DRAFT

PRELIMINARY SITE INVESTIGATION

MOUNT MORRIS DUMP SITE
Genesee Township, Michigan

SEPTEMBER 1991
REF. NO. 3990 (2)

CONESTOGA-ROVERS & ASSOCIATES

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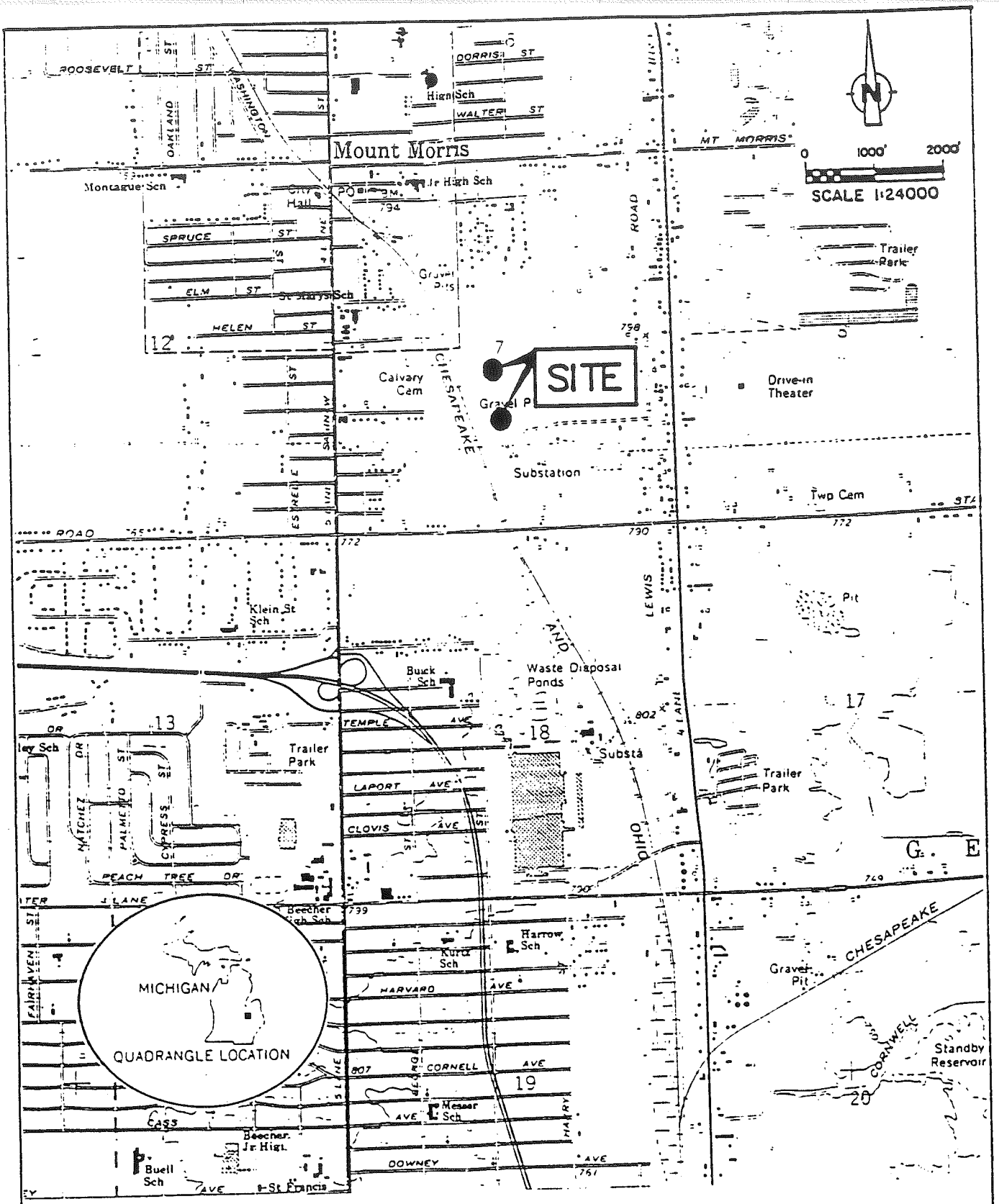
1.0 INTRODUCTION

Conestoga-Rovers & Associates, Inc. (CRA) recently conducted a Preliminary Site Investigation at the Mount Morris Dump Site (Site) as part of an "Investigation Work Plan" presented by CRA in April, 1991.

The purpose of the Preliminary Site Investigation was to characterize the general nature and extent of alleged PCB, VOC, Metals, and Cyanide contamination of the subsurface soils, ditch sediments, and groundwater on Site. Field activities on Site commenced June 25, 1991, and were completed June 28, 1991.

CRA had been retained by the law firm of Warner, Norcross & Judd, acting on behalf of General Motors Corporation (GM), to conduct the Preliminary Site Investigation. STS consultants based out of Lansing, Michigan, were hired by the law firm of Gault, Davison, Bowers, Hill, Parker & McAra on behalf of the owner Mr. Summerfield, to conduct a duplicate audit of the Site, as per the agreement between the two responsible parties. The Site is located in Section 7, ~~T43N, R8E~~ 13, T8N, R6E, in Genesee Township, Michigan. Also, the Site is approximately one-quarter of a mile southeast of the City of Mount Morris, Michigan, as shown in Figure 1.1. Illustrated in Figure 1.2 is the Site Plan which depicts the Site superimposed on a 1987 aerial photograph.

The Preliminary Site Investigation was conducted at three distinct locations within the Site area. CRA field personnel sampled woodblocks, subsurface soils, and groundwater at Disposal Area No. 1, shown in Figure 1.3. Subsurface soils and groundwater were sampled at Disposal Area No. 2, shown in Figure 1.4. The last sampling location, shown in Figure 1.5, focused on ditch sediments adjacent to the two disposal areas mentioned above.



SUORCE: USGS QUADRANGLE
FLINT NORTH, MICH.

figure 1.1

SITE LOCATION
MOUNT MORRIS DUMP SITE
Genesee County, Michigan

CRA

3990-02/04/91-1-0

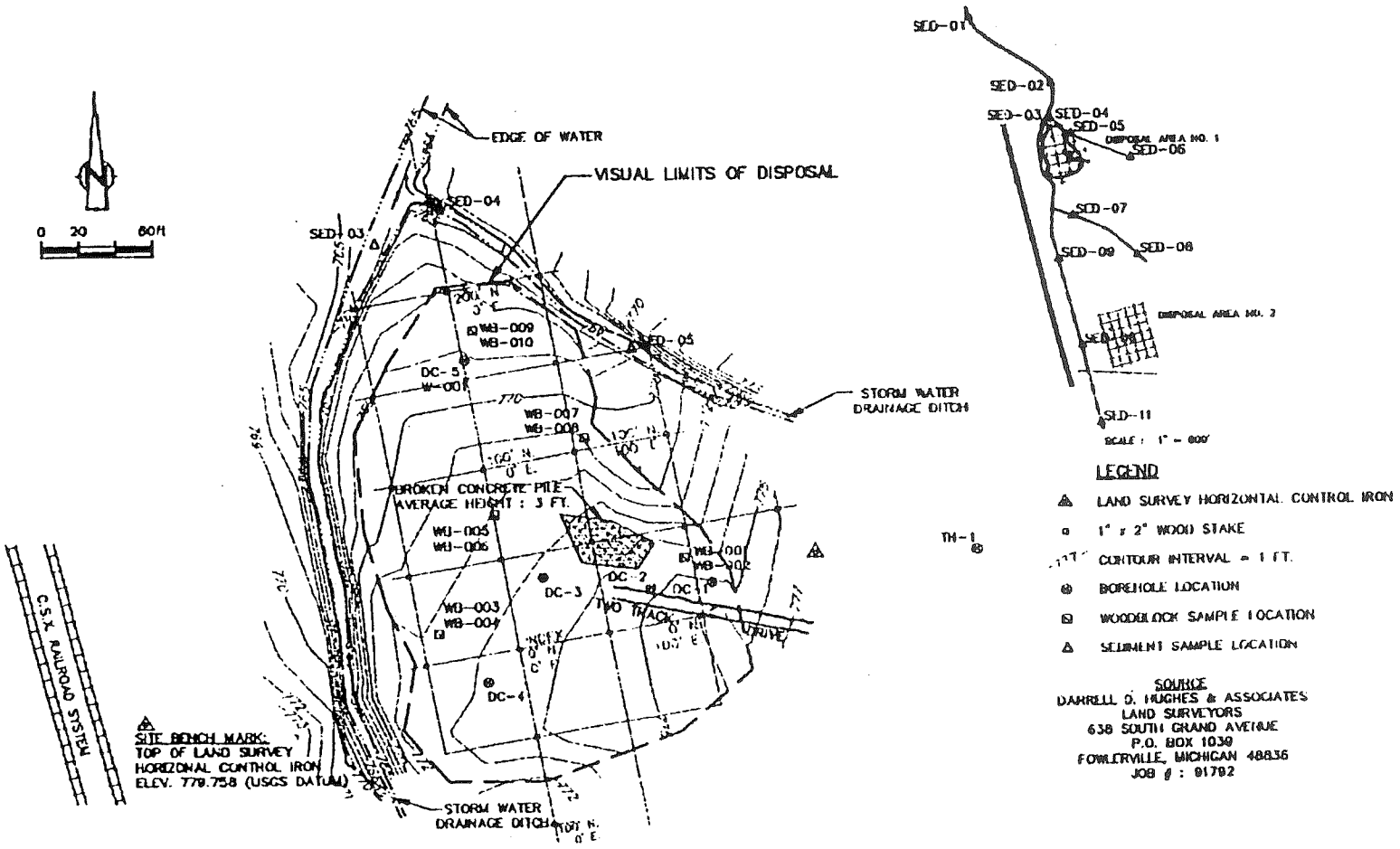
figure 1.2

SITE PLAN
MOUNT MORRIS DUMP SITE
Genesee County, Michigan

SOURCE: ~~1967~~ AERIAL PHOTOGRAPH
1987 ← need to use updated aerial photo

CRA

3990-03/04/91-1-0



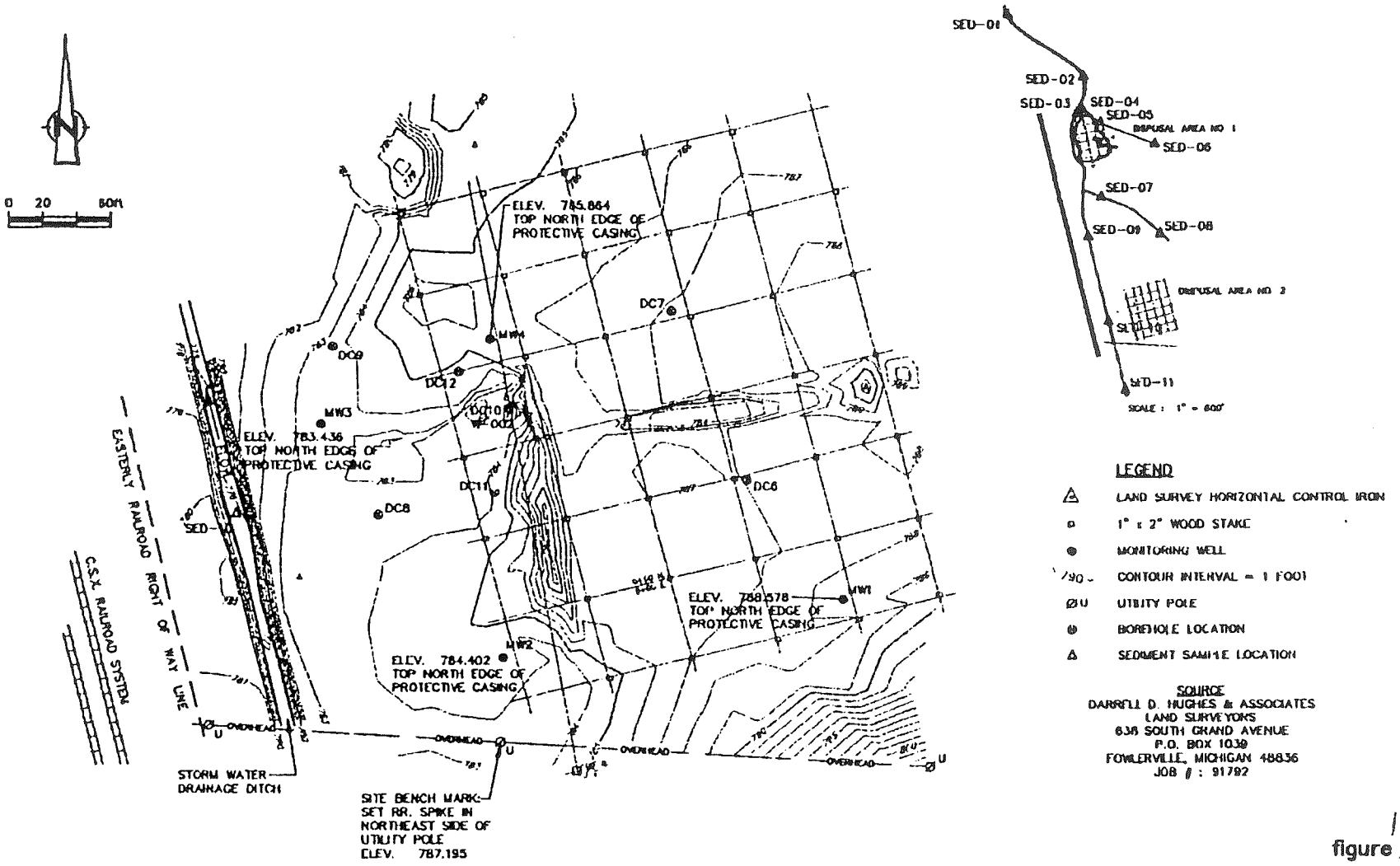
1.3

figure 1

SAMPLING LOCATIONS–DISPOSAL AREA No.1
MOUNT MORRIS DUMP SITE
Genesee County, Michigan

CRA

3990-20/08/91-0-3 (A-03)



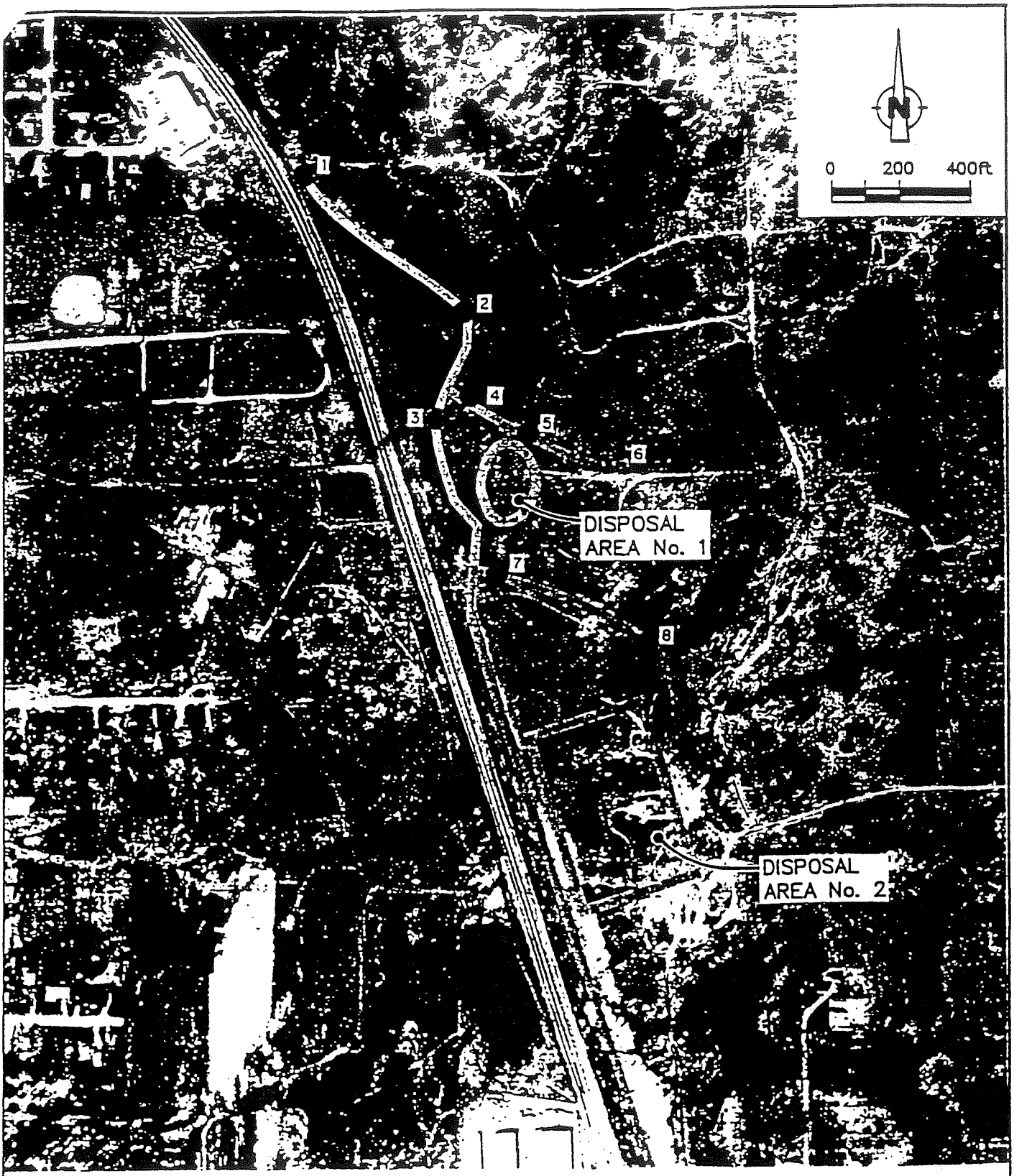
1.4

figure 2

SAMPLING LOCATIONS–DISPOSAL AREA No.2
MOUNT MORRIS DUMP SITE
Genesee County, Michigan

CRA

3980-20/08/91-0-3 (P-04)



SOURCE: AERIAL PHOTOGRAPHY, APRIL 1987

LEGEND

DITCH

DITCH SEDIMENT SAMPLING LOCATION

figure 1.5

DITCH SEDIMENT SAMPLING LOCATIONS
MOUNT MORRIS DUMP SITE
Genesee County, Michigan

CRA

3990-23/05/91-L-0

Finally, the subsurface soil, sediment, and groundwater analytical results presented in the Preliminary Site Investigation were obtained from the samples collected during the scope of field work on Site. Subsurface soil, sediment, and groundwater samples were delivered to Wadsworth/ALERT Laboratories in North Canton, Ohio. The samples were shipped on ice in sealed coolers under chain of custody for the analysis of PCB's, VOC's, Metals, and Cyanide. Also, twelve subsurface soil samples were selected for Grain Size Distribution Analysis (GSDA). The GSDA samples were tested by CTI & Associates, Inc. (CTI) of Farmington Hills, Michigan.

1.1 SITE DESCRIPTION

The Site is located in an area with low to moderate topographic relief. Elevations on Site ranged from 767 to 789 feet above mean sea level (AMSL).

At Disposal Area No. 1, the surface elevations sloped gently toward the main storm water drainage ditch on the western side of the Site. A tributary drainage ditch located north of Disposal Area No. 1 discharges surface water into the main storm water drainage ditch. Disposal Area No. 1 is approximately one acre in size and is situated approximately 400 feet north of Disposal Area No. 2.

Two elongated swales were located within Disposal Area No. 2. A steep hill rising above 800 feet AMSL is located on the south side of Disposal Area No. 2. Surface water generally flowed to the main storm water drainage ditch on the west side of the Site. Disposal Area No. 2 is approximately two acres in size.

1.2 TECHNICAL MEMORANDUM ORGANIZATION

This Technical Memorandum has been developed to present the analytical results for soil, geotechnical, groundwater, sediment, and woodblock samples obtained during the Preliminary Site Investigation. This memorandum is presented as the following sections:

Section 2.0 Schedule/Personnel
Section 3.0 Methodology
Section 4.0 Field Work
Section 5.0 Results
Section 6.0 Discussion of Results
Section 7.0 Summary

Section 2.0 presents the schedule and personnel involved during the completion of the Preliminary Site Investigation.

Section 3.0 describes the methods and protocols utilized to conduct the soil, geotechnical, groundwater, sediment, and woodblock sampling.

Section 4.0 describes the work completed and problems encountered during field activities.

Section 5.0 provides a summary of the soil, groundwater, sediment, and woodblock analytical results received by CRA from Wadsworth/ALERT Laboratories.

Section 6.0 presents a discussion of the information developed during the Preliminary Site Investigation.

Finally, Section 7.0 presents a summary of the information presented in this Technical Memorandum.

2.0 SCHEDULE/PERSONNEL

The boreholes installed during the Preliminary Site Investigation were completed between June 25, 1991 and June 28, 1991 by Professional Service Industries, Inc. (PSI) of Lansing, Michigan and CTI of Farmington Hills, Michigan.. This work was conducted under joint supervision of CRA and STS Consultants. CRA collected all samples and logged each borehole by examination of continuous auger samples and observation of drill performance.

Chemical analyses for selected soil, groundwater, sediment, and woodblock samples were performed by Wadsworth/ALERT Laboratories between June and August of 1991. In addition to the chemical analyses, 12 subsurface soil samples were analyzed for GSDA, conducted by CTI, in July, 1991.

Data compilation, reduction and validation was completed by CRA in August and September of 1991.

3.0 METHODOLOGY

Drilling was conducted by Professional Service Industries, Inc. utilizing a CME-55 wheel mounted drill rig. In order to complete the field activities by June 28, 1991, it was necessary to hire CTI to assist in the completion of the soil and groundwater investigation on Site. CTI utilized an all terrain vehicle for drilling through the soils on Site. All boreholes were drilled using either 4 1/4-inch inside diameter (ID) or 3 3/4-inch ID hollow stem augers (HSA). A total of 12 boreholes were drilled by Professional Services Industries, Inc. and CTI. One test boring was completed at Disposal Area No. 1 to define the eastern limit of the fill area.

Hollow stem augers and coring rods were five feet in length. The coring rods were inserted through the center of the augers providing a continuous soil core along the entire depth of the boring. In order to minimize the potential for cross contamination, the coring rods and HSAs were decontaminated between boreholes using a high pressure, low volume steam cleaner.

Continuous split-spoon soil samples were collected every borehole (when possible), and the soil horizons were recorded on stratigraphic borehole log sheets. Soil samples along the entire length of the borehole were screened with a HNu for organic vapors. These samples were bottled, cooled and shipped via Federal Express to Wadsworth/ALERT for chemical analysis and CTI for geotechnical analysis.

Additional soil samples required to provide a geologic record of each borehole were collected in sufficient quantity to provide a representative record of the entire length of the borehole. The geologic investigative samples collected from the boreholes were stored in the CRA Romulus, Michigan office for future reference.

