATE:	03/11/97
ANALYSIS DATE:	03/11/97
EXTRACTION DATE:	03/11/97
ANALYST:	avl
D.L. MULTIPLIER:	7.48

CLIENT ID: Project #MK1246
Muskegon Lakeshore Project

SAMPLE ID: St 32 B1 (1/2')

SAMPLE DATE:	03/04/97
SAMPLE RECEIVED:	03/05/97
SAMPLE TYPE:	Soil
SAMPLER:	tk

EPA 8270 Polynuclear Aromatic Hydrocarbons	RESULTS (mg/kg)
Naphthalene	* < 0.62
2-Methylnaphthalene	1.1
Acenaphthylene	* < 0.62
Acenaphthene	* < 0.62
Fluorene	* < 0.62
Phenanthrene	0.76
Anthracene	* < 0.62
Fluoranthene	0.81
Pyrene	0.81
Benzo[a]anthracene	* < 0.62
Chrysene	* < 0.62
Benzo[b]fluoranthene	0.69
Benzo[k]fluoranthene	* < 0.62
Benzo[a]pyrene	* < 0.62
Indeno[1,2,3-cd]pyrene	* < 0.62
Dibenzo[a,h]anthracene	* < 0.62
Benzo[g,h,i]perylene	* < 0.62

* Reporting limits for this sample were elevated due to a post extraction dilution required based on matrix interferences present in the sample.

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Mr. Matt Czerniak
Superior Environmental Corporation
2201 Wolf Lake Road
Muskegon, MI 49442

TRACE ID: R208-01
REPORT DATE: 03/12/97
ANALYST: dc/pb

CLIENT ID: Project #MK1246
Muskegon Lakeshore Project

SAMPLE ID: St 13 B1 (1')

SAMPLE DATE: 01/08/97
SAMPLE RECEIVED: 03/05/97
SAMPLE TYPE: Soil
SAMPLER: tk

TOTAL METALS	RESULTS (mg/kg)	ANALYZED	METHOD NUMBERS
Arsenic	21	03/10/97	EPA 7060A
Barium	270 [1]	03/10/97	EPA 6010A
Cadmium	4.7	03/10/97	EPA 6010A
Chromium	35	03/10/97	EPA 6010A
Copper	230	03/10/97	EPA 6010A
Lead	310	03/10/97	EPA 6010A
Mercury	0.18	03/07/97	EPA 7471A
Selenium	<0.50 [2]	03/11/97	EPA 7740
Silver	<0.50	03/11/97	EPA 7761
Zinc	410	03/10/97	EPA 6010A

[1] The matrix spike and matrix spike duplicate recoveries were out of control low. The relative percent difference between the matrix spike and matrix spike duplicate was also out of control. All positive results and reporting limits for this analyte in the non-spiked version of the sample must be considered estimated.

[2] The matrix spike and matrix spike duplicate recoveries were out of control low. All positive results and reporting limits for this analyte in the non-spiked version of the sample must be considered estimated.

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Mr. Matt Czerniak
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Muskegon, MI 49442

TRACE ID: R208-02
REPORT DATE: 03/12/97
ANALYST: dc/pb

CLIENT ID: Project #MK1246
Muskegon Lakeshore Project

SAMPLE ID: St 13 B4 (1')

SAMPLE DATE: 01/08/97
SAMPLE RECEIVED: 03/05/97
SAMPLE TYPE: Soil
SAMPLER: tk

TOTAL METALS	RESULTS (mg/kg)	ANALYZED	METHOD NUMBERS
Arsenic	7.8	03/10/97	EPA 7060A
Barium	120	03/10/97	EPA 6010A
Cadmium	2.9	03/10/97	EPA 6010A
Chromium	25	03/10/97	EPA 6010A
Copper	160	03/10/97	EPA 6010A
Lead	130	03/10/97	EPA 6010A
Mercury	0.18	03/07/97	EPA 7471A
Selenium	<0.50	03/11/97	EPA 7740
Silver	<0.50	03/11/97	EPA 7761
Zinc	180	03/10/97	EPA 6010A

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Mr. Matt Czerniak
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2201 Wolf Lake Road
Muskegon, MI 49442

TRACE ID: R208-03
REPORT DATE: 03/12/97
ANALYST: dc/pb

CLIENT ID: Project #MK1246
Muskegon Lakeshore Project

SAMPLE ID: St 15 B1 (2')