The purpose of the subsurface soil survey was to determine the vertical and horizontal extent of contamination, if any. The upper and lower elevation soil samples from each borehole were designated respectively as the A and B samples, (e.g. DC-1-A, DC-1-B).

After completion of each borehole, the augers and coring rods were steam cleaned and when necessary, drill rig decontamination was performed.

Three boreholes were used as boreholes in selected shallow and deep boreholes. Groundwater samples were collected after the groundwater was purged through the stainless steel augers.

Each borehole was subsequently grouted to surface using bentonite and cement.

Each monitoring well was subsequently developed to a silt-free condition (if possible) utilizing pre-cleaned dedicated bottom filling stainless steel bailers. After each successive well volume was removed, purged water was tested for pH, conductivity and temperature to determine the stability of the geochemistry of the water. Once the monitoring well was developed, the well was purged a minimum of three additional well volumes prior to sampling.

Groundwater samples were then collected, cooled and shipped via Federal Express to Wadsworth/ALERT for analysis.

4.0 FIELD WORK

4.1 BOREHOLE INSTALLATION

Field work activities were conducted between June 25, 1991 and June 28, 1991. During this period, one test boring was completed and sampled. Boreholes DC5 through DC10 were used as boreholes and the groundwater samples were tested by Wadsworth/ALERT Laboratories. Table 4.1 summarizes the total depth of each borehole completed as part of the Preliminary Site Investigation. A summary of groundwater sampling analyses is provided in Table 4.2. The five boreholes designated as temporary wells were grouted to surface on June 28, 1991 after groundwater sampling was completed. The locations of all boreholes are presented on Figure 1.3 and Figure -1.4.

Borehole stratigraphic log details are provided in Appendix A.

TABLE 4.1

PRELIMINARY SITE INVESTIGATON
SOIL BOREHOLE DEPTHS
MOUNT MORRIS DUMP SITE
GENESEE TOWNSHIP, MICHIGAN

Date	*Drilling Company*	*Borehole No.*	*Location*	*Total Depth (feet)*
6-25-91	PSI	TH-1	0+09N, 2+50E	4.0
6-25-91	PSI	DC-1	0+17N, 1+08E	9.5
6-25-91	PSI	DC-2	0+20N, 0+76E	6.0
6-27-91	PSI	DC-3	0+36N, 0+20E	~~17.0~~ 16.5
6-27-91	CTI	DC-4	0+15S, 0+20W	9.5
6-27-91	PSI	DC-5	1~~5~~+61N, 0+01E	17.0
6-27-91	CTI	DC-6	0+47N, 0+57.5E	9.0
6-27-91	CTI	DC-7	1+55N, 0+41E	12.0
6-28-91	CTI	DC-8	0+79N, 1+56[redacted]W	9.0
6-28-91	CTI	DC-9	1+83N, 1+56[redacted]W	9.0
6-28-91	PSI	DC-10	1+22N, 0+66.5[redacted]W	20.0
6-28-91	CTI	DC-11	0+75.5N, 0+87[redacted]W	10.0
6-28-91	PSI	DC-12	1+50N, 0+89.5[redacted]W	9.5

TABLE ~~4~~ 4.2

SOIL SAMPLING SUMMARY
MOUNT MORRIS DUMP SITE
GENESEE TOWNSHIP, MICHIGAN

Location	*Sample Interval (Depth Below Ground Surface ~~(ft.)~~ in feet)*	*HNU Reading (ppm)*
DC-1A0		
DC-1B0		
DC-1C0		
DC-2A0		
DC-2B0		
DC-3A		
DC-3B		
DC-3C		
DC-3D		
DC-3E		
DC-3F		
DC-3G		
DC-3H		
DC-3I		
DC-3J		
DC-4A-10		
DC-4A-20		
DC-4B0		
DC-4C0		
DC-4D0		
DC-4E0		
DC-5A		
DC-5B		
DC-5C		

NOTE: Analyses Requested = PCB, EP Toxicity Metals (plus Copper and Zinc), Total Cyanide, VOC - (Michigan Scan 1 & Scan 2 Lists)

TABLE 3 4.2

SOIL SAMPLES
SUMMARY OF ANALYTICAL RESULTS

PARAMETER VOLATILE ORGANICS (µg/kg)	DC2A	DC2B	DC14B (DC2B DUP.)	DC3A	DC3B
Benzene	< 2	< 2	< 2	< 2	< 2
Benzyl chloride	< 2	< 2	< 2	< 2	< 2
Bromobenzene	< 2	< 2	< 2	< 2	< 2
Bromodichloromethane	< 2	< 2	< 2	< 2	< 2
Bromoform	< 2	< 2	< 2	< 2	< 2
Bromomethane	< 2	< 2	< 2	< 2	< 2
Carbon Tetrachloride	< 2	< 2	< 2	< 2	< 2
Chlorobenzene	< 2	< 2	< 2	< 2	< 2
Chloroethane	< 2	< 2	< 2	< 2	< 2
Chloroform	< 2	< 2	< 2	< 2	< 2
1-Chlorohexane	< 2	< 2	< 2	< 2	< 2
2-Chloroethyl vinyl ether	< 2	< 2	< 2	< 2	< 2
Chloromethane	< 2	< 2	< 2	< 2	< 2
Chlorotoluene	< 2	< 2	< 2	< 2	< 2
Dibromochloromethane	< 2	< 2	< 2	< 2	< 2
Dibromomethane	< 2	< 2	< 2	< 2	< 2
1,2-Dichlorobenzene	< 2	< 2	< 2	< 2	< 2
1,3-Dichlorobenzene	< 2	< 2	< 2	< 2	< 2
1,4-Dichlorobenzene	< 2	< 2	< 2	< 2	< 2
Dichlorodifluoromethane	< 2	< 2	< 2	< 2	< 2
1,1-Dichloroethane	< 2	< 2	< 2	< 2	< 2
1,2-Dichloroethane	< 2	< 2	< 2	< 2	< 2
1,1-Dichloroethylene	< 2	< 2	< 2	< 2	< 2
cis-1,2-Dichloroethylene	< 2	< 2	< 2	< 2	< 2
trans-1,2-Dichloroethylene	< 2	< 2	< 2	< 2	< 2
Dichloromethane	< 2	< 2	< 2	< 2	< 2
1,2-Dichloropropane	< 2	< 2	< 2	< 2	< 2
trans-1,3-Dichloropropylene	< 2	< 2	< 2	< 2	< 2
Ethylbenzene	< 2	< 2	< 2	< 2	< 2
1,1,2,2-Tetrachloroethane	< 2	< 2	< 2	< 2	< 2
1,1,1,2-Tetrachloroethane	< 2	< 2	< 2	< 2	< 2
Tetrachloroethylene	< 2	< 2	< 2	< 2	< 2
Toluene	2	10	17	< 2	< 2
1,1,1-Trichloroethane	< 2	< 2	< 2	< 2	< 2
1,1,2-Trichloroethane	< 2	< 2	< 2	< 2	< 2
Trichloroethylene	< 2	< 2	< 2	< 2	< 2

TABLE 3 4.2

SOIL SAMPLES
SUMMARY OF ANALYTICAL RESULTS

PARAMETER	DC2A	DC2B	DC14B (DC2B DUP.)	DC3A	DC3B
VOLATILE ORGANICS (µg/kg)					
Trichlorofluoromethane	< 2	< 2	< 2	< 2	< 2
Trichloropropane	< 2	< 2	< 2	< 2	< 2
Vinyl Chloride	< 2	< 2	< 2	< 2	< 2
Xylenes	< 2	< 2	< 2	< 2	< 2
PCBs (mg/kg)					
PCB 1016	< 1	< 1	< 1	< 1	NA
PCB 1221	< 1	< 1	< 1	< 1	NA
PCB 1232	< 1	< 1	< 1	< 1	NA
PCB 1242	< 1	< 1	< 1	< 1	NA
PCB 1248	< 1	< 1	< 1	< 1	NA
PCB 1254	< 1	< 1	< 1	< 1	NA
PCB 1260	< 1	< 1	< 1	< 1	NA
PCB 1262	NA	NA	NA	NA	NA
METALS & CYANIDE (µg/l)					
Arsenic	< 5	< 5	< 5	< 5	NA
Barium	610	580	580	980	NA
Cadmium	24	5	6	38	NA
Chromium	12	< 10	< 10	14	NA
Copper	11	< 10	11	780	NA
Lead	6	< 5	< 5	120	NA
Mercury	< 0.2	< 0.2	< 0.2	< 0.2	NA
Selenium	< 5	< 5	< 5	< 5	NA
Silver	< 10	< 10	< 10	< 10	NA
Zinc	8400	78	170	670000	NA
Cyanide (mg/kg)	< 0.25	< 0.25	< 0.25	1.3	NA

NOTES:
NA - Not analysed.
Data have not been validated by CRA's QA/QC officer.

TABLE 3 4.2

SOIL SAMPLES
SUMMARY OF ANALYTICAL RESULTS

PARAMETER	DC3J	DC4B	DC4E	DC5A	DC5G
VOLATILE ORGANICS (µg/kg)					
Benzene	< 2	< 2	< 2	< 2	< 2
Benzyl chloride	< 2	< 2	< 2	< 2	< 2
Bromobenzene	< 2	< 2	< 2	< 2	< 2
Bromodichloromethane	< 2	< 2	< 2	< 2	< 2
Bromoform	< 2	< 2	< 2	< 2	< 2
Bromomethane	< 2	< 2	< 2	< 2	< 2
Carbon Tetrachloride	< 2	< 2	< 2	< 2	< 2
Chlorobenzene	< 2	< 2	< 2	< 2	< 2
Chloroethane	< 2	< 2	< 2	< 2	< 2
Chloroform	< 2	< 2	< 2	< 2	< 2
1-Chlorohexane	< 2	< 2	< 2	< 2	< 2
2-Chloroethyl vinyl ether	< 2	< 2	< 2	< 2	< 2
Chloromethane	< 2	< 2	< 2	< 2	< 2
Chlorotoluene	< 2	< 2	< 2	< 2	< 2
Dibromochloromethane	< 2	< 2	< 2	< 2	< 2
Dibromomethane	< 2	< 2	< 2	< 2	< 2
1,2-Dichlorobenzene	< 2	< 2	< 2	< 2	< 2
1,3-Dichlorobenzene	< 2	< 2	< 2	< 2	< 2
1,4-Dichlorobenzene	< 2	< 2	< 2	< 2	< 2
Dichlorodifluoromethane	< 2	< 2	< 2	< 2	< 2
1,1-Dichloroethane	< 2	< 2	< 2	< 2	< 2
1,2-Dichloroethane	< 2	< 2	< 2	< 2	< 2
1,1-Dichloroethylene	< 2	< 2	< 2	< 2	< 2
cis-1,2-Dichloroethylene	< 2	< 2	< 2	< 2	< 2
trans-1,2-Dichloroethylene	< 2	< 2	< 2	< 2	< 2
Dichloromethane	< 2	< 2	< 2	< 2	< 2
1,2-Dichloropropane	< 2	< 2	< 2	< 2	< 2
trans-1,3-Dichloropropylene	< 2	< 2	< 2	< 2	< 2
Ethylbenzene	< 2	< 2	< 2	< 2	< 2
1,1,2,2-Tetrachloroethane	< 2	< 2	< 2	< 2	< 2
1,1,1,2-Tetrachloroethane	< 2	< 2	< 2	< 2	< 2
Tetrachloroethylene	< 2	< 2	< 2	< 2	< 2
Toluene	< 2	< 2	2	2	< 2
1,1,1-Trichloroethane	< 2	< 2	< 2	< 2	< 2
1,1,2-Trichloroethane	< 2	< 2	< 2	< 2	< 2
Trichloroethylene	< 2	< 2	< 2	< 2	< 2

TABLE 4.2

SOIL SAMPLES
SUMMARY OF ANALYTICAL RESULTS

PARAMETER	DC3J	DC4B	DC4E	DC5A	DC5G
VOLATILE ORGANICS (µg/kg)					
Trichlorofluoromethane	< 2	< 2	< 2	< 2	< 2
Trichloropropane	< 2	< 2	< 2	< 2	< 2
Vinyl Chloride	< 2	< 2	< 2	< 2	< 2
Xylenes	< 2	2600	< 2	< 2	< 2
PCBs (mg/kg)					
PCB 1016	< 1	< 1	< 1	< 1	< 1
PCB 1221	< 1	< 1	< 1	< 1	< 1
PCB 1232	< 1	< 1	< 1	< 1	< 1
PCB 1242	< 1	< 1	< 1	5	< 1
PCB 1248	< 1	< 1	< 1	< 1	< 1
PCB 1254	< 1	< 1	< 1	< 1	< 1
PCB 1260	< 1	< 1	< 1	< 1	< 1
PCB 1262	NA	NA	NA	NA	NA
METALS & CYANIDE (µg/l)					
Arsenic	< 5	< 5	< 5	< 5	5
Barium	230	650	250	1200	280
Cadmium	7	26	10	13	< 5
Chromium	< 10	< 10	< 10	92	< 10
Copper	18	< 10	35	< 10	< 10
Lead	7	< 5	< 5	25	62
Mercury	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Selenium	< 5	< 5	< 5	< 5	< 5
Silver	< 10	< 10	< 10	< 10	< 10
Zinc	1000	85000	1500	340000	2900
Cyanide (mg/kg)	< 0.25	0.29	< 0.25	0.29	< 0.25

NOTES:
NA - Not analysed.
Data have not been validated by CRA's QA/QC officer.

TABLE 4.2

SOIL SAMPLES
SUMMARY OF ANALYTICAL RESULTS

PARAMETER	DC6B	DC6C	DC7B	DC7E	DC8D
VOLATILE ORGANICS (µg/kg)					
Benzene	< 2	< 2	< 2	< 2	< 2
Benzyl chloride	< 2	< 2	< 2	< 2	< 2
Bromobenzene	< 2	< 2	< 2	< 2	< 2
Bromodichloromethane	< 2	< 2	< 2	< 2	< 2
Bromoform	< 2	< 2	< 2	< 2	< 2
Bromomethane	< 2	< 2	< 2	< 2	< 2
Carbon Tetrachloride	< 2	< 2	< 2	< 2	< 2
Chlorobenzene	< 2	< 2	< 2	< 2	< 2
Chloroethane	< 2	< 2	< 2	< 2	< 2
Chloroform	< 2	< 2	< 2	< 2	< 2
1-Chlorohexane	< 2	< 2	< 2	< 2	< 2
2-Chloroethyl vinyl ether	< 2	< 2	< 2	< 2	< 2
Chloromethane	< 2	< 2	< 2	< 2	< 2
Chlorotoluene	< 2	< 2	< 2	< 2	< 2
Dibromochloromethane	< 2	< 2	< 2	< 2	< 2
Dibromomethane	< 2	< 2	< 2	< 2	< 2
1,2-Dichlorobenzene	< 2	< 2	< 2	< 2	< 2
1,3-Dichlorobenzene	< 2	< 2	< 2	< 2	< 2
1,4-Dichlorobenzene	< 2	< 2	< 2	< 2	< 2
Dichlorodifluoromethane	< 2	< 2	< 2	< 2	< 2
1,1-Dichloroethane	< 2	< 2	< 2	< 2	< 2
1,2-Dichloroethane	< 2	< 2	< 2	< 2	< 2
1,1-Dichloroethylene	< 2	< 2	< 2	< 2	< 2
cis-1,2-Dichloroethylene	< 2	< 2	< 2	< 2	< 2
trans-1,2-Dichloroethylene	< 2	< 2	< 2	< 2	< 2
Dichloromethane	< 2	< 2	< 2	< 2	< 2
1,2-Dichloropropane	< 2	< 2	< 2	< 2	< 2
trans-1,3-Dichloropropylene	< 2	< 2	< 2	< 2	< 2
Ethylbenzene	8	< 2	< 2	< 2	< 2
1,1,2,2-Tetrachloroethane	< 2	< 2	< 2	< 2	< 2
1,1,1,2-Tetrachloroethane	< 2	< 2	< 2	< 2	< 2
Tetrachloroethylene	< 2	< 2	< 2	< 2	< 2
Toluene	19	< 2	< 2	< 2	< 2
1,1,1-Trichloroethane	< 2	< 2	< 2	< 2	< 2
1,1,2-Trichloroethane	< 2	< 2	< 2	< 2	< 2
Trichloroethylene	< 2	< 2	< 2	< 2	< 2

TABLE 4.2

SOIL SAMPLES
SUMMARY OF ANALYTICAL RESULTS

PARAMETER	DC6B	DC6C	DC7B	DC7E	DC8D
VOLATILE ORGANICS (µg/kg)					
Trichlorofluoromethane	< 2	< 2	< 2	< 2	< 2
Trichloropropane	< 2	< 2	< 2	< 2	< 2
Vinyl Chloride	< 2	< 2	< 2	< 2	< 2
Xylenes	37	< 2	< 2	5	< 2
PCBs (mg/kg)					
PCB 1016	< 1	< 1	< 1	< 1	< 1
PCB 1221	< 1	< 1	< 1	< 1	< 1
PCB 1232	< 1	< 1	< 1	< 1	< 1
PCB 1242	< 1	< 1	< 1	< 1	< 1
PCB 1248	< 1	< 1	< 1	< 1	< 1
PCB 1254	< 1	< 1	< 1	< 1	< 1
PCB 1260	< 1	< 1	< 1	< 1	< 1
PCB 1262	NA	NA	NA	NA	NA
METALS & CYANIDE (µg/l)					
Arsenic	< 5	< 5	< 5	< 5	< 5
Barium	310	340	150	250	390
Cadmium	< 5	< 5	< 5	7	< 5
Chromium	< 10	< 10	< 10	< 10	< 10
Copper	< 10	< 10	< 10	< 10	86
Lead	6	< 5	< 5	6	< 5
Mercury	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Selenium	< 5	< 5	< 5	< 5	< 5
Silver	< 10	< 10	< 10	< 10	< 10
Zinc	70	65	98	96	58
Cyanide (mg/kg)	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25

NOTES:
NA - Not analysed.
Data have not been validated by CRA's QA/QC officer.

TABLE 4.2

SOIL SAMPLES
SUMMARY OF ANALYTICAL RESULTS

PARAMETER VOLATILE ORGANICS (µg/kg)	DC9B	DC10A	DC10B	DC15B	DC10C
Benzene	< 2	< 2	< 100,000	< 20,000	< 100,000
Benzyl chloride	< 2	< 2	< 100,000	< 20,000	< 100,000
Bromobenzene	< 2	< 2	< 100,000	< 20,000	< 100,000
Bromodichloromethane	< 2	< 2	< 100,000	< 20,000	< 100,000
Bromoform	< 2	< 2	< 100,000	< 20,000	< 100,000
Bromomethane	< 2	< 2	< 100,000	< 20,000	< 100,000
Carbon Tetrachloride	< 2	< 2	< 100,000	< 20,000	< 100,000
Chlorobenzene	< 2	< 2	< 100,000	< 20,000	< 100,000
Chloroethane	< 2	< 2	< 100,000	< 20,000	< 100,000
Chloroform	< 2	< 2	< 100,000	< 20,000	< 100,000
1-Chlorohexane	< 2	< 2	< 100,000	< 20,000	< 100,000
2-Chloroethyl vinyl ether	< 2	< 2	< 100,000	< 20,000	< 100,000
Chloromethane	< 2	< 2	< 100,000	< 20,000	< 100,000
Chlorotoluene	< 2	< 2	< 100,000	< 20,000	< 100,000
Dibromochloromethane	< 2	< 2	< 100,000	< 20,000	< 100,000
Dibromomethane	< 2	< 2	< 100,000	< 20,000	< 100,000
1,2-Dichlorobenzene	< 2	< 2	< 100,000	< 20,000	< 100,000
1,3-Dichlorobenzene	< 2	< 2	< 100,000	< 20,000	< 100,000
1,4-Dichlorobenzene	< 2	< 2	< 100,000	< 20,000	< 100,000
Dichlorodifluoromethane	< 2	< 2	< 100,000	< 20,000	< 100,000
1,1-Dichloroethane	< 2	< 2	< 100,000	< 20,000	< 100,000
1,2-Dichloroethane	< 2	< 2	< 100,000	< 20,000	< 100,000
1,1-Dichloroethylene	< 2	< 2	< 100,000	< 20,000	< 100,000
cis-1,2-Dichloroethylene	< 2	< 2	< 100,000	< 20,000	< 100,000
trans-1,2-Dichloroethylene	< 2	< 2	< 100,000	< 20,000	< 100,000
Dichloromethane	< 2	< 2	< 100,000	< 20,000	< 100,000
1,2-Dichloropropane	< 2	< 2	< 100,000	< 20,000	< 100,000
trans-1,3-Dichloropropylene	< 2	< 2	< 100,000	< 20,000	< 100,000
Ethylbenzene	< 2	9	120,000	< 530,000	< 100,000
1,1,2,2-Tetrachloroethane	< 2	< 2	< 100,000	< 20,000	< 100,000
1,1,1,2-Tetrachloroethane	< 2	< 2	< 100,000	< 20,000	< 100,000
Tetrachloroethylene	< 2	< 2	< 100,000	< 20,000	< 100,000
Toluene	< 2	48	130,000	< 1,900,000	< 100,000
1,1,1-Trichloroethane	< 2	< 2	< 100,000	< 20,000	< 100,000
1,1,2-Trichloroethane	< 2	< 2	< 100,000	< 20,000	< 100,000
Trichloroethylene	< 2	< 2	< 100,000	< 20,000	< 100,000

TABLE 3 4.2

SOIL SAMPLES
SUMMARY OF ANALYTICAL RESULTS

PARAMETER	DC9B	DC10A	DC10B	DC15B	DC10C
VOLATILE ORGANICS (µg/kg)					
Trichlorofluoromethane	< 2	< 2	< 100,000	< 20,000	< 100,000
Trichloropropane	< 2	< 2	< 100,000	< 20,000	< 100,000
Vinyl Chloride	< 2	< 2	< 100,000	< 20,000	< 100,000
Xylenes	< 2	64	< 100,000	3,100,000	110,000
PCBs (mg/kg)					
PCB 1016	< 1	< 1	< 1	< 1	< 1
PCB 1221	< 1	< 1	< 1	< 1	< 1
PCB 1232	< 1	< 1	< 1	< 1	< 1
PCB 1242	< 1	< 1	< 1	< 1	< 1
PCB 1248	< 1	< 1	< 1	< 1	< 1
PCB 1254	< 1	< 1	< 1	< 1	< 1
PCB 1260	< 1	< 1	< 1	< 1	< 1
PCB 1262	NA	NA	NA	NA	NA
METALS & CYANIDE (µg/l)					
Arsenic	< 5	< 5	< 5	< 5	< 5
Barium	740	380	460	380	210
Cadmium	< 5	< 5	< 5	< 5	< 5
Chromium	< 10	< 10	< 10	11	< 10
Copper	< 10	< 10	< 10	15	< 10
Lead	< 5	< 5	6	< 5	8
Mercury	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Selenium	< 5	< 5	< 5	< 5	< 5
Silver	< 10	< 10	< 10	< 10	< 10
Zinc	84	660	630	690	220
Cyanide (mg/kg)	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25

NOTES:
NA - Not analysed.
Data have not been validated by CRA's QA/QC officer.

TABLE 3/4.2

SOIL SAMPLES
SUMMARY OF ANALYTICAL RESULTS

PARAMETER	DC10E	DC10G	DC10J	DC11B	DC11C
VOLATILE ORGANICS (µg/kg)					
Benzene	< 2	< 2	< 10	< 2	< 2
Benzyl chloride	< 2	< 2	< 10	< 2	< 2
Bromobenzene	< 2	< 2	< 10	< 2	< 2
Bromodichloromethane	< 2	< 2	< 10	< 2	< 2
Bromoform	< 2	< 2	< 10	< 2	< 2
Bromomethane	< 2	< 2	< 10	< 2	< 2
Carbon Tetrachloride	< 2	< 2	< 10	< 2	< 2
Chlorobenzene	< 2	< 2	< 10	< 2	< 2
Chloroethane	< 2	< 2	< 10	< 2	< 2
Chloroform	< 2	< 2	< 10	< 2	< 2
1-Chlorohexane	< 2	< 2	< 10	< 2	< 2
2-Chloroethyl vinyl ether	< 2	< 2	< 10	< 2	< 2
Chloromethane	< 2	< 2	< 10	< 2	< 2
Chlorotoluene	< 2	< 2	< 10	< 2	< 2
Dibromochloromethane	< 2	< 2	< 10	< 2	< 2
Dibromomethane	< 2	< 2	< 10	< 2	< 2
1,2-Dichlorobenzene	< 2	< 2	< 10	< 2	< 2
1,3-Dichlorobenzene	< 2	< 2	< 10	< 2	< 2
1,4-Dichlorobenzene	< 2	< 2	< 10	< 2	< 2
Dichlorodifluoromethane	< 2	< 2	< 10	< 2	< 2
1,1-Dichloroethane	< 2	< 2	< 10	< 2	< 2
1,2-Dichloroethane	< 2	< 2	< 10	< 2	< 2
1,1-Dichloroethylene	< 2	< 2	< 10	< 2	< 2
cis-1,2-Dichloroethylene	< 2	< 2	< 10	< 2	< 2
trans-1,2-Dichloroethylene	< 2	< 2	< 10	< 2	< 2
Dichloromethane	< 2	< 2	10	< 2	< 2
1,2-Dichloropropane	< 2	< 2	< 10	< 2	< 2
trans-1,3-Dichloropropylene	< 2	< 2	< 10	< 2	< 2
Ethylbenzene	< 2	8	< 10	< 2	< 2
1,1,2,2-Tetrachloroethane	< 2	< 2	< 10	< 2	< 2
1,1,1,2-Tetrachloroethane	< 2	< 2	< 10	< 2	< 2
Tetrachloroethylene	< 2	< 2	< 10	< 2	< 2
Toluene	< 2	8	< 10	< 2	< 2
1,1,1-Trichloroethane	< 2	< 2	< 10	< 2	< 2
1,1,2-Trichloroethane	< 2	< 2	< 10	< 2	< 2
Trichloroethylene	< 2	< 2	< 10	< 2	< 2

TABLE 3 4.2

SOIL SAMPLES
SUMMARY OF ANALYTICAL RESULTS

PARAMETER	DC10E	DC10G	DC10J	DC11B	DC11C
VOLATILE ORGANICS (µg/kg)					
Trichlorofluoromethane	< 2	< 2	< 10	< 2	< 2
Trichloropropane	< 2	< 2	< 10	< 2	< 2
Vinyl Chloride	< 2	< 2	< 10	< 2	< 2
Xylenes	< 2	21	< 10	< 2	< 2
PCBs (mg/kg)					
PCB 1016	< 1	< 1	< 1	< 1	< 1
PCB 1221	< 1	< 1	< 1	< 1	< 1
PCB 1232	< 1	< 1	< 1	< 1	< 1
PCB 1242	< 1	< 1	< 1	< 1	< 1
PCB 1248	< 1	< 1	< 1	< 1	< 1
PCB 1254	< 1	< 1	< 1	< 1	< 1
PCB 1260	< 1	< 1	< 1	< 1	< 1
PCB 1262	NA	NA	NA	NA	NA
METALS & CYANIDE (µg/l)					
Arsenic	< 5	< 5	< 5	< 5	< 5
Barium	240	360	1,000	400	220
Cadmium	6	6	< 5	< 5	< 5
Chromium	< 10	< 10	< 10	< 10	< 10
Copper	15	27	16	20	< 10
Lead	17	< 5	8	6	6
Mercury	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Selenium	< 5	< 5	< 5	< 5	< 5
Silver	< 10	< 10	< 10	< 10	< 10
Zinc	110	220	71	160	68
Cyanide (mg/kg)	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25

NOTES:
NA - Not analysed.
Data have not been validated by CRA's QA/QC officer.

TABLE 3 4.2

SOIL SAMPLES
SUMMARY OF ANALYTICAL RESULTS

PARAMETER	DC12B	DC12D	DC13A	DC13B
VOLATILE ORGANICS (µg/kg)				
Benzene	< 2	< 2	< 2	< 1,000
Benzyl chloride	< 2	< 2	< 2	< 1,000
Bromobenzene	< 2	< 2	< 2	< 1,000
Bromodichloromethane	< 2	< 2	< 2	< 1,000
Bromoform	< 2	< 2	< 2	< 1,000
Bromomethane	< 2	< 2	< 2	< 1,000
Carbon Tetrachloride	< 2	< 2	< 2	< 1,000
Chlorobenzene	< 2	< 2	< 2	< 1,000
Chloroethane	< 2	< 2	< 2	< 1,000
Chloroform	< 2	< 2	< 2	< 1,000
1-Chlorohexane	< 2	< 2	< 2	< 1,000
2-Chloroethyl vinyl ether	< 2	< 2	< 2	< 1,000
Chloromethane	< 2	< 2	< 2	< 1,000
Chlorotoluene	< 2	< 2	< 2	< 1,000
Dibromochloromethane	< 2	< 2	< 2	< 1,000
Dibromomethane	< 2	< 2	< 2	< 1,000
1,2-Dichlorobenzene	< 2	< 2	< 2	< 1,000
1,3-Dichlorobenzene	< 2	< 2	< 2	< 1,000
1,4-Dichlorobenzene	< 2	< 2	< 2	< 1,000
Dichlorodifluoromethane	< 2	< 2	< 2	< 1,000
1,1-Dichloroethane	< 2	< 2	< 2	< 1,000
1,2-Dichloroethane	< 2	< 2	< 2	< 1,000
1,1-Dichloroethylene	< 2	< 2	< 2	< 1,000
cis-1,2-Dichloroethylene	< 2	< 2	< 2	< 1,000
trans-1,2-Dichloroethylene	< 2	< 2	< 2	< 1,000
Dichloromethane	< 2	< 2	< 2	< 1,000
1,2-Dichloropropane	< 2	< 2	< 2	< 1,000
trans-1,3-Dichloropropylene	< 2	< 2	< 2	< 1,000
Ethylbenzene	< 2	< 2	< 2	< 1,000
1,1,2,2-Tetrachloroethane	< 2	< 2	< 2	< 1,000
1,1,1,2-Tetrachloroethane	< 2	< 2	< 2	< 1,000
Tetrachloroethylene	< 2	< 2	< 2	< 1,000
Toluene	< 2	< 2	< 2	< 1,000
1,1,1-Trichloroethane	< 2	< 2	< 2	1,300
1,1,2-Trichloroethane	< 2	< 2	< 2	< 1,000
Trichloroethylene	< 2	< 2	< 2	< 1,000

TABLE 3/ 4.2

SOIL SAMPLES
SUMMARY OF ANALYTICAL RESULTS

PARAMETER	DC12B	DC12D	DC13A	DC13B
VOLATILE ORGANICS (µg/kg)				
Trichlorofluoromethane	< 2	< 2	< 2	< 1,000
Trichloropropane	< 2	< 2	< 2	< 1,000
Vinyl Chloride	< 2	< 2	< 2	< 1,000
Xylenes	< 2	< 2	< 2	< 1,000
PCBs (mg/kg)				
PCB 1016	< 1	< 1	< 1	< 1
PCB 1221	< 1	< 1	< 1	< 1
PCB 1232	< 1	< 1	< 1	< 1
PCB 1242	< 1	< 1	< 1	< 1
PCB 1248	< 1	< 1	< 1	< 1
PCB 1254	< 1	< 1	< 1	< 1
PCB 1260	< 1	< 1	< 1	< 1
PCB 1262	NA	NA	NA	NA
METALS & CYANIDE (µg/l)				
Arsenic	< 5	< 5	< 5	< 5
Barium	350	240	280	280
Cadmium	6	5	< 5	< 5
Chromium	< 10	< 10	< 10	< 10
Copper	10	21	< 10	11
Lead	< 5	< 5	< 5	< 5
Mercury	< 0.2	< 0.2	< 0.2	< 0.2
Selenium	< 5	< 5	< 5	< 5
Silver	< 10	< 10	< 10	< 10
Zinc	53	150	57	86
Cyanide (mg/kg)	< 0.25	< 0.25	< 0.25	< 0.25

NOTES:
NA - Not analysed.
Data have not been validated by CRA's QA/QC officer.

4.1.1 Disposal Area No. 1

4.1.2 Disposal Area No. 2

4.2 ENVIRONMENTAL SAMPLING

The following subsections provide a summary of the environmental samples collected during the Preliminary Site Investigation.

4.2.1 Soil Analytical Samples

Prior to initiation of the soil boring program at the Site, all augers, drill rods and continuous samplers were thoroughly steam cleaned to prevent any cross-contamination from previous drilling operations. Sampling utensils were decontaminated prior to collection of the soil samples in accordance with the following sequence:

i) water & alconox detergent wash with brushes to remove visible foreign matter;
ii) rinse with distilled water;
iii) rinse with reagent-grade methanol;
iv) rinse with reagent-grade hexane;
v) rinse with reagent-grade methanol;
vi) air dry for at least 15-minutes; and
vii) rinse with distilled water.

Table 4.2 presents a summary of the soil samples collected for chemical analysis during the Preliminary Site Investigation. A total of sixty-two samples were submitted for chemical analysis. The sample designated as the 'A' sample represents the upper soil elevation sampled. Similarly, the 'B' sample represents the sample collected from the lower elevations of the investigative borehole.

Chain-of-custody forms for the soil sampling are provided in Appendix C.

4.2.2 Geotechnical Analytical Samples

Twelve geotechnical samples representing ten borehole locations were collected from the stored investigative samples at CRA, Romulus, Michigan office and sent to CTI for GSDA on July 5, 1991. The GSDA consisted of complete sieve analysis and hydrometers following ASTM standards. Results for the GSDA are shown in Appendix B.

4.2.3 Groundwater Analytical Samples

Groundwater samples were collected from two borehole wells following well development in accordance with the following protocols:

i) New disposal latex gloves were worn by sampling personnel at each borehole well.

ii) The depth of groundwater was measured to the nearest 0.01 foot using a decontaminated electric tape.

iii) The pH, temperature and conductivity of the groundwater were recorded.

iv) Samples were obtained using a decontaminated bottom filling stainless steel bailer attached to a new length of nylon rope.

v) Samples for VOC were collected in 40 mL vials (zero headspace).

vi) Samples for PCB's, Metals, and Cyanide were collected in one liter amber glass bottles.

TABLE 4.3

WATER SAMPLES
SUMMARY OF ANALYTICAL RESULTS

PARAMETER	W-001	W-002	W-003	W-004	W-005
VOLATILE ORGANICS (µg/l)					
Benzene	< 2	< 33	< 2	< 2	< 1
Benzyl chloride	< 2	< 33	< 2	< 2	< 1
Bromobenzene	< 2	< 33	< 2	< 2	< 1
Bromodichloromethane	< 2	< 33	< 2	< 2	< 1
Bromoform	< 2	< 33	< 2	< 2	< 1
Bromomethane	< 2	< 33	< 2	< 2	< 1
Carbon Tetrachloride	< 2	< 33	< 2	< 2	< 1
Chlorobenzene	< 2	< 33	< 2	< 2	< 1
Chloroethane	< 2	< 33	< 2	< 2	< 1
Chloroform	< 2	< 33	< 2	< 2	< 1
1-Chlorohexane	< 2	< 33	< 2	< 2	< 1
2-Chloroethyl vinyl ether	< 2	< 33	< 2	< 2	< 1
Chloromethane	< 2	< 33	< 2	< 2	< 1
Chlorotoluene	< 2	< 33	< 2	< 2	< 1
Dibromochloromethane	< 2	< 33	< 2	< 2	< 1
Dibromomethane	< 2	< 33	< 2	< 2	< 1
1,2-Dichlorobenzene	< 2	< 33	< 2	< 2	< 1
1,3-Dichlorobenzene	< 2	< 33	< 2	< 2	< 1
1,4-Dichlorobenzene	< 2	< 33	< 2	< 2	< 1
Dichlorodifluoromethane	< 2	< 33	< 2	< 2	< 1
1,1-Dichloroethane	< 2	< 33	< 2	< 2	< 1
1,2-Dichloroethane	< 2	< 33	< 2	< 2	< 1
1,1-Dichloroethylene	< 2	< 33	< 2	< 2	< 1
cis-1,2-Dichloroethylene	< 2	< 33	< 2	< 2	< 1
trans-1,2-Dichloroethylene	< 2	< 33	< 2	< 2	< 1
Dichloromethane	< 2	< 33	< 2	< 2	< 1
1,2-Dichloropropane	< 2	< 33	< 2	< 2	< 1
trans-1,3-Dichloropropylene	< 2	< 33	< 2	< 2	< 1
Ethylbenzene	< 2	370	< 2	< 2	< 1
1,1,2,2-Tetrachloroethane	< 2	< 33	< 2	< 2	< 1
1,1,1,2-Tetrachloroethane	< 2	< 33	< 2	< 2	< 1
Tetrachloroethylene	< 2	< 33	< 2	< 2	< 1
Toluene	< 2	2100	< 2	< 2	3
1,1,1-Trichloroethane	< 2	< 33	< 2	< 2	< 1
1,1,2-Trichloroethane	< 2	< 33	< 2	< 2	< 1
Trichloroethylene	< 2	< 33	< 2	< 2	< 1

TABLE 2 4.3

WATER SAMPLES
SUMMARY OF ANALYTICAL RESULTS

PARAMETER	W-001	W-002	W-003	W-004	W-005
VOLATILE ORGANICS (µg/l)					
Trichlorofluoromethane	< 2	< 33	< 2	< 2	< 1
Trichloropropane	< 2	< 33	< 2	< 2	< 1
Vinyl Chloride	< 2	< 33	< 2	< 2	< 1
Xylenes	14	2200	< 2	< 2	< 1
PCBs (µg/l)					
PCB 1016	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
PCB 1221	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
PCB 1232	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
PCB 1242	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
PCB 1248	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
PCB 1254	< 1	< 1	< 1	< 1	< 0.5
PCB 1260	< 1	< 1	< 1	< 1	< 0.5
PCB 1262	NA	NA	NA	NA	NA
METALS & CYANIDE (µg/l)					
Arsenic	< 5	< 5	< 5	< 5	< 5
Barium	160	2600	< 10	< 10	< 10
Cadmium	< 10	20	< 10	< 10	< 10
Chromium	< 20	470	< 20	< 20	< 20
Copper	< 10	1500	40	20	< 10
Lead	< 100	1400	< 100	< 100	< 100
Mercury	< 5	< 5	< 5	< 5	< 5
Selenium	< 5	< 5	< 5	< 5	< 5
Silver	< 10	< 10	< 10	< 10	< 10
Zinc	120	6800	50	< 50	< 50
Cyanide	< 5	< 5	< 5	< 5	< 5

NOTES:
NA - Not analysed.
Data have not been validated by CRA's QA/QC officer.

The two groundwater samples along with two blanks and one duplicate sample were submitted for chemical analysis. Table 4.3 presents a summary of the groundwater samples collected for laboratory analysis.

Chain-of-custody forms for the groundwater sampling are provided in Appendix C.

4.2.4 Sediment Analytical Samples

Sediment samples were collected from at eight locations along the bank of the storm water drainage ditches adjacent to Disposal Areas No. 1 and No. 2:

i) New disposal latex gloves were worn by sampling personnel at each sediment sample location.

ii) Samples were obtained using a decontaminated spoon.

iii) Samples for VOC were collected in 40 mL vials (zero headspace).

iv) Samples for PCB's, Metals, and Cyanide were collected in 250 ml. glass bottles.

The eight ditch sediment samples along with two duplicate samples were submitted for chemical analysis. Table 4.4 presents a summary of the ditch sediment samples collected for laboratory analysis.

4.2.5 Woodblock Analytical Samples

Eleven woodblock samples were collected from five locations at Disposal Area No. 1., shown in Table -4.5. New stainless steel drill bits were used to drill through the center of each woodblock sampled. The wood shavings were then collected in sample jars:

TABLE 4.4

SEDIMENT SAMPLES
SUMMARY OF ANALYTICAL RESULTS

PARAMETER	SED-001	SED-002	SED-003	SED-004	SED-005
VOLATILE ORGANICS (µg/kg)					
Benzene	< 1	< 1	< 1	< 1	1.2
Benzyl chloride	< 1	< 1	< 1	< 1	< 1
Bromobenzene	< 1	< 1	< 1	< 1	< 1
Bromodichloromethane	< 1	< 1	< 1	< 1	< 1
Bromoform	< 1	< 1	< 1	< 1	< 1
Bromomethane	< 1	< 1	< 1	< 1	< 1
Carbon Tetrachloride	< 1	< 1	< 1	< 1	< 1
Chlorobenzene	< 1	< 1	< 1	< 1	< 1
Chloroethane	< 1	< 1	< 1	< 1	< 1
Chloroform	< 1	< 1	< 1	< 1	< 1
1-Chlorohexane	< 1	< 1	< 1	< 1	< 1
2-Chloroethyl vinyl ether	< 1	< 1	< 1	< 1	< 1
Chloromethane	< 1	< 1	< 1	< 1	< 1
Chlorotoluene	< 1	< 1	< 1	< 1	< 1
Dibromochloromethane	< 1	< 1	< 1	< 1	< 1
Dibromomethane	< 1	< 1	< 1	< 1	< 1
1,2-Dichlorobenzene	< 1	< 1	< 1	< 1	< 1
1,3-Dichlorobenzene	< 1	< 1	< 1	< 1	< 1
1,4-Dichlorobenzene	< 1	< 1	< 1	< 1	< 1
Dichlorodifluoromethane	< 1	< 1	< 1	< 1	< 1
1,1-Dichloroethane	< 1	< 1	< 1	< 1	< 1
1,2-Dichloroethane	< 1	< 1	< 1	< 1	< 1
1,1-Dichloroethylene	< 1	< 1	< 1	< 1	< 1
cis-1,2-Dichloroethylene	< 1	< 1	< 1	< 1	< 1
trans-1,2-Dichloroethylene	< 1	< 1	< 1	< 1	< 1
Dichloromethane	< 1	< 1	< 1	< 1	< 1
1,2-Dichloropropane	< 1	< 1	< 1	< 1	< 1
trans-1,3-Dichloropropylene	< 1	< 1	< 1	< 1	< 1
Ethylbenzene	< 1	1.6	< 1	< 1	3.4
1,1,2,2-Tetrachloroethane	< 1	< 1	< 1	< 1	< 1
1,1,1,2-Tetrachloroethane	< 1	< 1	< 1	< 1	< 1
Tetrachloroethylene	< 1	< 1	< 1	< 1	< 1
Toluene	< 1	< 1	< 1	< 1	5.2
1,1,1-Trichloroethane	< 1	< 1	< 1	< 1	< 1
1,1,2-Trichloroethane	< 1	< 1	< 1	< 1	< 1
Trichloroethylene	< 1	< 1	< 1	< 1	< 1

TABLE 4.4

SEDIMENT SAMPLES
SUMMARY OF ANALYTICAL RESULTS

PARAMETER	SED-001	SED-002	SED-003	SED-004	SED-005
VOLATILE ORGANICS (µg/kg)					
Trichlorofluoromethane	< 1	< 1	< 1	< 1	< 1
Trichloropropane	< 1	< 1	< 1	< 1	< 1
Vinyl Chloride	< 1	< 1	< 1	< 1	< 1
Xylenes	3.9	7.9	3.7	< 1	13
PCBs (mg/kg)					
PCB 1016	< 1	< 1	< 1	< 1	< 1
PCB 1221	< 1	< 1	< 1	< 1	< 1
PCB 1232	< 1	< 1	< 1	< 1	< 1
PCB 1242	< 1	< 1	< 1	< 1	< 1
PCB 1248	< 1	< 1	< 1	< 1	< 1
PCB 1254	< 1	< 1	< 1	< 1	< 1
PCB 1260	< 1	< 1	< 1	< 1	< 1
PCB 1262	NA	NA	NA	NA	NA
METALS (µg/l) & CYANIDE (mg/kg)					
Arsenic	< 5	< 5	< 5	< 5	< 5
Barium	180	200	300	320	350
Cadmium	< 5	< 5	< 5	< 5	< 5
Chromium	< 10	< 10	< 10	< 10	< 10
Copper	< 10	< 10	< 10	12	< 10
Lead	< 5	< 5	< 5	< 5	< 5
Mercury	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Selenium	< 5	< 5	< 5	< 5	< 5
Silver	< 10	< 10	< 10	< 10	< 10
Zinc	200	280	320	570	170
Cyanide (mg/kg)	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25

NOTES:
NA - Not analysed.
Data have not been validated by CRA's QA/QC officer.