SAMPLE DATE: 01/09/97
SAMPLE RECEIVED: 03/05/97
SAMPLE TYPE: Soil
SAMPLER: tk

TOTAL METALS	RESULTS (mg/kg)	ANALYZED	METHOD NUMBERS
Arsenic	5.3	03/10/97	EPA 7060A
Barium	49	03/10/97	EPA 6010A
Cadmium	1.1	03/10/97	EPA 6010A
Chromium	8.6	03/10/97	EPA 6010A
Copper	51	03/10/97	EPA 6010A
Lead	66	03/10/97	EPA 6010A
Mercury	0.14	03/07/97	EPA 7471A
Selenium	<0.50	03/11/97	EPA 7740
Silver	<0.50	03/11/97	EPA 7761
Zinc	57	03/10/97	EPA 6010A

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Mr. Matt Czerniak
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Muskegon, MI 49442

TRACE ID: R208-04
REPORT DATE: 03/12/97
ANALYST: dc/pb

CLIENT ID: Project #MK1246
Muskegon Lakeshore Project

SAMPLE ID: St 17 B1 (2')

SAMPLE DATE: 01/09/97
SAMPLE RECEIVED: 03/05/97
SAMPLE TYPE: Soil
SAMPLER: tk

TOTAL METALS	RESULTS (mg/kg)	ANALYZED	METHOD NUMBERS
Arsenic	11	03/10/97	EPA 7060A
Barium	77	03/10/97	EPA 6010A
Cadmium	2.8	03/10/97	EPA 6010A
Chromium	42	03/10/97	EPA 6010A
Copper	56	03/10/97	EPA 6010A
Lead	230	03/10/97	EPA 6010A
Mercury	0.12	03/07/97	EPA 7471A
Selenium	<0.50	03/11/97	EPA 7740
Silver	<0.50	03/11/97	EPA 7761
Zinc	260	03/10/97	EPA 6010A

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TRACE ID: R208-05
REPORT DATE: 03/12/97
ANALYST: dc/pb

CLIENT ID: Project #MK1246
Muskegon Lakeshore Project

SAMPLE ID: St 19 B1 (2')

SAMPLE DATE: 01/15/97
SAMPLE RECEIVED: 03/05/97
SAMPLE TYPE: Soil
SAMPLER: tk

TOTAL METALS	RESULTS (mg/kg)	ANALYZED	METHOD NUMBERS
Arsenic	7.3	03/10/97	EPA 7060A
Barium	99	03/10/97	EPA 6010A
Cadmium	1.8	03/10/97	EPA 6010A
Chromium	13	03/10/97	EPA 6010A
Copper	20	03/10/97	EPA 6010A
Lead	31	03/10/97	EPA 6010A
Mercury	<0.10	03/07/97	EPA 7471A
Selenium	<0.50	03/11/97	EPA 7740
Silver	<0.50	03/11/97	EPA 7761
Zinc	150	03/10/97	EPA 6010A

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Muskegon, MI 49442

TRACE ID: R208-06
REPORT DATE: 03/12/97
ANALYST: dc/pb

CLIENT ID: Project #MK1246
Muskegon Lakeshore Project

SAMPLE ID: St 22 B1 (1/2-2')

SAMPLE DATE: 03/04/97
SAMPLE RECEIVED: 03/05/97
SAMPLE TYPE: Soil
SAMPLER: tk

TOTAL METALS	RESULTS (mg/kg)	ANALYZED	METHOD NUMBERS
Arsenic	5.5	03/10/97	EPA 7060A
Barium	40	03/10/97	EPA 6010A
Cadmium	1.1	03/10/97	EPA 6010A
Chromium	7.8	03/10/97	EPA 6010A
Copper	25	03/10/97	EPA 6010A
Lead	88	03/10/97	EPA 6010A
Mercury	<0.10	03/07/97	EPA 7471A
Selenium	<0.50	03/11/97	EPA 7740
Silver	<0.50	03/11/97	EPA 7761
Zinc	78	03/10/97	EPA 6010A

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Mr. Matt Czerniak
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Muskegon, MI 49442

TRACE ID: R208-07
REPORT DATE: 03/12/97
ANALYST: dc/pb

CLIENT ID: Project #MK1246
Muskegon Lakeshore Project

SAMPLE ID: St 25 B1 (1/2-2')

SAMPLE DATE: 03/04/97
SAMPLE RECEIVED: 03/05/97
SAMPLE TYPE: Soil
SAMPLER: tk

TOTAL METALS	RESULTS (mg/kg)	ANALYZED	METHOD NUMBERS
Arsenic	7.8	03/10/97	EPA 7060A
Barium	71	03/10/97	EPA 6010A
Cadmium	1.8	03/10/97	EPA 6010A
Chromium	11	03/10/97	EPA 6010A
Copper	65	03/10/97	EPA 6010A
Lead	190	03/10/97	EPA 6010A
Mercury	0.36	03/07/97	EPA 7471A
Selenium	<0.50	03/11/97	EPA 7740
Silver	<0.50	03/11/97	EPA 7761
Zinc	150	03/10/97	EPA 6010A