TABLE 4.4

SEDIMENT SAMPLES
SUMMARY OF ANALYTICAL RESULTS

PARAMETER	SED-006	SED-007	SED-008	SED-009	SED-010
VOLATILE ORGANICS (µg/kg)					
Benzene	3.1	< 1	< 1	< 1	< 1
Benzyl chloride	< 1	< 1	< 1	< 1	< 1
Bromobenzene	< 1	< 1	< 1	< 1	< 1
Bromodichloromethane	< 1	< 1	< 1	< 1	< 1
Bromoform	< 1	< 1	< 1	< 1	< 1
Bromomethane	< 1	< 1	< 1	< 1	< 1
Carbon Tetrachloride	< 1	< 1	< 1	< 1	< 1
Chlorobenzene	< 1	< 1	< 1	< 1	< 1
Chloroethane	< 1	< 1	< 1	< 1	< 1
Chloroform	< 1	< 1	< 1	< 1	< 1
1-Chlorohexane	< 1	< 1	< 1	< 1	< 1
2-Chloroethyl vinyl ether	< 1	< 1	< 1	< 1	< 1
Chloromethane	< 1	< 1	< 1	< 1	< 1
Chlorotoluene	< 1	< 1	< 1	< 1	< 1
Dibromochloromethane	< 1	< 1	< 1	< 1	< 1
Dibromomethane	< 1	< 1	< 1	< 1	< 1
1,2-Dichlorobenzene	< 1	< 1	< 1	< 1	< 1
1,3-Dichlorobenzene	< 1	< 1	< 1	< 1	< 1
1,4-Dichlorobenzene	< 1	< 1	< 1	< 1	< 1
Dichlorodifluoromethane	< 1	< 1	< 1	< 1	< 1
1,1-Dichloroethane	< 1	< 1	< 1	< 1	< 1
1,2-Dichloroethane	< 1	< 1	< 1	< 1	< 1
1,1-Dichloroethylene	< 1	< 1	< 1	< 1	< 1
cis-1,2-Dichloroethylene	< 1	< 1	< 1	< 1	< 1
trans-1,2-Dichloroethylene	< 1	< 1	< 1	< 1	< 1
Dichloromethane	< 1	< 1	< 1	< 1	< 1
1,2-Dichloropropane	< 1	< 1	< 1	< 1	< 1
trans-1,3-Dichloropropylene	< 1	< 1	< 1	< 1	< 1
Ethylbenzene	9.6	< 1	< 1	< 1	1.3
1,1,2,2-Tetrachloroethane	< 1	< 1	< 1	< 1	< 1
1,1,1,2-Tetrachloroethane	< 1	< 1	< 1	< 1	< 1
Tetrachloroethylene	< 1	< 1	< 1	< 1	< 1
Toluene	14	< 1	< 1	< 1	2.7
1,1,1-Trichloroethane	< 1	< 1	< 1	< 1	< 1
1,1,2-Trichloroethane	< 1	< 1	< 1	< 1	< 1
Trichloroethylene	< 1	< 1	< 1	< 1	< 1

TABLE 4.4

SEDIMENT SAMPLES
SUMMARY OF ANALYTICAL RESULTS

PARAMETER	SED-006	SED-007	SED-008	SED-009	SED-010
VOLATILE ORGANICS (µg/kg)					
Trichlorofluoromethane	< 1	< 1	< 1	< 1	< 1
Trichloropropane	< 1	< 1	< 1	< 1	< 1
Vinyl Chloride	< 1	< 1	< 1	< 1	< 1
Xylenes	55	< 1	< 1	< 1	4.4
PCBs (mg/kg)					
PCB 1016	< 1	< 1	< 1	< 1	< 1
PCB 1221	< 1	< 1	< 1	< 1	< 1
PCB 1232	< 1	< 1	< 1	< 1	< 1
PCB 1242	< 1	< 1	< 1	< 1	< 1
PCB 1248	< 1	< 1	< 1	< 1	< 1
PCB 1254	< 1	< 1	< 1	< 1	< 1
PCB 1260	< 1	< 1	< 1	< 1	< 1
PCB 1262	NA	NA	NA	NA	NA
METALS (µg/l) & CYANIDE (mg/kg)					
Arsenic	< 5	< 5	< 5	< 5	< 5
Barium	220	500	380	360	770
Cadmium	< 5	< 5	< 5	< 5	5
Chromium	< 10	< 10	< 10	< 10	< 10
Copper	< 10	< 10	< 10	< 10	15
Lead	< 5	< 5	< 5	< 5	8
Mercury	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Selenium	< 5	< 5	< 5	< 5	< 5
Silver	< 10	< 10	< 10	< 10	< 10
Zinc	160	220	530	250	110
Cyanide (mg/kg)	< 0.25	< 0.25	< 0.25	< 0.25	0.51

NOTES:
NA - Not analysed.
Data have not been validated by CRA's QA/QC officer.

TABLE 4.4

SEDIMENT SAMPLES
SUMMARY OF ANALYTICAL RESULTS

PARAMETER	SED-011	SED-012
VOLATILE ORGANICS (µg/kg)		DUP of SED-004
Benzene	< 1	< 1
Benzyl chloride	< 1	< 1
Bromobenzene	< 1	< 1
Bromodichloromethane	< 1	< 1
Bromoform	< 1	< 1
Bromomethane	< 1	< 1
Carbon Tetrachloride	< 1	< 1
Chlorobenzene	< 1	< 1
Chloroethane	< 1	< 1
Chloroform	< 1	< 1
1-Chlorohexane	< 1	< 1
2-Chloroethyl vinyl ether	< 1	< 1
Chloromethane	< 1	< 1
Chlorotoluene	< 1	< 1
Dibromochloromethane	< 1	< 1
Dibromomethane	< 1	< 1
1,2-Dichlorobenzene	< 1	< 1
1,3-Dichlorobenzene	< 1	< 1
1,4-Dichlorobenzene	< 1	< 1
Dichlorodifluoromethane	< 1	< 1
1,1-Dichloroethane	< 1	< 1
1,2-Dichloroethane	< 1	< 1
1,1-Dichloroethylene	< 1	< 1
cis-1,2-Dichloroethylene	< 1	< 1
trans-1,2-Dichloroethylene	< 1	< 1
Dichloromethane	< 1	< 1
1,2-Dichloropropane	< 1	< 1
trans-1,3-Dichloropropylene	< 1	< 1
Ethylbenzene	< 1	< 1
1,1,2,2-Tetrachloroethane	< 1	< 1
1,1,1,2-Tetrachloroethane	< 1	< 1
Tetrachloroethylene	< 1	< 1
Toluene	< 1	< 1
1,1,1-Trichloroethane	< 1	< 1
1,1,2-Trichloroethane	< 1	< 1
Trichloroethylene	< 1	< 1

TABLE 4.4

SEDIMENT SAMPLES
SUMMARY OF ANALYTICAL RESULTS

PARAMETER	SED-011	SED-012
VOLATILE ORGANICS (µg/kg)		DUP of SED-004
Benzene	< 1	< 1
Benzyl chloride	< 1	< 1
Bromobenzene	< 1	< 1
Bromodichloromethane	< 1	< 1
Bromoform	< 1	< 1
Bromomethane	< 1	< 1
Carbon Tetrachloride	< 1	< 1
Chlorobenzene	< 1	< 1
Chloroethane	< 1	< 1
Chloroform	< 1	< 1
1-Chlorohexane	< 1	< 1
2-Chloroethyl vinyl ether	< 1	< 1
Chloromethane	< 1	< 1
Chlorotoluene	< 1	< 1
Dibromochloromethane	< 1	< 1
Dibromomethane	< 1	< 1
1,2-Dichlorobenzene	< 1	< 1
1,3-Dichlorobenzene	< 1	< 1
1,4-Dichlorobenzene	< 1	< 1
Dichlorodifluoromethane	< 1	< 1
1,1-Dichloroethane	< 1	< 1
1,2-Dichloroethane	< 1	< 1
1,1-Dichloroethylene	< 1	< 1
cis-1,2-Dichloroethylene	< 1	< 1
trans-1,2-Dichloroethylene	< 1	< 1
Dichloromethane	< 1	< 1
1,2-Dichloropropane	< 1	< 1
trans-1,3-Dichloropropylene	< 1	< 1
Ethylbenzene	< 1	< 1
1,1,2,2-Tetrachloroethane	< 1	< 1
1,1,1,2-Tetrachloroethane	< 1	< 1
Tetrachloroethylene	< 1	< 1
Toluene	< 1	< 1
1,1,1-Trichloroethane	< 1	< 1
1,1,2-Trichloroethane	< 1	< 1
Trichloroethylene	< 1	< 1

TABLE 4.4

SEDIMENT SAMPLES
SUMMARY OF ANALYTICAL RESULTS

PARAMETER	SED-011	SED-012
VOLATILE ORGANICS (µg/kg)		
Trichlorofluoromethane	< 1	< 1
Trichloropropane	< 1	< 1
Vinyl Chloride	< 1	< 1
Xylenes	1.3	3.5
PCBs (mg/kg)		
PCB 1016	< 1	< 1
PCB 1221	< 1	< 1
PCB 1232	< 1	< 1
PCB 1242	< 1	< 1
PCB 1248	< 1	< 1
PCB 1254	< 1	< 1
PCB 1260	< 1	< 1
PCB 1262	NA	NA
METALS (µg/l) & CYANIDE (mg/kg)		
Arsenic	< 5	< 5
Barium	230	380
Cadmium	< 5	< 5
Chromium	< 10	< 10
Copper	< 10	< 10
Lead	< 5	< 5
Mercury	< 0.2	< 0.2
Selenium	< 5	< 5
Silver	< 10	< 10
Zinc	170	520
Cyanide (mg/kg)	0.35	0.32

NOTES:
NA - Not analysed.
Data have not been validated by CRA's QA/QC officer.

TABLE 4.4

SEDIMENT SAMPLES
SUMMARY OF ANALYTICAL RESULTS

PARAMETER	SED-011	SED-012
VOLATILE ORGANICS (µg/kg)		Duplicate of SED-004
Benzene	< 1	< 1
Benzyl chloride	< 1	< 1
Bromobenzene	< 1	< 1
Bromodichloromethane	< 1	< 1
Bromoform	< 1	< 1
Bromomethane	< 1	< 1
Carbon Tetrachloride	< 1	< 1
Chlorobenzene	< 1	< 1
Chloroethane	< 1	< 1
Chloroform	< 1	< 1
1-Chlorohexane	< 1	< 1
2-Chloroethyl vinyl ether	< 1	< 1
Chloromethane	< 1	< 1
Chlorotoluene	< 1	< 1
Dibromochloromethane	< 1	< 1
Dibromomethane	< 1	< 1
1,2-Dichlorobenzene	< 1	< 1
1,3-Dichlorobenzene	< 1	< 1
1,4-Dichlorobenzene	< 1	< 1
Dichlorodifluoromethane	< 1	< 1
1,1-Dichloroethane	< 1	< 1
1,2-Dichloroethane	< 1	< 1
1,1-Dichloroethylene	< 1	< 1
cis-1,2-Dichloroethylene	< 1	< 1
trans-1,2-Dichloroethylene	< 1	< 1
Dichloromethane	< 1	< 1
1,2-Dichloropropane	< 1	< 1
trans-1,3-Dichloropropylene	< 1	< 1
Ethylbenzene	< 1	< 1
1,1,2,2-Tetrachloroethane	< 1	< 1
1,1,1,2-Tetrachloroethane	< 1	< 1
Tetrachloroethylene	< 1	< 1
Toluene	< 1	< 1
1,1,1-Trichloroethane	< 1	< 1
1,1,2-Trichloroethane	< 1	< 1
Trichloroethylene	< 1	< 1

TABLE 4.4.1

SEDIMENT SAMPLES
SUMMARY OF ANALYTICAL RESULTS

PARAMETER	SED-011	SED-012
VOLATILE ORGANICS (µg/kg)		Duplicate of SED-004
Trichlorofluoromethane	< 1	< 1
Trichloropropane	< 1	< 1
Vinyl Chloride	< 1	< 1
Xylenes	1.3	3.5
PCBs (mg/kg)		
PCB 1016	< 1	< 1
PCB 1221	< 1	< 1
PCB 1232	< 1	< 1
PCB 1242	< 1	< 1
PCB 1248	< 1	< 1
PCB 1254	< 1	< 1
PCB 1260	< 1	< 1
PCB 1262	NA	NA
METALS (µg/l) & CYANIDE (mg/kg)		
Arsenic	< 5	< 5
Barium	230	380
Cadmium	< 5	< 5
Chromium	< 10	< 10
Copper	< 10	< 10
Lead	< 5	< 5
Mercury	< 0.2	< 0.2
Selenium	< 5	< 5
Silver	< 10	< 10
Zinc	170	520
Cyanide (mg/kg)	0.35	0.32

NOTES:
NA - Not analysed.
Data have not been validated by CRA's QA/QC officer.

TABLE 1 4.5

WOODBLOCK SAMPLES
SUMMARY OF ANALYTICAL RESULTS

PARAMETER PCBs (mg/kg)	SURFACE					
	WB-001	WB-003	WB-011 (WB-003 DUP.)	WB-005	WB-007	WB-009
PCB 1016	< 1	< 1	< 1	< 1	< 1	< 1
PCB 1221	< 1	< 1	< 1	< 1	< 1	< 1
PCB 1232	< 1	< 1	< 1	< 1	< 1	< 1
PCB 1242	< 1	< 1	< 1	1	< 1	1
PCB 1248	< 1	< 1	< 1	< 1	< 1	< 1
PCB 1254	2	< 1	< 1	4	< 1	< 1
PCB 1260	< 1	< 1	< 1	< 2	9	< 1
PCB 1262	< 1	NA	NA	< 1	NA	NA

PARAMETER PCBs (mg/kg)	SUB-SURFACE				
	WB-002	WB-004	WB-006	WB-008	WB-010
PCB 1016		< 1	< 1	< 1	< 1
PCB 1221		< 1	< 1	< 1	< 1
PCB 1232		< 1	< 1	< 1	< 1
PCB 1242		< 1	< 1	1	16
PCB 1248		< 1	< 1	< 1	< 1
PCB 1254		< 1	< 1	< 1	< 1
PCB 1260		< 1	< 1	2	< 1
PCB 1262		NA	NA	NA	NA

NOTES:

NA - Not analysed.
Data have not been validated by CRA's QA/QC Officer.

i) New disposal latex gloves were worn by sampling personnel at each woodblock sample location.

ii) Samples were obtained using a decontaminated stainless steel drill bit and spoon.

iii) Samples for PCB's were collected in 250 ml glass jars.

4.3 SAMPLE ANALYSES

4.3.1 General

All analytical services for the Preliminary Site Investigation were performed by Wadsworth/Alert Laboratories of North Canton, Ohio. Soil and groundwater samples were labeled in the field and packed in coolers with ice to maintain sample temperatures at or below 4°C. Coolers were hand delivered to Federal Express for shipment following sample collection using standard chain-of-custody procedures. Completed sample chain-of-custody forms and the complete analytical report are presented in Appendix C.

4.3.2 Analytical Protocols

All analyses, sampling, handling and laboratory QA/QC procedures were performed in accordance with the specified analytical methods as presented in U.S. EPA SW-846 "Test Methods for Evaluating Solid Waste". Parameters and specific methods of analysis were as follows:

Sample Matrix	*Parameters*	*Analytical Methods*
Soil	VOC	SW-846 Method 8240
	PCB	SW-846 Method 8015
	RCRA Metals	SW-846 Method 8020
	Cyanide	SW-846 Method 7000 series
Groundwater	VOC	SW-846 Method 8240
	PCB	SW-846 Method 8015
	RCRA Metals	SW-846 Method 8020
	Cyanide	SW-846 Method 8270
Sediment	VOC	
	PCB	
	RCRA Metals	
	Cyanide	
Woodblock	PCB	

4.3.3 Analytical QA/QC

In addition to collecting and analyzing soil and groundwater samples to delineate the extent of Target Compound List/Target Analyte List (TCL/TAL) constituents at the Site, samples were collected and analyzed for data validation purposes (QA/QC samples). These samples included:

i) Blind duplicate samples;

ii) Rinsate blanks; and

iii) Matrix spike/matrix spike duplicate samples.

The analytical results of these additional QA/QC samples are also presented in Appendix D.

In order to verify the quality of the analytical data and the laboratories' compliance with QA/QC requirement of the analytical methods, the QA/QC data were reviewed by CRA. Based on CRA's review, it is concluded that all of the data are of good quality and can be used for quantitative purposes. A summary of CRA's data assessment and validation is presented in Appendix E.

5.0 RESULTS

The purpose of this section is to provide a summary information and analytical data developed during the Preliminary Site Investigation. This information is presented in the following sections:

Section 5.1 Stratigraphy;
Section 5.2 Hydrology;
Section 5.3 Groundwater Flow Patterns;
Section 5.4 Soil Analytical Results; and
Section 5.5 Groundwater Analytical Results.

The laboratory data packages are provided as Appendix D. The CRA data validation report is presented as Appendix E.

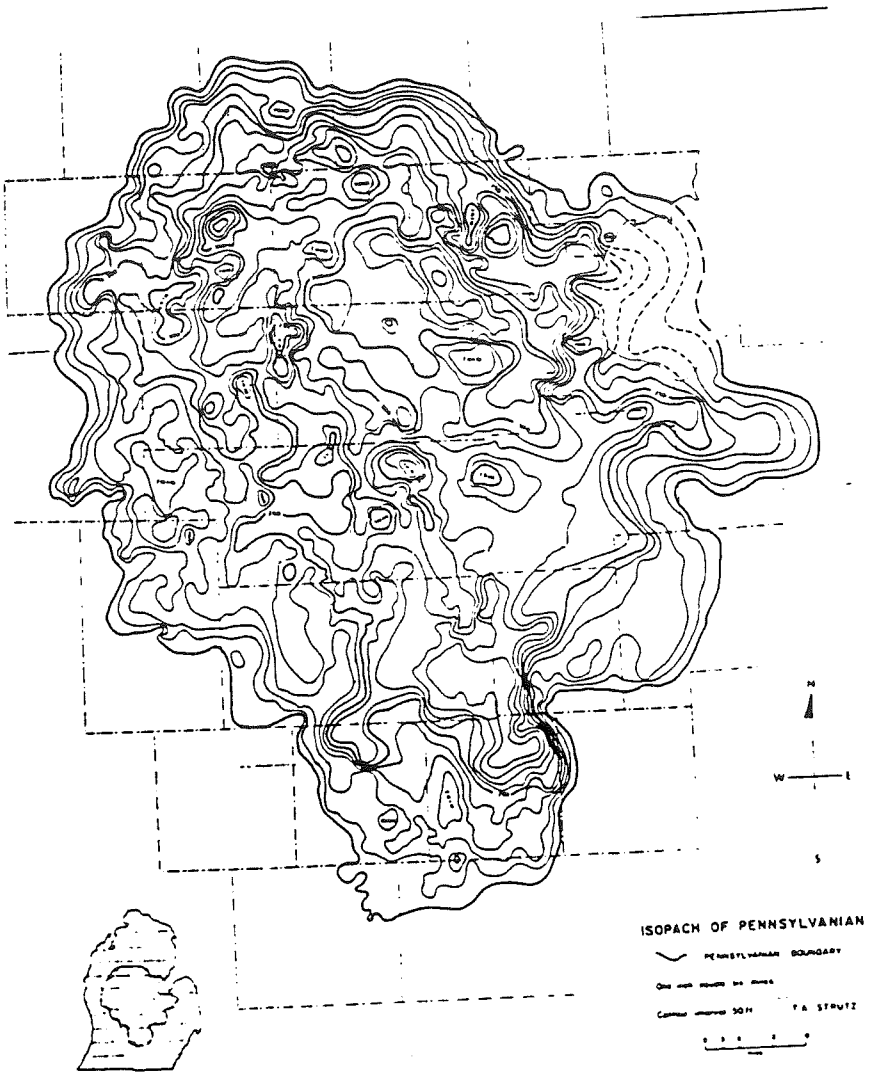
5.1 STRATIGRAPHY

5.1.1 Regional Stratigraphy

Regional topography consists mainly of glacial and post-glacial deposits. The Site lies within medium-textured end morgine and glacial till deposits due to the advance and retreat of Pleistocene continental glaciers.

Sedimentary rocks, existing directly below the glacial deposits, consist of the Saginaw Formation Pottsville Series, Lower Pennsylvanian System of the Paleozoic Era. The Saginaw Formation is made up of alternating marine limestones, shales, siltstones, sandstones, and coal deposits, often referred to as "cyclic" deposits.

Figure 2.57. Morainic Systems of the Southern Peninsula. (From Leverett and Taylor, 1915.)



5.2

Figure ~~2.54~~. Thickness of Pennsylvanian rocks in Michigan. (From Strutz, 1978.)

Saginaw Formation deposits is approximately 50 to 150 feet thick below the Site, and may have been eroded somewhat, especially towards the southeast near the margin of the formation.

5.1.2 Local Stratigraphy

The stratigraphy under the Site was ascertained by completing a series of shallow boreholes during the Preliminary Site Investigation.

Twelve boreholes were drilled at the Site, six at Disposal Area No. 1 (including one test borehole), and seven at Disposal Area No. 2.

Table 4.1 presents summary borehole logs presented in Appendix A. The stratigraphic logs indicate that the Site surface is covered in various areas with miscellaneous fill or sandy topsoil. Directly below this layer various areas of the Site are covered by sand, clay, or silty clay. Drilling activities conducted during the Preliminary Site Investigation indicated the presence of a high water table. The fill materials are generally less than six and one-half feet thick.

5.1.3 Grain Size Distribution Analysis

Grain Size Distribution Analysis (GSDA) results indicate that Disposal Areas No. 1 and No. 2 consist mainly of a clay, silt, and fine sand mixture, except for test boring No. 2, where medium to coarse sand and gravel were predominant.

5.1.4 Shelby Tube Analysis

The permeability of the clay at borehole DC-12 was determined to be 6.7×10^{-8} cmls via Shelby Tube Analysis.

Carefully, the shelby tube was sealed at both ends and rushed to the laboratory for analysis on June 28, 1991.

5.2 HYDROLOGY

The main surface water feature in the area of Mount Morris is the Flint River. The Mount Morris within the Flint River Basin.

The Site drainage is northerly and westerly to a series of ditches which flow and discharge to the Flint River. The Flint River is approximately five miles from the Site and eventually discharges into the Saginaw River.

Stormwater runoff originating on Site may flow overland to the north and west ditches or alternatively may infiltrate into Site fill materials.

5.3 GROUNDWATER FLOW PATTERNS

5.3.1 Regional Hydrogeology

The major regional aquifer exists below the Flint moraine. In general, glacial drift in moraine areas are not aquifers due to the poorly sorted materials and very low permeabilities. Groundwater below moraine soils tend to be less contaminated. Groundwater wells completed in the Pennsylvanian aquifer system are generally situated in sandstones of the Saginaw and Grand River Formations, which may be hydraulically interconnected.

The quality of the groundwater is reported as being generally suitable for most domestic and irrigational purposes. Groundwater yields are generally low in the Pennsylvanian aquifer system. Water quality from the Pennsylvanian aquifer system is generally good.

5.3.2 Local Hydrogeology

Groundwater was encountered between 9.5 to 14.0 feet below ground surface (bgs) during the completion of the boreholes in Disposal Area No. 1.

5.3.2.1 Aquifer

The upper unconfined artesian aquifer flow directions were determined based upon groundwater elevations measured in DC-3, 4, 5, 6, 7, 10, and 12.

5.4 SOIL ANALYTICAL RESULTS

Soil samples were collected from continuous two foot elevations of each borehole and selected samples were submitted for the analyses presented in Table 4.3. These analyses included PCBs, EP Toxicity, Metals (plus Copper and Zinc), Total Cyanide, and VOC. Soil analytical results are presented in the following subsections.

5.4.1 VOC

The analytical results for VOC in the soil samples collected during the Preliminary Site Investigation are presented in Table 4.2. The results presented in Table 4.2 indicate that the following analytes were detected:

toluene,
xylenes,
ethyl benzene, and
1,1,1 - trichloroethane.

The results indicate the following analyte distributions:

1. VOC contamination is present in the upper elevations of the Site soils (i.e. fill materials and surficial soils);

2. the native soils of the Site were determined to be free of Site related constituents.

5.4.2 PCBs in Soil

PCB analytical results for selected soil samples are presented in Table 4.2. The results indicate that the following substance was detected:

PCB 1242.

Analytical results above background concentrations were identified in the north portion of Disposal Area No. 1 in the surficial soils and fill materials two feet bgs.

5.4.3 Metals & Cyanide in Soil

The analytical results for EP Toxicity Metals (plus Copper and Zinc) are presented in Table 4.2.

Results indicate the following detectable levels of metals and/or cyanide:

barium,
cadmium,
chromium,
copper,
lead,
zinc, and
cyanide.

5.5 GROUNDWATER ANALYTICAL RESULTS

Groundwater samples were collected from five boreholes as summarized in Table 4.2. The PCBs, EP Toxicity Metals (plus Copper and Zinc), Total Cyanide, and VOC results for groundwater sampling are presented in Tables 4.3.

5.6 SEDIMENT ANALYTICAL RESULTS

The sediment analytical results for PCBs, EP Toxicity Metals (plus Copper and Zinc), Total Cyanide, and VOC in the soil samples collected during the Preliminary Site Investigation are presented in Table 4.4. The results presented in Table 4.4 indicate that the following analytes were detected:

Metals & Cyanide	VOC
barium,	benzene,
copper,	ethylbenzene,
zinc, and	toluene, and
cyanide.	xylenes.

The results indicate the following analyte distributions:

1. VOC contamination is present in the sediments north of the Disposal Area No. 1.

5.7 WOODBLOCK ANALYTICAL RESULTS

The woodblocks were sampled for PCBs at Disposal Area -No. 1 at surface and subsurface locations. Results on Table -4.5 show the following parameters which were found:

PCB 1254,

PCB 1260, and

PCB 1242.

6.0 DISCUSSION OF RESULTS

The results presented in Section 5.0 of this Preliminary Site Investigation indicates a distribution of PCBs, Metals, Cyanide, and VOCs.

Groundwater analytical results indicate detectable limits of VOCs, Metals, Copper, and Zinc. PCBs were found in three surface and one subsurface samples.

Ditch sediment sample results indicate low concentrations of VOCs, barium, zinc, and cyanide.

7.0 SUMMARY

Analytical test results from the Preliminary Site Investigation indicates that low concentrations of PCBs, Metals, Copper, Zinc, Cyanide, and VOCs exist on Site. There is no indication that contamination exists below a maximum depth of 15 feet. However, it is recommended that at least one borehole should be completed below 15 feet to determine the vertical extent of contamination of the lower aquifer, if one exists.

Groundwater flow direction is toward the northwest at Disposal Area No. 1, and to the west in Disposal Area No. 2. The surface water flow direction appears to follow the groundwater flow direction.

The ditch sediment analysis indicates concentrations of barium and barium and zinc, typical of background levels in soils, except for sediment sample No. 4, just north of Disposal Area No. 1. The zinc concentration was slightly elevated at sample location No. 4. Cyanide was detected in sediment sample location No. 5 slightly above the detection limit.

The horizontal extent of contamination of the soil and groundwater appears to be limited to the boundaries of Disposal Area No. 1 and No. 2

APPENDIX A

SOIL BOREHOLE LOGS

STRATIGRAPHY LOG (OVERBURDEN)

SHEET NO. 1 OF 1

PROJECT NAME Mt. Morris Dump Site
PROJECT NUMBER 3990
CLIENT Warner, Norcross & Judd
LOCATION Mt. Morris, MI

DRILLING CONTRACTOR PSI, Inc.
DRILLER Scott Smith
SURFACE ELEVATION
WEATHER (a.m.)
(p.m.)

HOLE DESIGNATION TH-1
DATE STARTED 6-25-91
DATE COMPLETED 6-25-91
DRILLING METHOD Hollow Stem Auger
CRA SUPERVISOR Mark Gliha

DEPTH OR ELEVATION (ft/m) FROM	AT	TO	SAMPLE #	SAMPLING METHOD	PENETRATION RECORD SPLIT SPOON BLOWS 6"	6"	6"	6"	RECOVERED LENGTH	SAMPLE DESCRIPTION (COMPONENTS, COLOUR, MOISTURE, NATIVE/FILL)	NOTES (STRUCTURES, DRILLER'S COMMENTS, GEOLOGIC CLASSIFICATION)

SENT BY: 7- 3-91 :11:44AM : CONESTOGA ROVERS- 13139421858:# 2/ 2

2/05/85

CRA

STRATIGRAPHY LOG (OVERBURDEN)

SHEET NO. 2 OF 1

PROJECT NAME Mt. Morris Dump Site
PROJECT NUMBER 3990
CLIENT Warner, Norcross & Judd
LOCATION Mt. Morris, MI

DRILLING CONTRACTOR PSI, Inc.
DRILLER Scott Smith
SURFACE ELEVATION
WEATHER (a.m.)
(p.m.)

HOLE DESIGNATION DC-1
DATE STARTED 6-25-91
DATE COMPLETED 6-25-91
DRILLING METHOD Hollow Stem Auger
CRA SUPERVISOR Mark Gliha

DEPTH OR ELEVATION (ft/m) FROM	AT	TO	SAMPLE #	SAMPLING METHOD	PENETRATION RECORD SPLIT SPOON BLOWS 6"	6"	6"	6"	RECOVERED LENGTH	SAMPLE DESCRIPTION (COMPONENTS, COLOUR, MOISTURE, NATIVE/FILL)	NOTES (STRUCTURES, DRILLER'S COMMENTS, GEOLOGIC CLASSIFICATION)

SENT BY: 7- 3-91 :11:44AM : CONESTOGA ROVERS- 13139421858:# 2/ 2

2/05/85

CRA

STRATIGRAPHY LOG (OVERBURDEN)

SHEET NO. 3 OF 1

PROJECT NAME Mt. Morris Dump Site
PROJECT NUMBER 3920
CLIENT Warner, Norcross & Judd
LOCATION Mt. Morris, MI

DRILLING CONTRACTOR PSI, Inc.
DRILLER Scott Smith
SURFACE ELEVATION
WEATHER (a.m.)
(p.m.)

HOLE DESIGNATION DC-2
DATE STARTED 6-25-91
DATE COMPLETED 6-25-91
DRILLING METHOD Hollow Stem Auger
CRA SUPERVISOR Mark Elliha

DEPTH OR ELEVATION (ft/m) FROM	AT	TO	SAMPLE #	SAMPLING METHOD	PENETRATION RECORD SPLIT SPOON BLOWS 6"	6"	6"	6"	RECOVERED LENGTH	SAMPLE DESCRIPTION (COMPONENTS, COLOUR, MOISTURE, NATIVE/FILL)	NOTES (STRUCTURES, DRILLER'S COMMENTS, GEOLOGIC CLASSIFICATION)

2/05/85

CRA

STRATIGRAPHY LOG (OVERBURDEN)

SHEET NO. 4 OF 1

PROJECT NAME Mt. Morris Dump Site
PROJECT NUMBER 3990
CLIENT Warner, Norcross & Judd
LOCATION Mt. Morris, MI

DRILLING CONTRACTOR PSI, Inc.
DRILLER Alan Babb
SURFACE ELEVATION
WEATHER (a.m.)
(p.m.)

HOLE DESIGNATION DC-3
DATE STARTED 6-27-91
DATE COMPLETED 6-27-91
DRILLING METHOD Hollow Stem Auger
CRA SUPERVISOR Mike Okamoto

DEPTH OR ELEVATION (ft/m) FROM	AT	TO	SAMPLE #	SAMPLING METHOD	PENETRATION RECORD SPLIT SPOON BLOWS 6"	6"	6"	6"	LENGTH RECOVERED	SAMPLE DESCRIPTION (COMPONENTS, COLOUR, MOISTURE, NATIVE/FILL)	NOTES (STRUCTURES, DRILLER'S COMMENTS, GEOLOGIC CLASSIFICATION)

SENT BY: 7- 3-91 :11:44AM : CONESTOGA ROVERS- 13139421858:# 2/ 2

2/05/85

CRA

STRATIGRAPHY LOG (OVERBURDEN)

SHEET NO. 5 OF 1

PROJECT NAME Mt. Morris Dump Site
PROJECT NUMBER 3990
CLIENT Warner, Norcross & Judd
LOCATION Mt. Morris, MI

DRILLING CONTRACTOR CTI and Assoc, Inc.
DRILLER Richard Near
SURFACE ELEVATION
WEATHER (a.m.)
(p.m.)

HOLE DESIGNATION DC-4
DATE STARTED 6-27-91
DATE COMPLETED 6-27-91
DRILLING METHOD Hollow Stem Auger
CRA SUPERVISOR Mark Gliha

DEPTH OR ELEVATION (ft/m) FROM	AT	TO	SAMPLE #	SAMPLING METHOD	PENETRATION RECORD SPLIT SPOON BLOWS 6"	6"	6"	6"	RECOVERED LENGTH	SAMPLE DESCRIPTION (COMPONENTS, COLOUR, MOISTURE, NATIVE/FILL)	NOTES (STRUCTURES, DRILLER'S COMMENTS, GEOLOGIC CLASSIFICATION)

SENT BY:
7- 3-91 :11:44AM : CONESTOGA ROVERS-
13139421858:# 2/ 2

2/05/85

CRA

STRATIGRAPHY LOG (OVERBURDEN)

SHEET NO. 6 OF 1

PROJECT NAME Mt. Morris Dump Site
PROJECT NUMBER 3990
CLIENT Warner, Norcross & Judd
LOCATION Mt. Morris, MI

DRILLING CONTRACTOR PSI, Inc.
DRILLER Mike Bond
SURFACE ELEVATION
WEATHER (a.m.)
(p.m.)

HOLE DESIGNATION DC-5
DATE STARTED 6-27-91
DATE COMPLETED 6-27-91
DRILLING METHOD Hollow Stem Auger
CRA SUPERVISOR Mike Okamoto

DEPTH OR ELEVATION (ft/m) FROM	AT	TO	SAMPLE #	SAMPLING METHOD	PENETRATION RECORD SPLIT SPOON BLOWS 6"	6"	6"	6"	RECOVERED LENGTH	SAMPLE DESCRIPTION (COMPONENTS, COLOUR, MOISTURE, NATIVE/FILL)	NOTES (STRUCTURES, DRILLER'S COMMENTS, GEOLOGIC CLASSIFICATION)

SENT BY: 7- 3-91 :11:44AM : CONESTOGA ROVERS- 13139421858:# 2/ 2

2/05/86

CRA

STRATIGRAPHY LOG (OVERBURDEN)

SHEET NO. 7 OF 1

PROJECT NAME Mt. Morris Dump Site
PROJECT NUMBER 3990
CLIENT Warner, Norcross & Judd
LOCATION Mt. Morris, MI

DRILLING CONTRACTOR CTI and Assoc, Inc
DRILLER Richard Near
SURFACE ELEVATION
WEATHER (a.m.)
(p.m.)

HOLE DESIGNATION DC-6
DATE STARTED 6-27-91
DATE COMPLETED 6-27-91
DRILLING METHOD Hollow Stem Auger
CRA SUPERVISOR Mark Gliha

DEPTH OR ELEVATION (ft/m) FROM	AT	TO	SAMPLE #	SAMPLING METHOD	PENETRATION RECORD SPLIT SPOON BLOWS 6"	6"	6"	6"	RECOVERED LENGTH	SAMPLE DESCRIPTION (COMPONENTS, COLOUR, MOISTURE, NATIVE/FILL)	NOTES (STRUCTURES, DRILLER'S COMMENTS, GEOLOGIC CLASSIFICATION)

2/05/85

CRA

STRATIGRAPHY LOG (OVERBURDEN)

SHEET NO. 8 OF 1

PROJECT NAME Mt. Morris Dump Site
PROJECT NUMBER 3990
CLIENT Warner, Norcross & Judd
LOCATION Mt. Morris, MI

DRILLING CONTRACTOR CTI and Assoc, Inc.
DRILLER Richard Near
SURFACE ELEVATION
WEATHER (a.m.)
(p.m.)

HOLE DESIGNATION DC-7
DATE STARTED 6-27-91
DATE COMPLETED 6-27-91
DRILLING METHOD Hollow Stem Auger
CRA SUPERVISOR Mark Gliha

DEPTH OR ELEVATION (ft/m) FROM	AT	TO	SAMPLE #	SAMPLING METHOD	PENETRATION RECORD SPLIT SPOON BLOWS 6"	6"	6"	6"	RECOVERED LENGTH	SAMPLE DESCRIPTION (COMPONENTS, COLOUR, MOISTURE, NATIVE/FILL)	NOTES (STRUCTURES, DRILLER'S COMMENTS, GEOLOGIC CLASSIFICATION)

2/05/85

CRA

STRATIGRAPHY LOG (OVERBURDEN)

SHEET NO. 9 OF 1

PROJECT NAME Mt. Morris Dump Site
PROJECT NUMBER 3990
CLIENT Warner, Norcross & Judd
LOCATION Mt. Morris, MI

DRILLING CONTRACTOR CTI and Assoc. Inc.
DRILLER Pat Cody
SURFACE ELEVATION
WEATHER (a.m.)
(p.m.)

HOLE DESIGNATION DC-8
DATE STARTED 6-28-91
DATE COMPLETED 6-28-91
DRILLING METHOD Hollow Stem Auger
CRA SUPERVISOR Mark Gluba

DEPTH OR ELEVATION (ft/m) FROM	AT	TO	SAMPLE #	SAMPLING METHOD	PENETRATION RECORD SPLIT SPOON BLOWS 6"	6"	6"	6"	RECOVERED LENGTH	SAMPLE DESCRIPTION (COMPONENTS, COLOUR, MOISTURE, NATIVE/FILL)	NOTES (STRUCTURES, DRILLER'S COMMENTS, GEOLOGIC CLASSIFICATION)

2/05/85

CRA

SENT BY:
7- 3-91 :11:44AM : CONESTOGA ROVERS-
13139421858:# 2/ 2

STRATIGRAPHY LOG (OVERBURDEN)

SHEET NO. 10 OF 1

PROJECT NAME Mt. Morris Dump Site
PROJECT NUMBER 3990
CLIENT Warner, Norcross & Judd
LOCATION Mt. Morris, MI

DRILLING CONTRACTOR CTI and Assoc, Inc.
DRILLER Pat Cody
SURFACE ELEVATION
WEATHER (a.m.)
(p.m.)

HOLE DESIGNATION DC-9
DATE STARTED 6-28-91
DATE COMPLETED 6-28-91
DRILLING METHOD Hollow Stem Auger
CRA SUPERVISOR Mark Gliha

DEPTH OR ELEVATION (ft/m) FROM	AT	TO	SAMPLE #	SAMPLING METHOD	PENETRATION RECORD SPLIT SPOON BLOWS 6"	6"	6"	6"	RECOVERED LENGTH	SAMPLE DESCRIPTION (COMPONENTS, COLOUR, MOISTURE, NATIVE/FILL)	NOTES (STRUCTURES, DRILLER'S COMMENTS, GEOLOGIC CLASSIFICATION)

2/05/85

CRA

STRATIGRAPHY LOG (OVERBURDEN)

SHEET NO. 11 OF 1

PROJECT NAME Mt. Morris Dump Site
PROJECT NUMBER 3990
CLIENT Warner, Norcross & Judd
LOCATION Mt. Morris, MI

DRILLING CONTRACTOR PSI, Inc.
DRILLER Mike Bond
SURFACE ELEVATION
WEATHER (a.m.)
(p.m.)

HOLE DESIGNATION DC-10
DATE STARTED 6-28-91
DATE COMPLETED 6-28-91
DRILLING METHOD Hollow Stem Auger
CRA SUPERVISOR Mike Okamoto

DEPTH OR ELEVATION (ft/m) FROM	AT	TO	SAMPLE #	SAMPLE METHOD	PENETRATION RECORD SPLIT SPOON BLOWS 6"	6"	6"	6"	RECOVERED LENGTH	SAMPLE DESCRIPTION (COMPONENTS, COLOUR, MOISTURE, NATIVE/FILL)	NOTES (STRUCTURES, DRILLER'S COMMENTS, GEOLOGIC CLASSIFICATION)

2/05/85

CRA

STRATIGRAPHY LOG (OVERBURDEN)

SHEET NO. 12 OF 1

PROJECT NAME Mt. Morris Dump Site
PROJECT NUMBER 3990
CLIENT Warner, Norcross & Judd
LOCATION Mt. Morris, MI

DRILLING CONTRACTOR CTI and Assoc, Inc
DRILLER Pat Cody
SURFACE ELEVATION
WEATHER (a.m.)
(p.m.)

HOLE DESIGNATION DC-11
DATE STARTED 6-28-91
DATE COMPLETED 6-28-91
DRILLING METHOD Hollow Stem Auger
CRA SUPERVISOR Mark Gliha

DEPTH OR ELEVATION (ft/m) FROM	AT	TO	SAMPLE #	SAMPLING METHOD	PENETRATION RECORD SPLIT SPOON BLOWS 6"	6"	6"	6"	RECOVERED LENGTH	SAMPLE DESCRIPTION (COMPONENTS, COLOUR, MOISTURE, NATIVE/FILL)	NOTES (STRUCTURES, DRILLER'S COMMENTS, GEOLOGIC CLASSIFICATION)

2/05/85

CRA

SENT BY: 7- 3-91 ;11:44AM ; CONESTOGA ROVERS- 13139421858:# 2/ 2

STRATIGRAPHY LOG (OVERBURDEN)

SHEET NO. 13 OF 1

PROJECT NAME Mt. Morris Dump Site
PROJECT NUMBER 3990
CLIENT Warner, Norcross & Judd
LOCATION Mt. Morris, MI

DRILLING CONTRACTOR PSI, Inc.
DRILLER Mike Bond
SURFACE ELEVATION
WEATHER (a.m.)
(p.m.)

HOLE DESIGNATION DC-12
DATE STARTED 6-28-91
DATE COMPLETED 6-28-91
DRILLING METHOD Hollow Stem Auger
CRA SUPERVISOR Mike Okamoto

DEPTH OR ELEVATION (ft/m) FROM	AT	TO	SAMPLE #	SAMPLING METHOD	PENETRATION RECORD SPLIT SPOON BLOWS 6"	6"	6"	6"	RECOVERED LENGTH	SAMPLE DESCRIPTION (COMPONENTS, COLOUR, MOISTURE, NATIVE/FILL)	NOTES (STRUCTURES, DRILLER'S COMMENTS, GEOLOGIC CLASSIFICATION)

2/05/85

CRA

DC-1 By PSI 6-25-91

0-1' Loose dry medium black top soil
1-1½' Loose moist fine brown sand
1½'-5' Loose moist fine brown sand (fill), some clay, rubber, and wood debris,
5'-9'6" Stiff moist fine ~~gray-brown~~ brown-gray clay, trace sand, ~~trace~~ and silt.

No G.W.
E.B. = 9'6"

DC-2 By PSI 6-25-91

0-2' Loose moist ~~brown~~ fine brown sand, some clay, trace gravel, wood, and concrete (fill)
2'-2'6" Loose dry medium black top soil
2'6"-6' Stiff moist fine brown-gray clay, trace silt, sand, organics, and gravel.

No GW
E.B. = 6'0"

(see Mike's) DC-3 By PSI (6-27-91)

DC-4 (By CTI) (6-27-91)

0-4' Loose moist medium brown sand, oxidized, ~~trace gravel~~ some rubber debris, trace gravel.

4'-6' Stiff moist fine gray clay, some sand, trace gravel and wood debris [fill]

6'-7'3" Stiff moist fine gray clay, oxidized, some sand, trace organics.

7'3"-8' stiff moist fine gray clay, some silt and sand.

8'-12' stiff wet medium gray sand, some silt.

GW = 9'6"
EB = 12'

(see Mike) DC-5 (PSI) 6-27-91

DC-6 (By CTI) 6-27-91

0-2'	Loose moist fine brown sand, some silt.
2'-5½'	Stiff wet fine brown-gray clay, some silt and sand.
5½'-6½'	Stiff wet medium ~~grained~~ brown sand
6½'-7'	Stiff wet fine brown sand, some silt.
7'-9'	stiff wet fine gray clay, some silt

DC-7 (By CTI) 6-28-91

0-9' ~~Stiff~~ Loose dry fine to medium brown sand.

9'-10' ~~Stiff~~ ~~Loose~~ stiff wet medium brown sand, trace gravel

10'-12' ~~Stiff~~ ~~Loose~~ stiff wet medium to coarse brown sand, some gravel

No G.W.
EB=12'

DC-8 (By CTI) 6-28-91

0-6" Loose dry medium brown top soil, some sand.

0'6" to 4' Loose moist fine brown sand, oxidized, some silt and clay, ~~oxidized~~.

4'-5'6" Stiff moist fine brown-gray clay, some silty sand, trace organics and wood debris.

5'6"-9' Very stiff moist fine brown clay, some silty, trace sand, gravel, and organics.

No G.W.
EB=9'

DC-9 (By CTI) 6·28·91

0-6" Loose dry medium brown top soil, some sand,

6"- 3'6" Stiff moist fine ~~clay~~ brown clay, some sand & ~~trace~~ and silt, ~~and~~ trace organics.

3'6"- 9' Very stiff fine brown-gray clay, some sand and silt, trace ~~gray~~ organics and gravel.

GW = 5'6"

EB = 9'

(By Mike) DC-10 (~~By CTI~~) 6·28·91

DC-11 (By CT I)

0-6" Loose dry medium black top soil, some sand

6"-2'0" Loose moist medium brown sand, some silt

2'0"-4'0" Stiff moist medium gray sand, trace organi

4'-6'6" Stiff Wet fine to medium brown sand, trace silt,

6'6"-10' Very Stiff Wet medium tan sand, trace gravel and organics.

GW = 5'6"

EB = 10'

Professional Service Industries, Inc.