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Mr. Matt Czemiak
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Muskegon, MI 49442

TRACE ID: R208-08
REPORT DATE: 03/12/97
ANALYST: dc/pb

CLIENT ID: Project #MK1246
Muskegon Lakeshore Project

SAMPLE ID: St 27 B1 (1/2-2')

SAMPLE DATE: 03/04/97
SAMPLE RECEIVED: 03/05/97
SAMPLE TYPE: Soil
SAMPLER: tk

TOTAL METALS	RESULTS (mg/kg)	ANALYZED	METHOD NUMBERS
Arsenic	5.3	03/10/97	EPA 7060A
Barium	45	03/10/97	EPA 6010A
Cadmium	1.5	03/10/97	EPA 6010A
Chromium	9.1	03/10/97	EPA 6010A
Copper	120	03/10/97	EPA 6010A
Lead	450	03/10/97	EPA 6010A
Mercury	0.86	03/07/97	EPA 7471A
Selenium	<0.50	03/11/97	EPA 7740
Silver	<0.50	03/11/97	EPA 7761
Zinc	120	03/10/97	EPA 6010A

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Mr. Matt Czerniak
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TRACE ID: R208-09
REPORT DATE: 03/12/97
ANALYST: dc/pb

CLIENT ID: Project #MK1246
Muskegon Lakeshore Project

SAMPLE ID: St 29 B1 (0-1')

SAMPLE DATE: 03/04/97
SAMPLE RECEIVED: 03/05/97
SAMPLE TYPE: Soil
SAMPLER: tk

TOTAL METALS	RESULTS (mg/kg)	ANALYZED	METHOD NUMBERS
Arsenic	21	03/10/97	EPA 7060A
Barium	120	03/10/97	EPA 6010A
Cadmium	5.6	03/10/97	EPA 6010A
Chromium	25	03/10/97	EPA 6010A
Copper	430	03/10/97	EPA 6010A
Lead	1300	03/10/97	EPA 6010A
Mercury	1.4	03/07/97	EPA 7471A
Selenium	<0.50	03/11/97	EPA 7740
Silver	<0.50	03/11/97	EPA 7761
Zinc	590	03/10/97	EPA 6010A

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Mr. Matt Czerniak
Superior Environmental Corporation
2201 Wolf Lake Road
Muskegon, MI 49442

TRACE ID: R208-10
REPORT DATE: 03/12/97
ANALYST: dc/pb

CLIENT ID: Project #MK1246
Muskegon Lakeshore Project

SAMPLE ID: St 32 B1 (1/2')

SAMPLE DATE: 03/04/97
SAMPLE RECEIVED: 03/05/97
SAMPLE TYPE: Soil
SAMPLER: tk

TOTAL METALS	RESULTS (mg/kg)	ANALYZED	METHOD NUMBERS
Arsenic	40	03/10/97	EPA 7060A
Barium	140	03/10/97	EPA 6010A
Cadmium	2.9	03/10/97	EPA 6010A
Chromium	35	03/10/97	EPA 6010A
Copper	240	03/10/97	EPA 6010A
Lead	310	03/10/97	EPA 6010A
Mercury	0.24	03/07/97	EPA 7471A
Selenium	<0.50	03/11/97	EPA 7740
Silver	<0.50	03/11/97	EPA 7761
Zinc	390	03/10/97	EPA 6010A

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Mr. Matt Czemiak
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TRACE ID: R208-11
REPORT DATE: 03/12/97
ANALYST: dc/pb

CLIENT ID: Project #MK1246
Muskegon Lakeshore Project

SAMPLE ID: St 37 B2 (2')

SAMPLE DATE: 03/04/97
SAMPLE RECEIVED: 03/05/97
SAMPLE TYPE: Soil
SAMPLER: tk

TOTAL METALS	RESULTS (mg/kg)	ANALYZED	METHOD NUMBERS
Arsenic	18	03/10/97	EPA 7060A
Barium	26	03/10/97	EPA 6010A
Cadmium	6.8	03/10/97	EPA 6010A
Chromium	67	03/10/97	EPA 6010A
Copper	210	03/10/97	EPA 6010A
Lead	15	03/10/97	EPA 6010A
Mercury	<0.10	03/07/97	EPA 7471A
Selenium	<0.50	03/11/97	EPA 7740
Silver	<0.50	03/11/97	EPA 7761
Zinc	23	03/10/97	EPA 6010A