LOG OF SOIL BORING NO. DC-2

PROJECT CRA

JOB NO. 406-14122

LOCATION Lewis Road

SURFACE ELEV. _____ DATE 6-25-91

Mt. Morris, Michigan

Sample & Type	Depth	SOIL DESCRIPTION	Penetration Blows for 6"	Moisture %	Dry Den. Wt. P.C.F.	Unc. Comp. Strength PSF Qp	Qu	Rec. %
	1	Fine to medium clayey CLAY, brown, moist						
	2		4					
		Sandy TOPSOIL, dark brown, moist	4					
A SS	3		5					
	4	Sandy CLAY, mottled with trace of fine gravel, moist	5					
	5		4 5					
B SS	6		7 9					
	7	END OF BORING						
	8							
	9							
	10							
	11							
	12							
	13							
	14							
	15							
	16							
	17							
	18							
	19							
	20							
	21							
	22							
	23							
	24							
	25							

TYPE OF SAMPLE
D - DISTURBED
SS - SPLIT SPOON
UL - UNDIST LINER
TW - THIN WALL TUBE
RC - ROCK CORE
WS - WASHED SAMPLE

REMARKS:

GROUND WATER OBSERVATIONS
G W ENCOUNTERED AT FT. WET
G W ENCOUNTERED AT FT. WET
G W AFTER COMPLETION FT. WET
G W AFTER HRS. FT. WET
G W VOLUMES

Professional Service Industries, Inc.

LOG OF SOIL BORING NO. DC-3

PROJECT CRA

JOB NO. 406-14122

LOCATION Lewis Road

SURFACE ELEV. _____ DATE 5-27-91

Mt. Morris, Michigan

Sample & Type	Depth	SOIL DESCRIPTION	Penetration Blows for 6"	Moisture %	Dry Sam. Wt. P.C.F.	Unc. Comp. Strength PSF Qp	Qu	%
			16					
A	1	FILL, variegated with rubber and paint, moist	75					
SS		(Driller reported foul odor)	for 3"					
	2		15					
B			9					
SS	3		5					
			4					
C	4		5					
SS			7					
	5		4					
D			3					
SS	6		4					
			6					
E	7	Medium SAND, black with traces of clay, moist	9					
SS			9					
	8		5					
F			6					
SS	9		6					
			3					
G	10	Very sandy CLAY, variegated, moist	4					
SS			5					
	11		2					
H		Sandy CLAY, brown with some marl, moist	2					
SS	12	Medium SAND, black, very moist	3					
			8					
I	13	Medium SAND, brown, wet	6					
SS			5					
	14		3					
J			3					
SS	15		3					
			2					
K	16		1					
SS			1					
	17							
		END OF BORING						
	18							
	19							
	20							
	21							
	22							
	23							
	24							
	25							

TYPE OF SAMPLE
D - DISTURBED
SS - SPLIT SPOON
UL - UNDIST LINER
TW - THIN WALL TUBE
RC - ROCK CORE
WS - WASHED SAMPLE

REMARKS:

GROUND WATER OBSERVATIONS

G W ENCOUNTERED AT	12	FT.	7	HRS.
G W ENCOUNTERED AT		FT.		HRS.
G W AFTER COMPLETION		FT.		HRS.
G W AFTER	HRS.		FT	HRS.
G W VOLUMES	HEAVY			

Professional Service Industries, Inc.

LOG OF SOIL BORING NO. DC-5

PROJECT CRA

JOB NO. 6-27-91

LOCATION Lewis Road

SURFACE ELEV. _____ DATE 6-27-91

Mt. Morris, Michigan

Samples & Type	Depth	SOIL DESCRIPTION	Penetration Blows for 6"	Moisture %	Dry Den. Wt. P.C.F.	Unc. Comp. Strength PSF Qs	Qu	SW %
	1	Miscellaneous FILL, wood and bricks, brown, moist						
	2		10					
	3		14					
A SS	4		35					
	5							
B SS	6		6					
	7	PEAT, black, moist	7					
C SS	8		7					
			8					
D SS	9		5					
	10		4					
E SS	11		2					
			2					
F SS	12		2					
	13	MARL, moist, gray	1					
G SS	14		1					
			4					
H SS	15		7					
	16	Medium SAND, gray, wet	2					
I SS	17		2					
			3					
	18	END OF BORING	3					
			5					
	19		7					
	20							
	21							
	22							
	23							
	24							
	25							

TYPE OF SAMPLE
D - DISTURBED
SS - SPLIT SPOON
UL - UNDIST LINER
TW - THIN WALL TUBE
RC - ROCK CORE
WS - WASHED SAMPLE

REMARKS:

GROUND WATER OBSERVATIONS

G W ENCOUNTERED AT	13	FT.	6	HRS.
G W ENCOUNTERED AT		FT.		HRS.
G W AFTER COMPLETION		FT.		HRS.
G W AFTER HRS.		FT.		HRS.
G W VOLUMES	HEAVY			

Professional Service Industries, Inc.

LOG OF SOIL BORING NO. DC-51

PROJECT GRA

JOB NO. 406-14122

LOCATION Lewis Road

SURFACE ELEV. _____ DATE 6-27-91

Mt. Morris, Michigan

Sample & Type	Depth	SOIL DESCRIPTION	Penetration Blows per 6"	Moisture %	Dry Den. Wt. P.C.F.	Unc. Comp. Strength PSF Qu	Qp	REC. %
		Miscellaneous FILL, wood and bricks, brown, moist	8					
A	1		5					
SS								
	2		6					
B			4					
SS	3		6					
			8					
	4							
C	5		3					
SS			7					
	6		20					
	7	PEAT, black, moist	2					
O			4					
SS	8		6					
			3					
E	9		4					
SS			8					
	10							
	11							
	12	MARL, moist, gray						
	13							
	14	Medium SAND, gray, wet						
	15							
	16							
	17							
	18	END OF BORING						
	19							
	20							
	21							
	22							
	23							
	24							
	25							

TYPE OF SAMPLE
D - DISTURBED
SS - SPLIT SPOON
UL - UNDIST LINER
TW - THIN WALL TUBE
RC - ROCK CORE
WS - WASHED SAMPLE

REMARKS:

GROUND WATER OBSERVATIONS

G W ENCOUNTERED AT		FT.	INS.
G W ENCOUNTERED AT		FT	INS.
G W AFTER COMPLETION		FT	INS.
G W AFTER	HRS.	FT.	INS.
G W VOLUMES			

Professional Service Industries, Inc.

LOG OF SOIL BORING NO. DC-10

PROJECT CRA

JOB NO 406-14122

LOCATION Lewis Road

SURFACE ELEV. DATE 6-28-91 Mt. Morris, Michigan

Sample & Type	Depth	SOIL DESCRIPTION	Penetration Blows for 6"	Moisture %	Dry Den. in P.C.F.	Ind. Comp. Strength PSF Qs	Qu	%
		Sandy topsoil FILL, moist	1					
	1		1					
A			1					
SS	2		3					
		SLUDGE, green	1					
	3	Medium SAND, gray, wet (Driller reported foul odor)	3					
B			4					
SS	4		6					
			1					
	5		3					
C			4					
SS	6		6					
			5					
	7		7					
D			9					
SS	8		11					
			13					
	9		13					
E			13					
SS	10		15					
			13					
	11		20					
F			20					
SS	12	Very sandy fine SILT, gray, very moist	22					
			--					
	13		1-					
G			19					
SS	14		22					
		Coarse SAND and GRAVEL, brown, wet	--					
	15		17					
H			17					
SS	16		16					
			7					
	17	Silty CLAY, gray with pebbles, moist	12					
I			22					
SS	18		18					
			12					
	19		16					
J			22					
SS	20		27					
		END OF BORING						
	21							
	22							
	23							
	24							
	25							

TYPE OF SAMPLE
D - DISTURBED
SS - SPLIT SPOON
UL - UNDIST LINER
TW - THIN WALL TUBE
RC - ROCK CORE
WS - WASHED SAMPLE

REMARKS:

GROUND WATER OBSERVATIONS

G W ENCOUNTERED AT	2	FT.	2	INS.
G W ENCOUNTERED AT		FT.		INS.
G W AFTER COMPLETION		FT.		INS.
G W AFTER HRS.		FT.		INS.
G W VOLUMES	HEAVY			

Professional Service Industries, Inc.

LOG OF SOIL BORING NO. DC-12

PROJECT CRA

JOB NO. 406-14122

LOCATION Lewis Road

SURFACE ELEV. _____ DATE 6-28-91

Mt. Morris, MI

Sample & Type	Depth	SOIL DESCRIPTION	Penetration Blows for 6"	Moisture %	Dry Den. Wt. P.C.F.	Unc. Comp. Strength PSF Qp	Qu	Str. %
		Sandy TOPSOIL, dark brown, moist						
	1	Fine to medium SAND, brown, moist						
	2	Mixed SAND with rubber, wood and clay	3					
A SS	3		3					
	4		4					
	5		4					
			3					
B SS	6	Sandy CLAY, mottled with trace of silt, moist	3					
			4					
	7	Sandy CLAY, mottled with trace of silt and fine gravel, moist	4					
C SS	8		5					
D SS	9		7					
			9					
	10		5					
		END OF BORING	6					
	11							
	12							
	13							
	14							
	15							
	16							
	17							
	18							
	19							
	20							
	21							
	22							
	23							
	24							
	25							

TYPE OF SAMPLE
- D - DISTURBED
- SS - SPLIT SPOON
- UL - UNDIST LINER
- TW - THIN WALL TUBE
- RC - ROCK CORE
- WS - WASHED SAMPLE

REMARKS:

GROUND WATER OBSERVATIONS

G W ENCOUNTERED AT	FT.	AUG.
G W ENCOUNTERED AT	FT.	AUG.
G W AFTER COMPLETION	FT.	AUG.
G W AFTER HRS	FT.	AUG.
G W VOLUMES	NONE	

Professional Service Industries, Inc.

LOG OF SOIL BORING NO. DC-12

PROJECT CRA

JOB NO. 406-14122

LOCATION Lewis Road

SURFACE ELEV. DATE 6-28-91

Mt. Morris, Michigan

Sample & Type	Depth	SOIL DESCRIPTION	Penetration Blows for 6"	Moisture %	Dry Den. Wt. P.C.F.	Unc. Comp. Strength PSF Qu	Qp	Rec. %
		Sandy TOPSOIL, brown, moist	1					
	1		2					
A		Medium SAND, brown, moist	5					
SS	2		10					
			13					
	3		10					
B		Medium SAND, brown, wet	16					
SS	4		18					
			11					
	5		14					
C			17					
SS	6	SILT, gray, wet	14					
			10					
	7	Fine silty SAND, gray	13					
D			13					
SS	8		15					
			11					
	9		12					
E			14					
SS	10		10					
		Silty CLAY, gray, moist	5					
	11		5					
F			11					
SS	12		14					
	13							
ST								
I	14	PUSH from 12' to 14' R=2'						
		END OF BORING						
	15							
	16							
	17							
	18							
	19							
	20							
	21							
	22							
	23							
	24							
	25							

TYPE OF SAMPLE
D - DISTURBED
SS - SPLIT SPOON
UL - UNDIST LINER
TW - THIN WALL TUBE
RC - ROCK CORE
WS - WASHED SAMPLE

REMARKS:

GROUND WATER OBSERVATIONS

G W ENCOUNTERED AT	3	FT.	0 HRS.
G W ENCOUNTERED AT		FT.	HRS.
G W AFTER COMPLETION		FT.	HRS.
G W AFTER HRS.		FT	HRS.
G W VOLUMES	HEAVY		

APPENDIX B

GRAIN SIZE DISTRIBUTION ANALYSIS

FILE COPY

#3390
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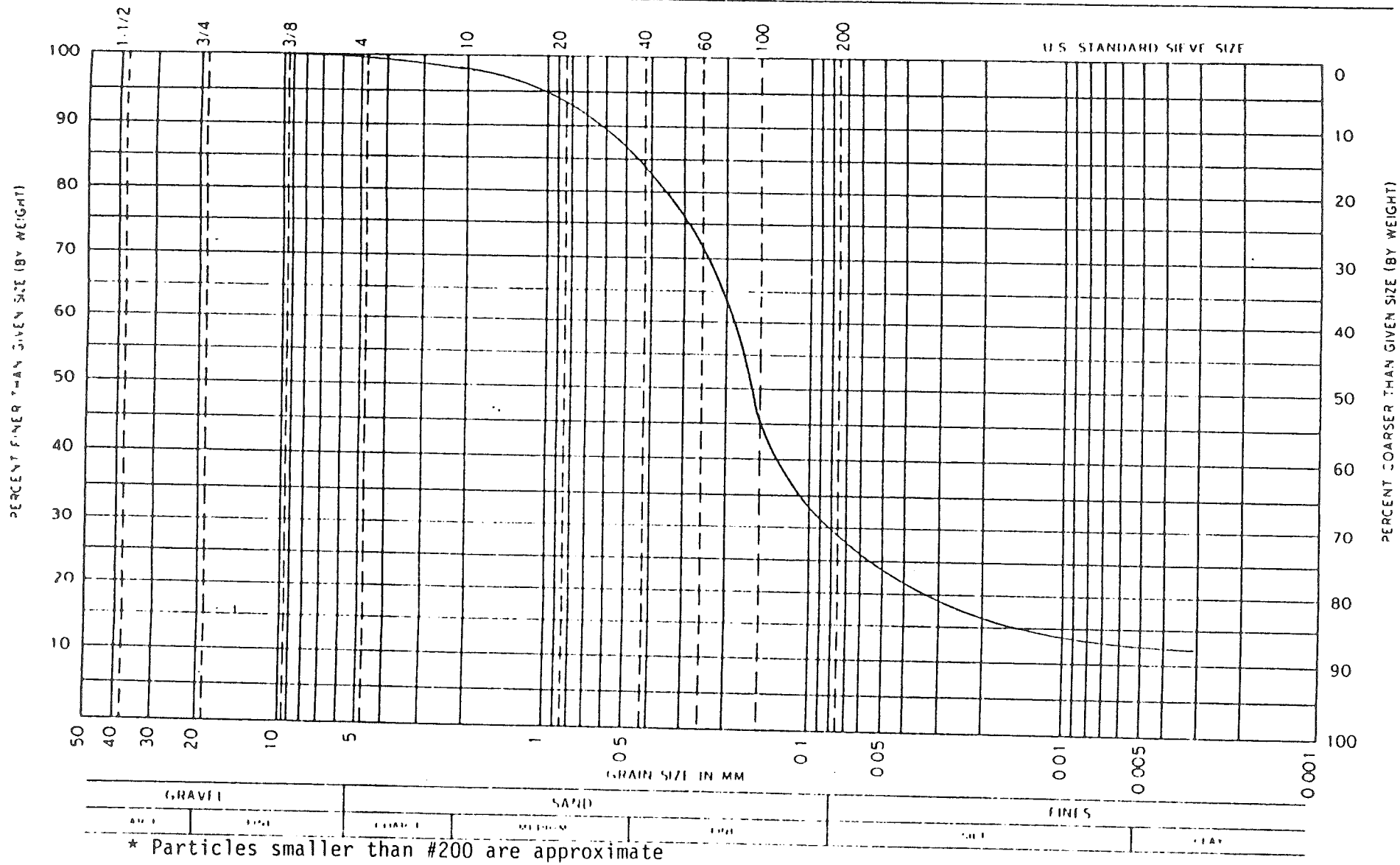
GRAIN SIZE DISTRIBUTION CURVE

PROJECT Mt. Morris Dump Site PROJECT NO F-11125

Sample NO DC-11B (CTI - 1) SAMPLE DEPTH DATE TESTED 7-10-91

SAMPLE DESCRIPTION Gray silty sand



* Particles smaller than #200 are approximate

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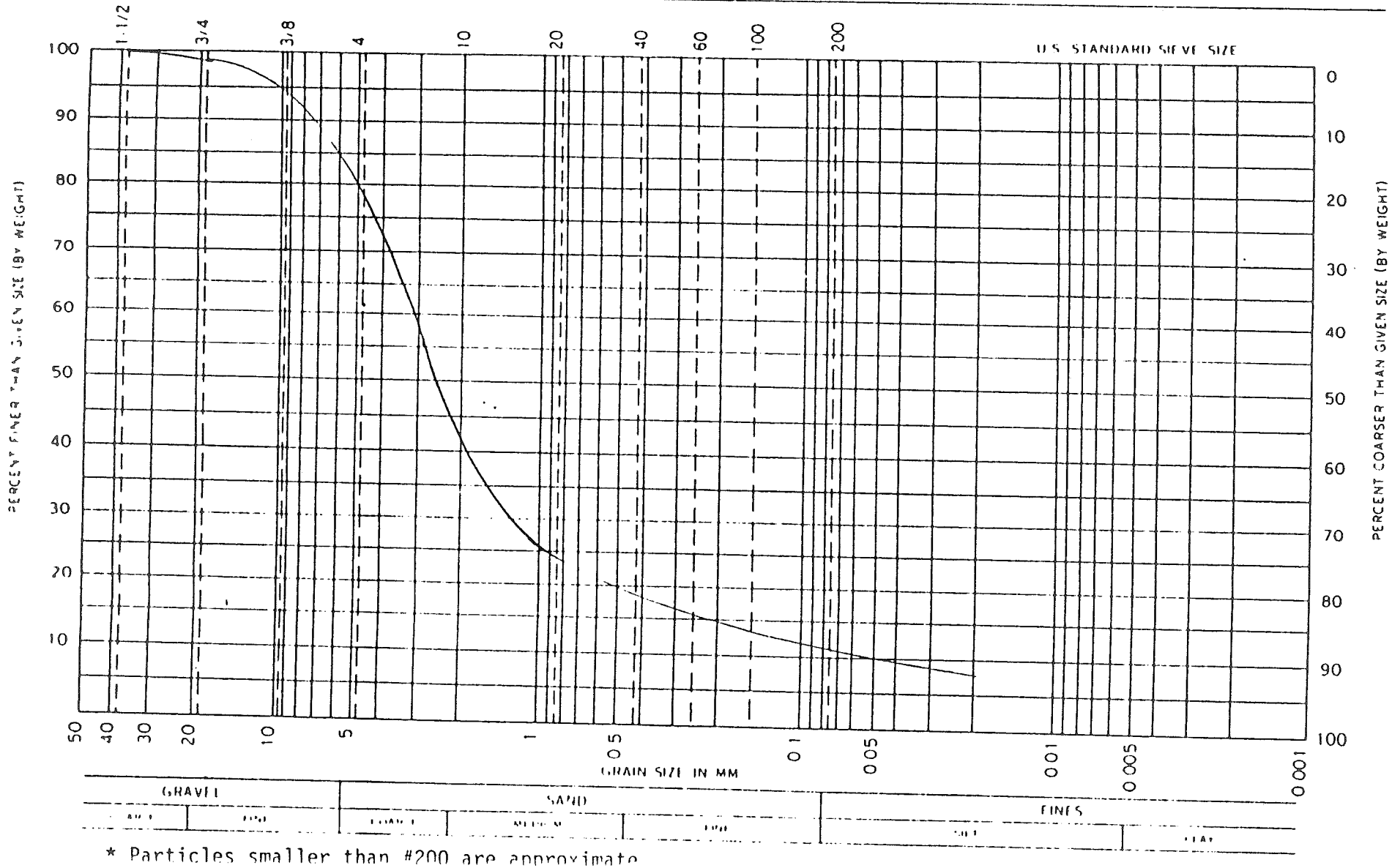
GRAIN SIZE DISTRIBUTION CURVE

PROJECT Mt. Morris Dump Site PROJECT NO F-11125

Sample NO DC-4A (CTI - 2) SAMPLE DEPTH DATE TESTED 7-10-91

SAMPLE DESCRIPTION Brown gravely sand with clay and a trace of silt



* Particles smaller than #200 are approximate

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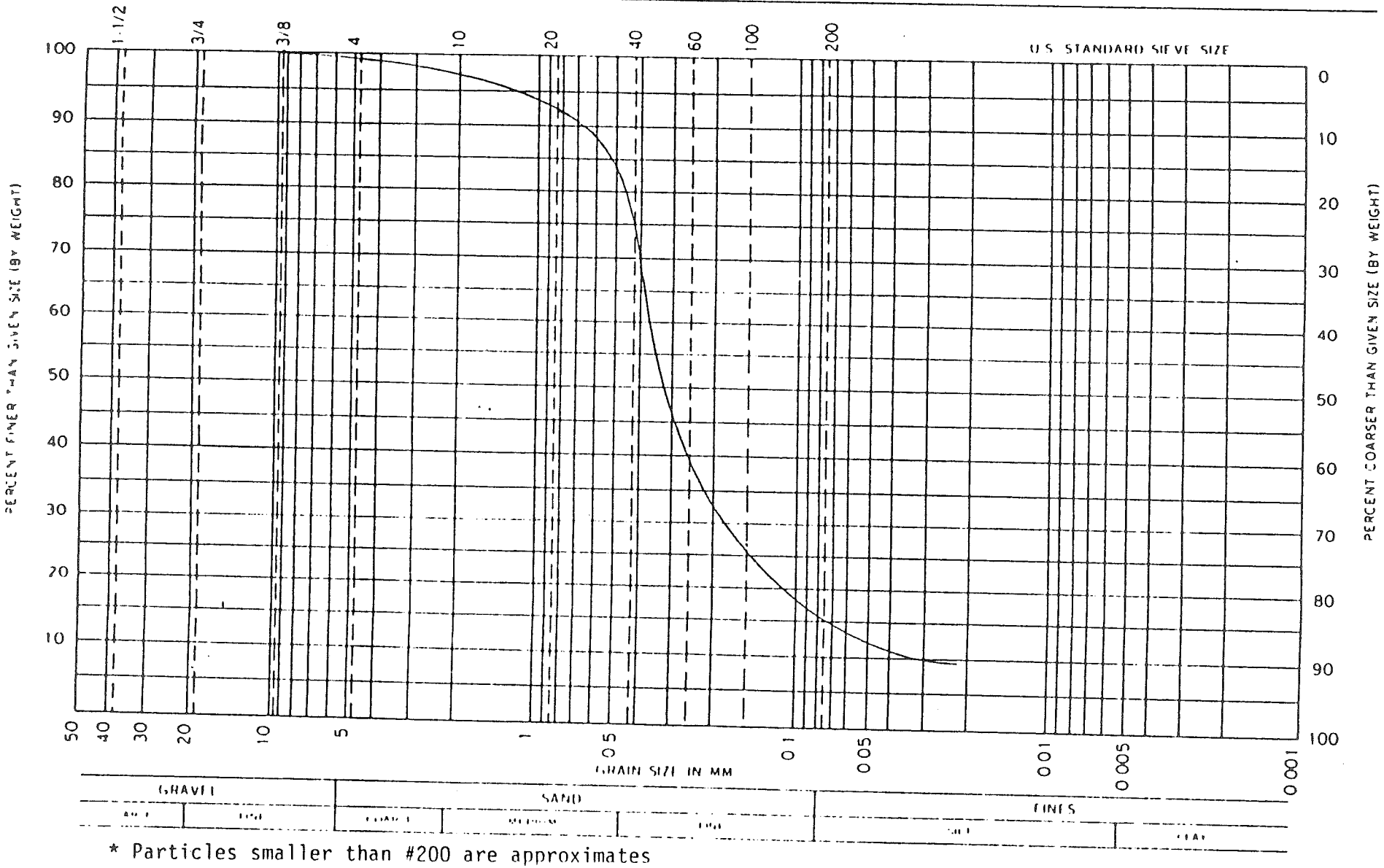
GRAIN SIZE DISTRIBUTION CURVE

PROJECT Mt. Morris Dump Site PROJECT NO F-11125

Sample NO DC-3J (CTI - 3) SAMPLE DEPTH DATE TESTED 7-10-91

SAMPLE DESCRIPTION Gray clayey sand with a trace of silt and sand



* Particles smaller than #200 are approximates

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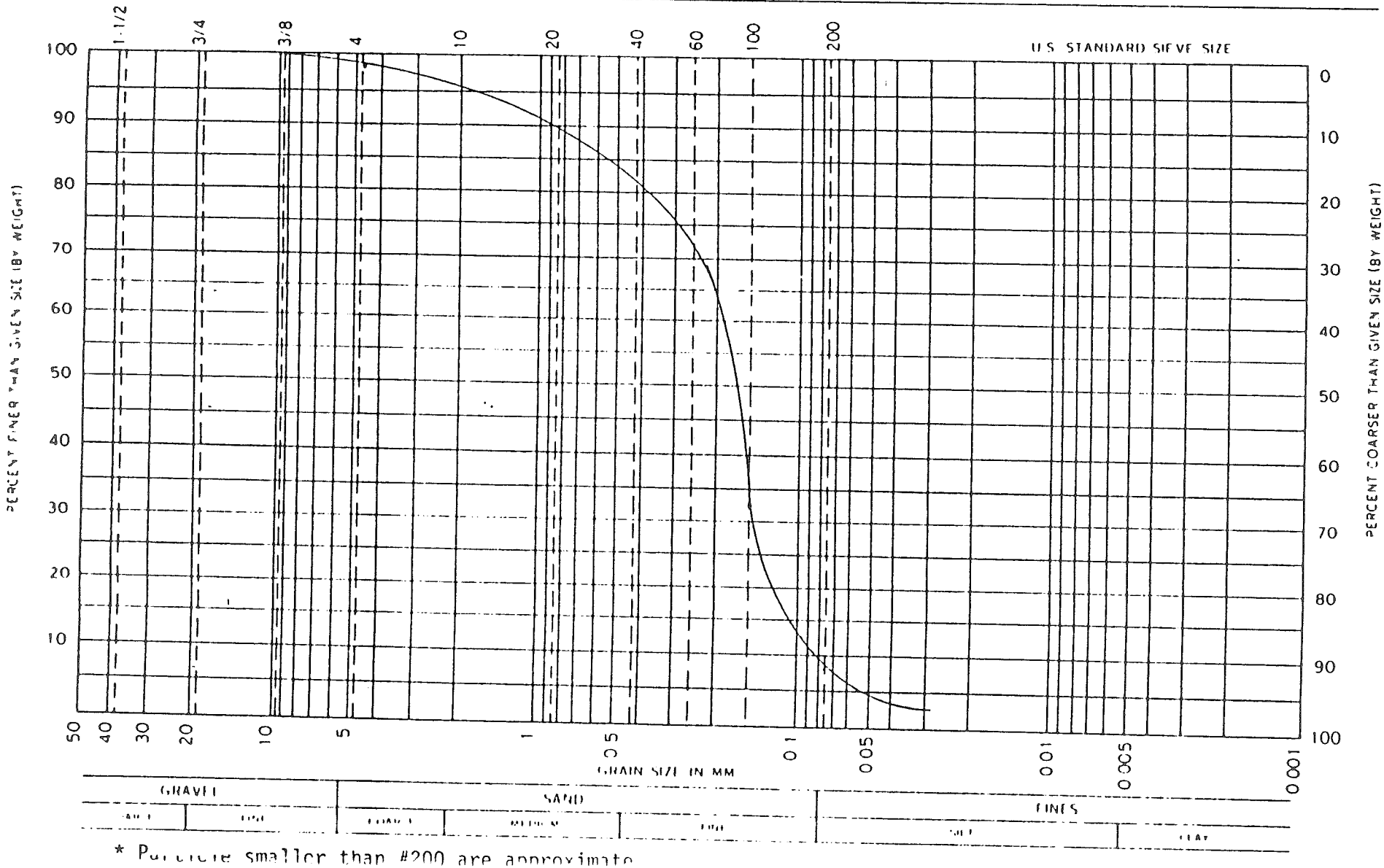
GRAIN SIZE DISTRIBUTION CURVE

PROJECT Mt. Morris Dump Site PROJECT NO F-11125

Sample NO DC-4E (CTI - 4) SAMPLE DEPTH _____ DATE TESTED 7-10-91

SAMPLE DESCRIPTION Gray sand with a trace of clay, silt and gravel



* Particle smaller than #200 are approximate

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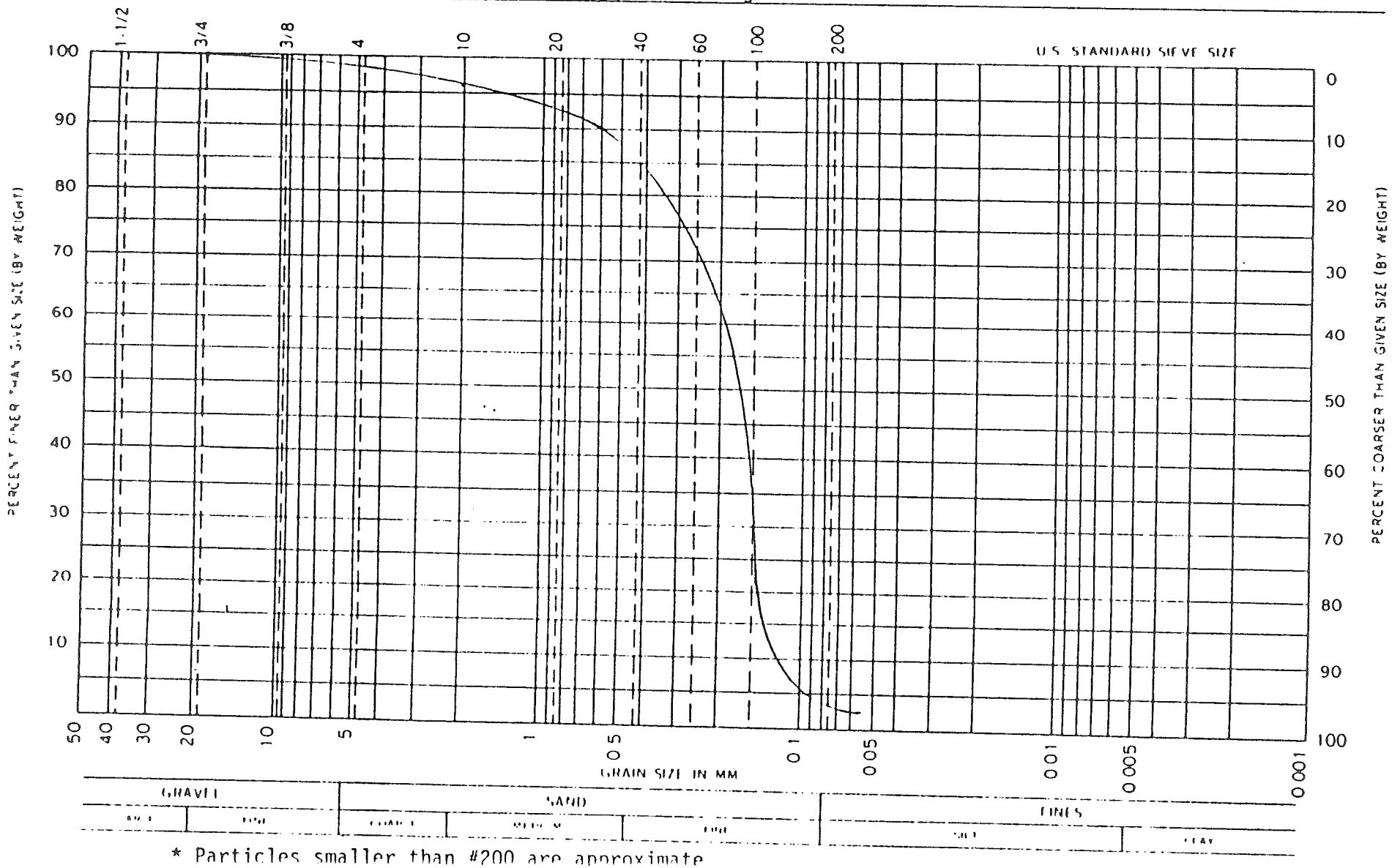
GRAIN SIZE DISTRIBUTION CURVE

PROJECT Mt. Morris Dump Site PROJECT NO F-11125

Sample NO DC-11C (CTI - 5) SAMPLE DEPTH DATE TESTED 7-10-91

SAMPLE DESCRIPTION Brown sand with a trace of clay, silt and gravel



* Particles smaller than #200 are approximate

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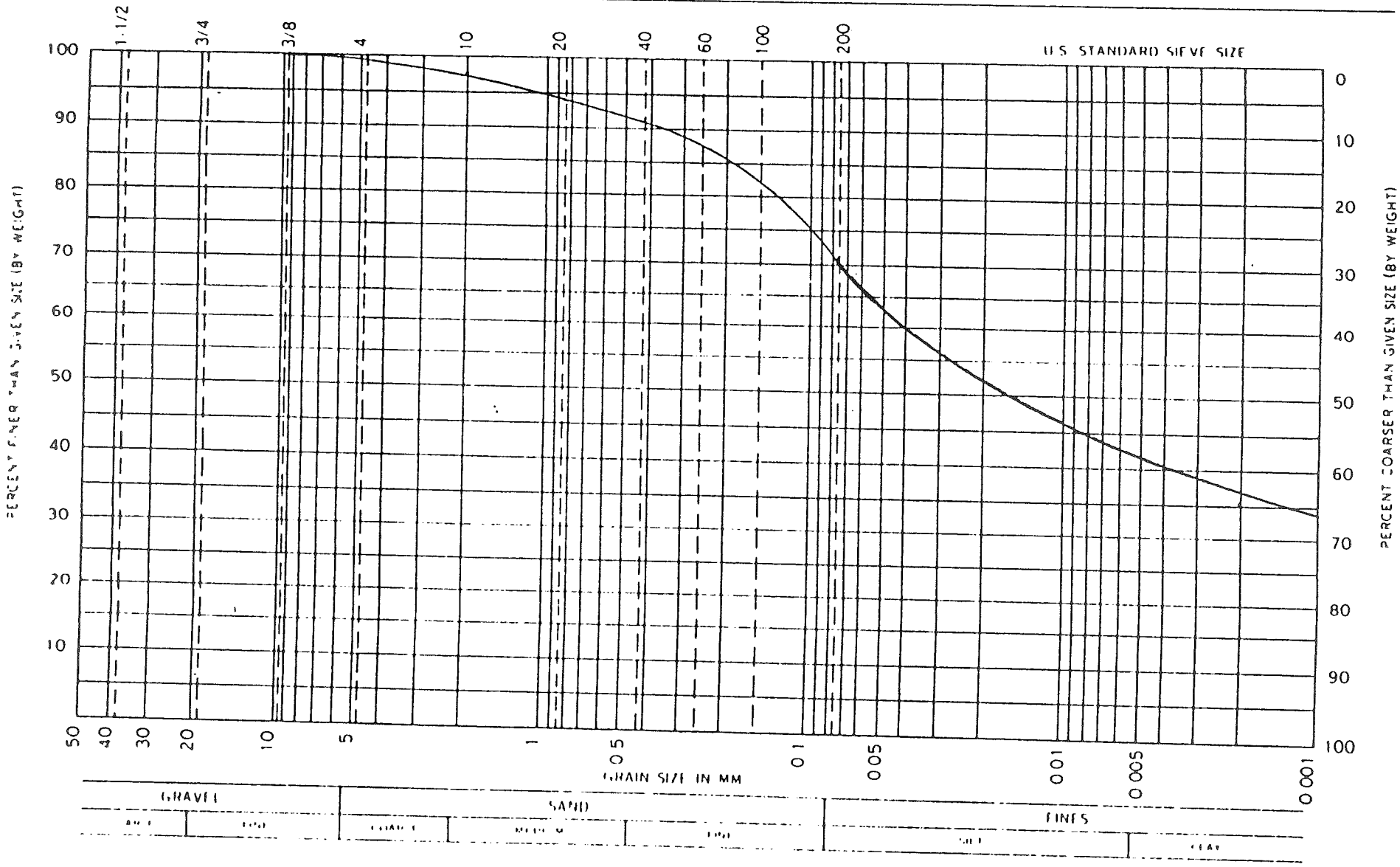
GRAIN SIZE DISTRIBUTION CURVE

PROJECT Mt. Morris Dump Site PROJECT NO F-11125

Sample NO 6 SAMPLE DEPTH DATE TESTED 7-10-91

SAMPLE DESCRIPTION Brown silty clay with some sand and a trace of gravel



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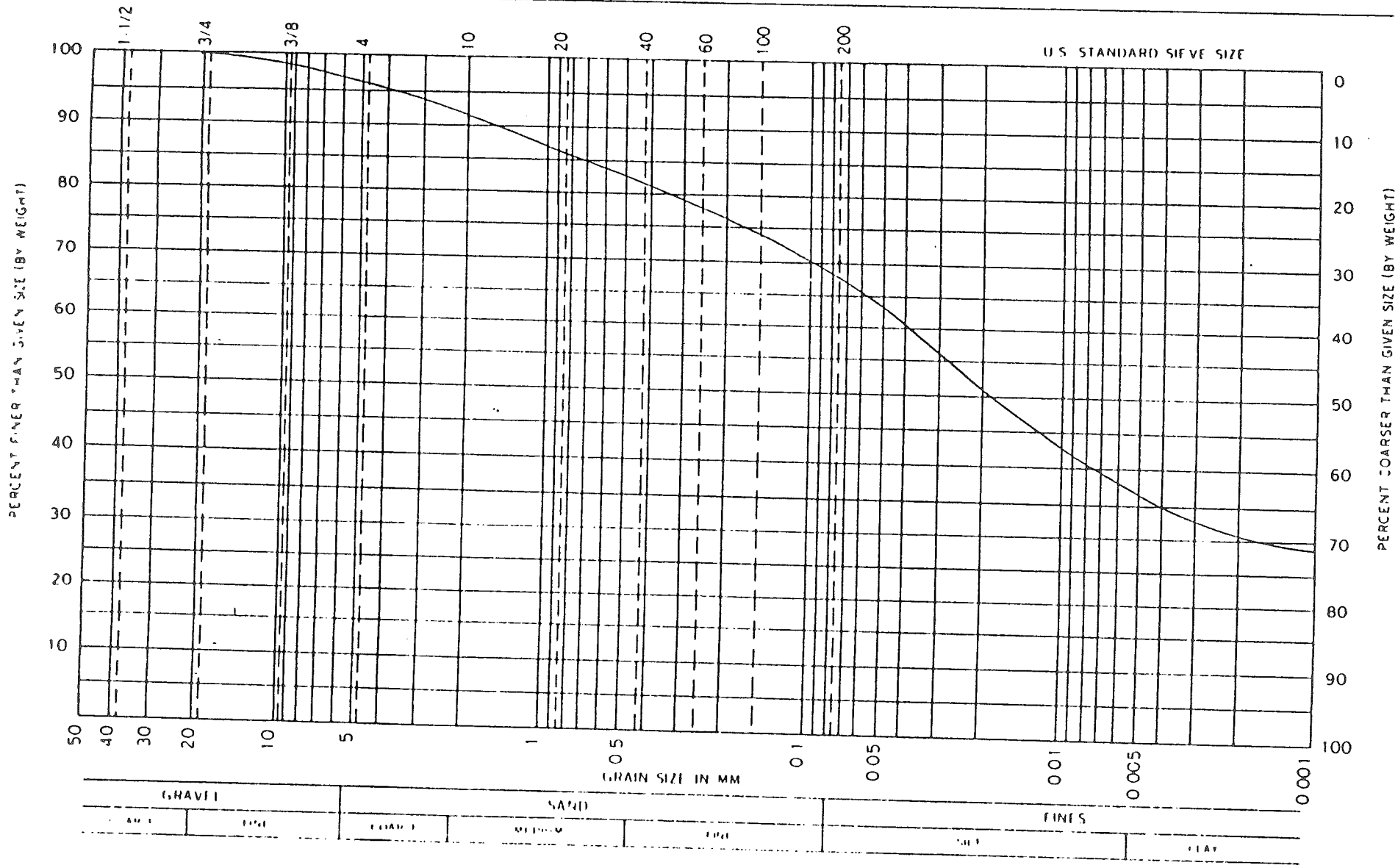
GRAIN SIZE DISTRIBUTION CURVE

PROJECT Mt. Morris Dump Site PROJECT NO F-11125

Sample NO 7 SAMPLE DEPTH DATE TESTED 7-10-91

SAMPLE DESCRIPTION Variegated silty clay with some sand and a trace of gravel



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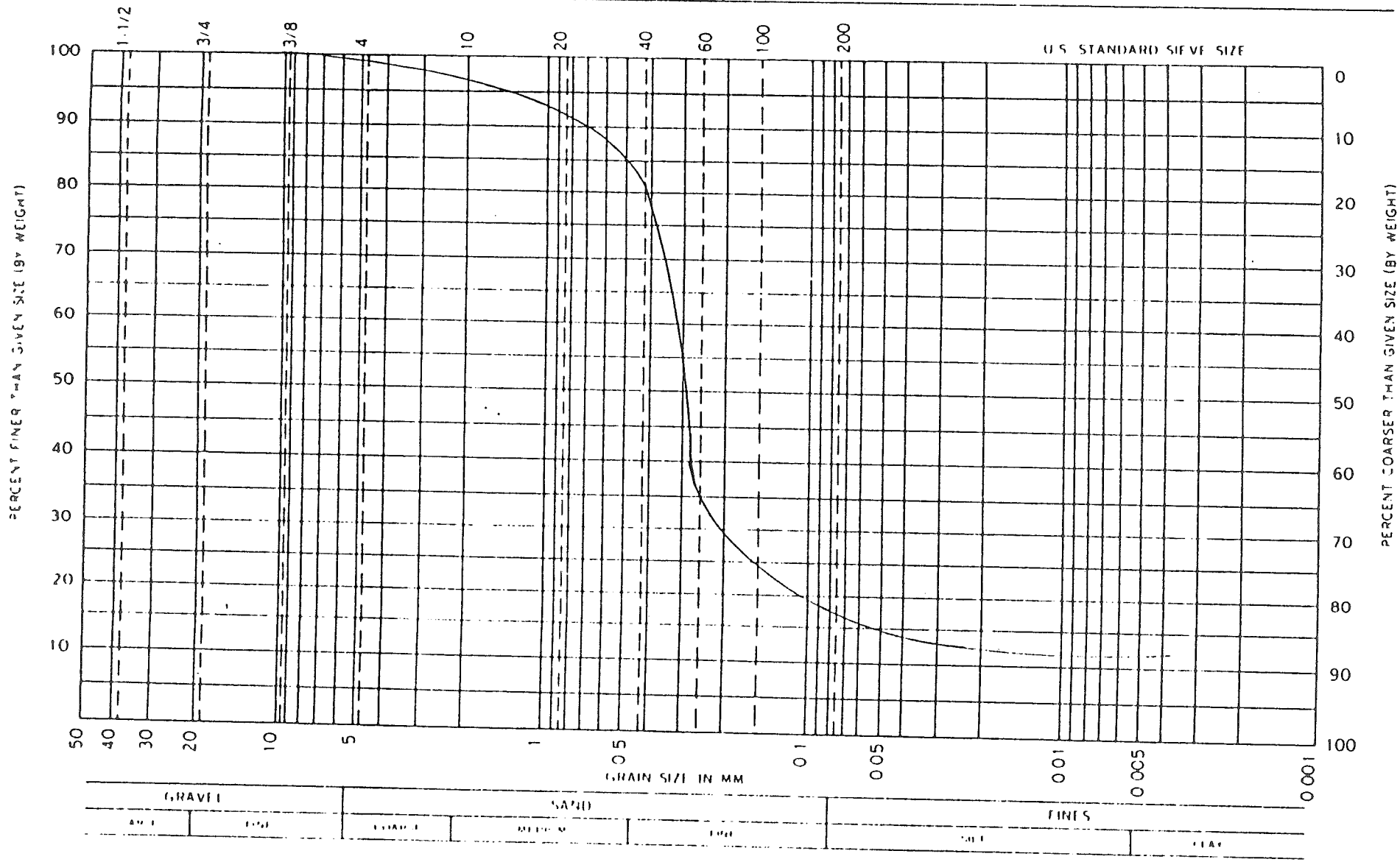
GRAIN SIZE DISTRIBUTION CURVE