Superior ENVIRONMENTAL CORP

3/12 R208

CHAIN-OF-CUSTODY RECORD

HPN 1887

SUPERIOR ENVIRONMENTAL CORP. · 2201 WOLF LAKE ROAD · MUSKEGON, MI 49442-4845 · 616-788-5558 FAX 788-5450

PROJECT NO. MK1246

DATE 3-5-97 PAGE NO. 1 of 2

PROJECT NAME: Muskegon Lakeshore Project

PROJECT LOCATION: Muskegon

PROJECT CONTACT:

PROJECT TELEPHONE NO.:

CLIENT'S REPRESENTATIVE:

PROJECT MANAGER/SUPERVISOR: Matt Czerniak

ANALYSIS DESIRED (INDICATE SEPARATE CONTAINERS): MDNR TEN METALS; PNA'S (8270)

ITEM NO.	PROJECT SAMPLE NUMBER	DATE	TIME	COMP	GRAB	SAMPLE DESCRIPTION (INCLUDE MATRIX AND POINT OF SAMPLE)	NUMBER OF CONTAINERS	MDNR TEN METALS	PNA'S (8270)	REMARKS
1	St13B1(1')	1/8			X	STATION 13 Boring 1 1' BGL	1 4oz	X		
2	St13B4(1')	1/8			X	STATION 13 Boring 4 1' BGL	1 4oz	X		
3	St15B1(2')	1/9			X	STATION 15 Boring 1 2' BGL	1 4oz	X		
4	St17B1(2')	1/9			X	STATION 17 Boring 1 2' BGL	1 4oz	X		
5	St19B1(2')	1/15			X	STATION 19 Boring 1 2' BGL	1 4oz	X		
6	St22B1(1/2-2')	3/4			X	STATION 22 Boring 1 1/2-2' BGL	2 4oz	X	X	
7	St25B1(1/2-2')	3/4			X	STATION 25 Boring 1 1/2-2' BGL	2 4oz	X		omit PNA'S
8	St27B1(1/2-2')	3/4			X	STATION 27 Boring 1 1/2-2' BGL	2 4oz	X	X	
9	St29B1(0-1')	3/4			X	STATION 29 Boring 1 0-1' BGL	2 4oz	X		
10	St32B1(1/2')	3/4			X	STATION 32 Boring 1 1/2' BGL	2 4oz	X	X	

TRANSFER NUMBER	ITEM NUMBER	TRANSFERS RELINQUISHED BY	TRANSFERS ACCEPTED BY	DATE	TIME
1	#1-10	SEC Storage	Tim Kamp	3/5	400p
2	#1-10	Tim Kamp	K. Gard	3/5	400p
3					
4					

LABORATORY: TRACE

8°C

TURNAROUND REQUIRED: Normal

RUSH: NO

SAMPLER'S SIGNATURE:

3/17 R208 8/P

Superior ENVIRONMENTAL CORP

CHAIN-OF-CUSTODY RECORD

KY

PROJECT NO. MK246

DATE 3-5-97 PAGE NO. 2 of 2

SUPERIOR ENVIRONMENTAL CORP. · 2201 WOLF LAKE ROAD · MUSKEGON, MI 49442-4845 · 616-788-5558 FAX 788-5450

PROJECT NAME: Muskegon Lakeshore Project

PROJECT LOCATION: Muskegon

PROJECT CONTACT:

PROJECT TELEPHONE NO.:

CLIENT'S REPRESENTATIVE:

PROJECT MANAGER/SUPERVISOR: Matt Czerniak

ANALYSIS DESIRED (INDICATE SEPARATE CONTAINERS): MDNR TEN METALS

ITEM NO.	PROJECT SAMPLE NUMBER	DATE	TIME	COMP	GRAB	SAMPLE DESCRIPTION (INCLUDE MATRIX AND POINT OF SAMPLE)	NUMBER OF CONTAINERS	MDNR TEN METALS	REMARKS
1	St37B2(2')	3/4				STATION 37 Boring 2 2' BGL	2 4oz	X	
2									
3									
4									
5									
6									
7									
8									
9									
10									

TRANSFER NUMBER	ITEM NUMBER	TRANSFERS RELINQUISHED BY	TRANSFERS ACCEPTED BY	DATE	TIME
1	#1	SEC Storage	Jim Kamp	3/5	400p
2	#1	Timothy Kamp	K. Jardine	3/5	400p
3					
4					

LABORATORY: TRACE 8°C

TURNAROUND REQUIRED: Normal

RUSH: NO

SAMPLER'S SIGNATURE: Timothy Kamp

PROFESSIONAL ENVIRONMENTAL SERVICES