PROJECT Mt. Morris Dump Site PROJECT NO F-11125

Sample NO 8 SAMPLE DEPTH DATE TESTED 7-10-91

SAMPLE DESCRIPTION Gray sand with little clay and a trace of gravel and silt



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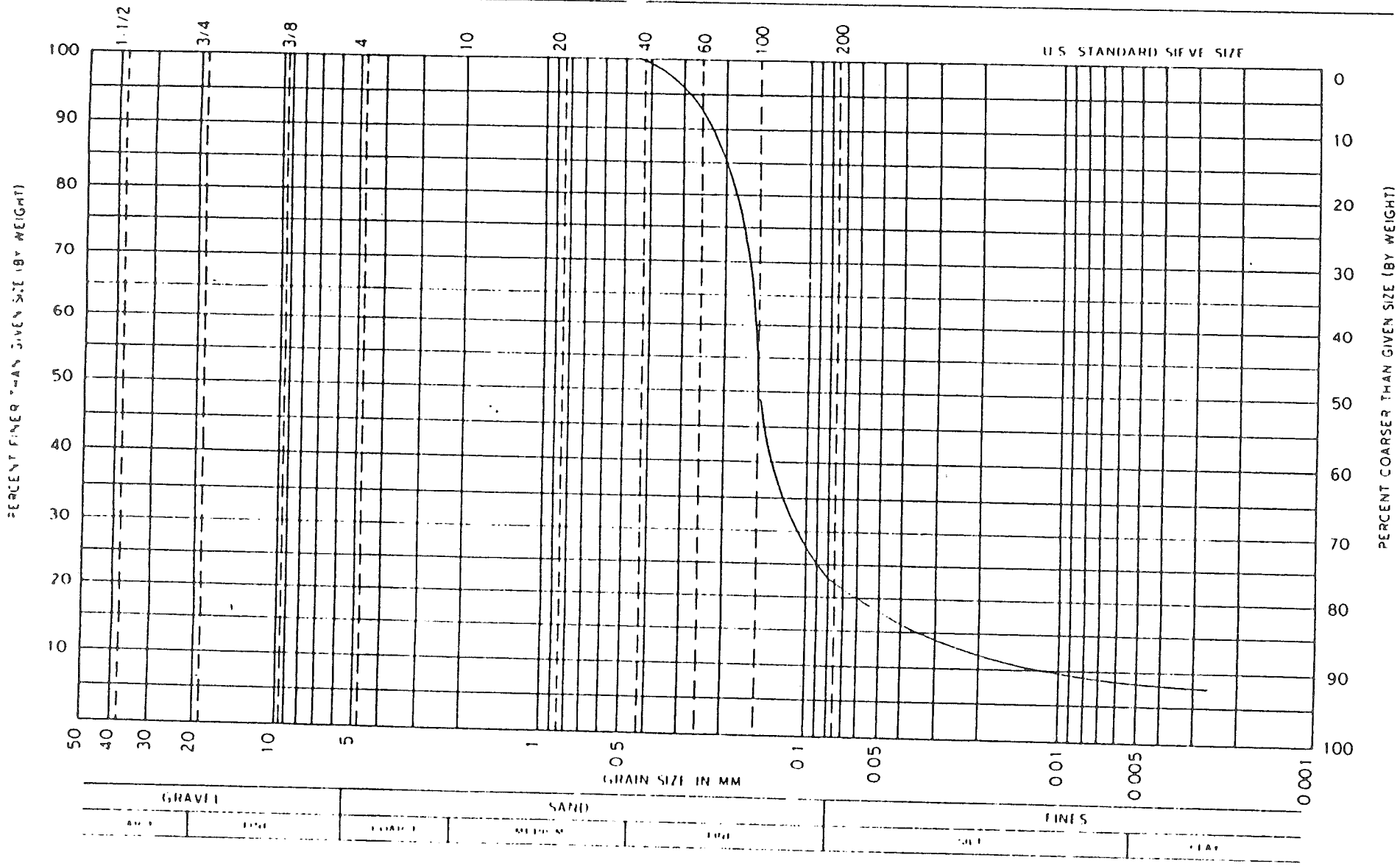
GRAIN SIZE DISTRIBUTION CURVE

PROJECT Mt. Morris Dump Site PROJECT NO F-11125

Sample NO 9 SAMPLE DEPTH DATE TESTED 7-10-91

SAMPLE DESCRIPTION Brown fine silty sand with a trace of clay



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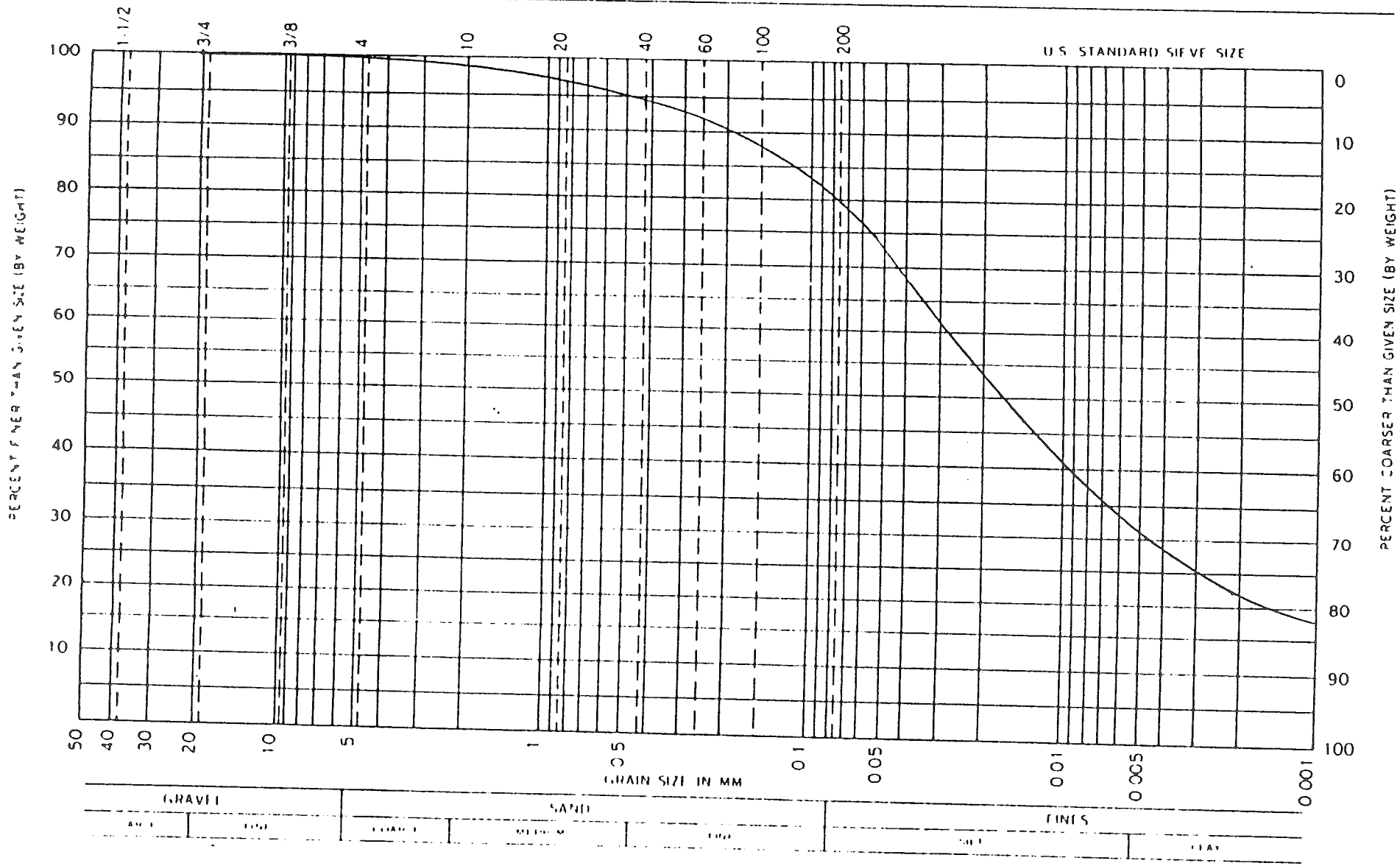
GRAIN SIZE DISTRIBUTION CURVE

PROJECT Mt. Morris Dump Site PROJECT NO F-11125

Sample NO 10 SAMPLE DEPTH DATE TESTED 7-10-91

SAMPLE DESCRIPTION Gray clayey silt with little sand and a trace of gravel



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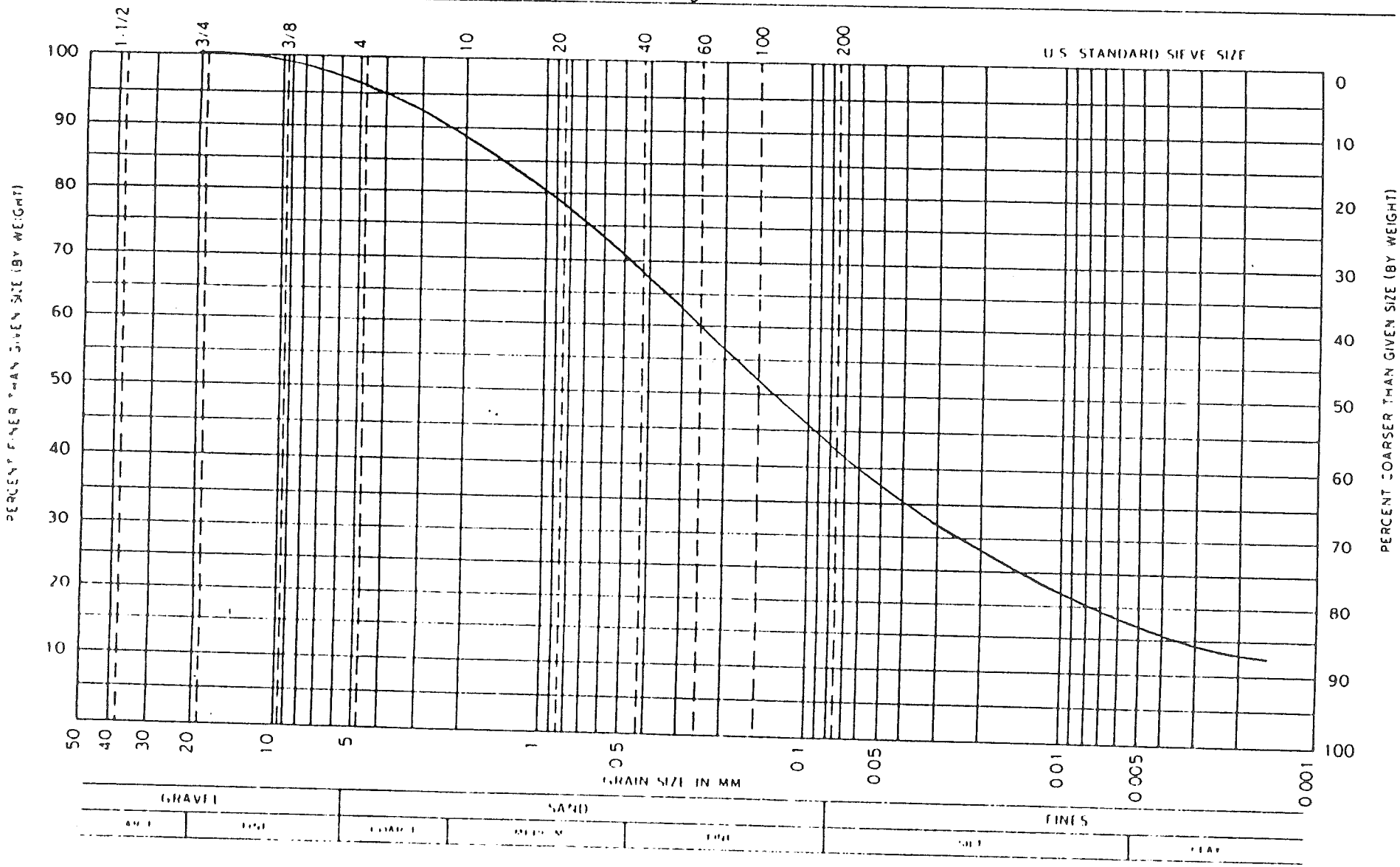
GRAIN SIZE DISTRIBUTION CURVE

PROJECT Mt. Morris Dump Site PROJECT NO F-11125

Sample NO 11 SAMPLE DEPTH DATE TESTED 7-10-91

SAMPLE DESCRIPTION Gray silty clayey sand with a trace of gravel



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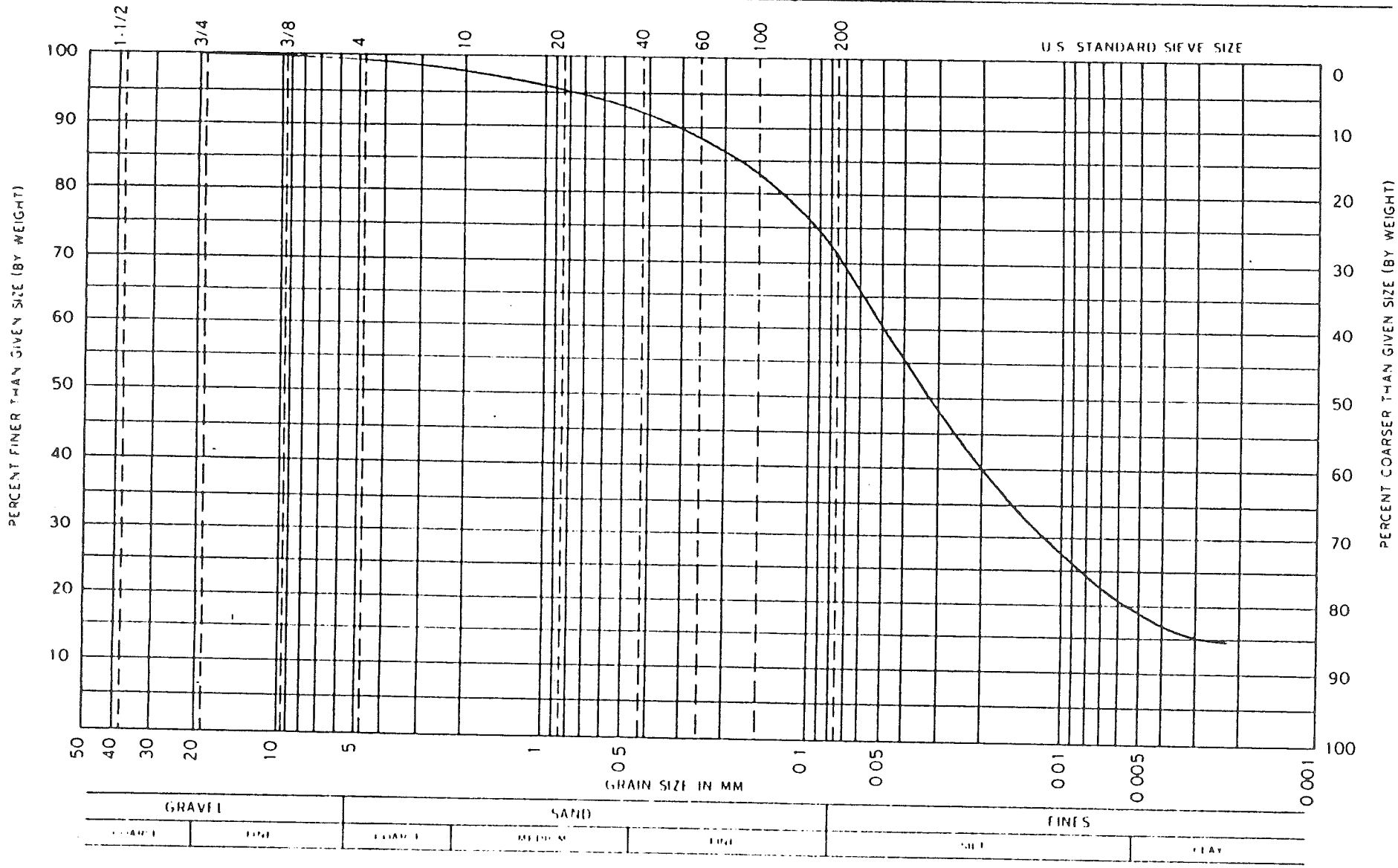
GRAIN SIZE DISTRIBUTION CURVE

PROJECT Mt. Morris Dump Site PROJECT NO F-11125

Sample NO 12 SAMPLE DEPTH DATE TESTED 7-10-91

SAMPLE DESCRIPTION Gray sandy silt with little clay and a trace of gravel



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SUMMARY OF LABORATORY TEST RESULTS

Project Name: Mt. Morris Dump Site 3370 Project No: F-11125 Date: 7/15/91 Sheet 1 of 1

Test Boring - Sample	Depth of Sample, ft	Pocket Penetrometer Resistance (TSF)	Natural Water Content (% of Dry Weight)	Natural Density (PCF)	Unconfined Compression		Atterberg Limits				Particle Size Distribution						Unified Soil Classification	Coefficient of Permeability x 10 (cm/sec)	Loss-on-Ignition (% of Dry Weight)	☐ Standard ■ Modified			
					Strength (PSF)	Failure Strain (%)	Shrinkage Limit (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Clay (%)	Silt (%)	Fine Sand (%)	Medium Sand (%)	Coarse Sand (%)	Gravel (%)				Maximum Dry Density (lb/ft³)	Optimum Moisture Content (%)		
1											⇐27	⇒	63	9	1	0							
2											⇐12	⇒	9	20	21	38							
3											⇐15	⇒	67	15	3	0							
4											⇐9	⇒	76	11	3	1							
5											⇐5	⇒	84	8	1	2							
6											43	29	21	4	2	1							
7											40	30	21	5	2	2							
8											6	1	74	12	5	2							
9											7	3	90	0	0	0							
10											33	50	11	3	1	2							
11											22	19	47	5	1	6							
12											21	49	22	4	2	2							

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SIEVE ANALYSIS *(ASTM C117, C136, D421, D422)*

PROJECT: Mt. Morris Dump Site | PROJECT NO.: F-11125 | DATE: 7-10-91

CLIENT: CRA Consulting Engineers | SAMPLE NO.: 1

SAMPLED OR SAMPLE SUBMITTED BY: Client

SOURCE: [X] ON-SITE [ ] PIT

DC-118 (Gray silty sand)

MEETS SPECIFICATIONS FOR | DOES NOT MEET SPECIFICATIONS FOR

		WASHED GRADATION			Gray silty sand
SIEVE NO.	SPEC.	FRACTIONAL WT. RETAINED	FRACTIONAL % RETAINED	CUMULATIVE % PASSING	
3"					A. Crushed Count [ ] yes [X] no
2"					B. Deleterious Particle [ ] yes [X] no
1-3/4"					C. Sieve Requirement [ ] 3/8" [ ] #4
1-1/2"					D. Total Test Weight g
1"					E. Weight Obviously Crushed
3/4"					F. Weight Questionable
1/2"					G. % Crushed
3/8"		0.0	0.0	100.0	Specification (min.)
#4		0.3	0.3	99.7	H. Weight Soft Particles
#8		0.4	0.4	99.3	I. Weight Chert
#10		0.4	0.4	98.9	J. Weight Coal and Coke
#16					K. % Soft Particles
#20					Specification (max.)
#30		4.3	4.6	94.3	L. % Chert
#40		4.4	4.8	89.5	Specification (max.)
#50		9.5	10.3	79.2	M. % Soft Particle and Chert
#60					Specification (max.)
#80					N. % Coal and Coke
#100		30.4	32.9	46.3	Specification (max.)
#200		18.0	19.5	26.8	O. Fineness Modulus
PAN		1.5	26.8		Specification
Loss By Wash		23.3		25.2	P. Tare Weight
TOTAL SAMPLE		92.5	100.0	0.0	LAB TECHNICIAN: LS/DH

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SIEVE ANALYSIS (ASTM C117, C136, D421, D422)

PROJECT: Mt. Morris Dump Site | PROJECT NO.: F-11125 | DATE: 7-10-91

CLIENT: CRA Consulting Engineers | SAMPLE NO.: 2

SAMPLED OR SAMPLE SUBMITTED BY: Client

SOURCE: [X] ON-SITE [ ] PIT

DC-4A (brown sand with a trace of gravel)

MEETS SPECIFICATIONS FOR | DOES NOT MEET SPECIFICATIONS FOR

		WASHED GRADATION			Clayey, gravely sand
SIEVE NO.	SPEC.	FRACTIONAL WT. RETAINED	FRACTIONAL % RETAINED	CUMULATIVE % PASSING	
3"					A. Crushed Count [ ] yes [X] no
2"					B. Deleterious Particle [ ] yes [X] no
1-3/4"					C. Sieve Requirement [ ] 3/8" [ ] #4
1-1/2"					D. Total Test Weight g
1"					E. Weight Obviously Crushed
3/4"					F. Weight Questionable
1/2"		0.0	0.0	100.0	G. % Crushed
3/8"		36.8	29.8	70.2	Specification (min.)
#4		10.0	8.1	62.1	H. Weight Soft Particles
#8		20.5	16.6	45.5	I. Weight Chert
#10		5.4	4.4	41.1	J. Weight Coal and Coke
#16					K. % Soft Particles
#20					Specification (max.)
#30		20.8	16.9	24.2	L. % Chert
#40		4.0	3.2	21.0	Specification (max.)
#50		2.8	2.3	18.7	M. % Soft Particle and Chert
#60					Specification (max.)
#80					N. % Coal and Coke
#100		4.7	3.8	14.9	Specification (max.)
#200		3.8	3.1	11.8	O. Fineness Modulus
PAN		1.2	11.8		Specification
Loss By Wash		13.4		10.9	P. Tare Weight 0.0
TOTAL SAMPLE		123.4	100.0	0.0	LAB TECHNICIAN: LS/DH

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SIEVE ANALYSIS *(ASTM C117, C136, D421, D422)*

PROJECT: Mt. Morris Dump Site | PROJECT NO.: F-11125 | DATE: 7-10-91

CLIENT: CRA Consulting Engineers | SAMPLE NO.: 3

SAMPLED OR SAMPLE SUBMITTED BY: Client

SOURCE: [X] ON-SITE [ ] PIT

DC-3J (wet gray clay)

MEETS SPECIFICATIONS FOR | DOES NOT MEET SPECIFICATIONS FOR

		WASHED GRADATION			Gray clayey sand
SIEVE NO.	SPEC.	FRACTIONAL WT. RETAINED	FRACTIONAL % RETAINED	CUMULATIVE % PASSING	
3"					A. Crushed Count [ ] yes [X] no
2"					B. Deleterious Particle [ ] yes [X] no
1-3/4"					C. Sieve Requirement [ ] 3/8" [ ] #4
1-1/2"					D. Total Test Weight g
1"					E. Weight Obviously Crushed
3/4"					F. Weight Questionable
1/2"					G. % Crushed
3/8"		0.0	0.0	100.0	Specification (min.)
#4		0.4	0.4	99.6	H. Weight Soft Particles
#8		1.8	1.7	97.9	I. Weight Chert
#10		0.8	0.8	97.1	J. Weight Coal and Coke
#16					K. % Soft Particles
#20					Specification (max.)
#30		8.1	7.8	89.3	L. % Chert
#40		7.3	7.0	82.3	Specification (max.)
#50		16.5	15.9	66.4	M. % Soft Particle and Chert
#60					Specification (max.)
#80					N. % Coal and Coke
#100		40.6	39.1	27.3	Specification (max.)
#200		12.5	12.0	15.3	O. Fineness Modulus
PAN		0.8	15.3		Specification
Loss By Wash		15.1		14.5	P. Tare Weight
TOTAL SAMPLE		103.9	100.0	0.0	LAB TECHNICIAN: LS/DH

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SIEVE ANALYSIS (ASTM C117, C136, D421, D422)

PROJECT: Mt. Morris Dump Site | PROJECT NO.: F-11125 | DATE: 7-10-91

CLIENT: CRA Consulting Engineer | SAMPLE NO.: 4

SAMPLED OR SAMPLE SUBMITTED BY: Client

SOURCE: [X] ON-SITE [ ] PIT

DC-4E (wet silty gray sand)

MEETS SPECIFICATIONS FOR | DOES NOT MEET SPECIFICATIONS FOR

		WASHED GRADATION			
SIEVE NO.	SPEC.	FRACTIONAL WT. RETAINED	FRACTIONAL % RETAINED	CUMULATIVE % PASSING	Gray sand with a trace of clay, silt and gravel.
3"					A. Crushed Count [ ] yes [X] no
2"					B. Deleterious Particle [ ] yes [X] no
1-3/4"					C. Sieve Requirement [ ] 3/8" [ ] #4
1-1/2"					D. Total Test Weight g
1"					E. Weight Obviously Crushed
3/4"					F. Weight Questionable
1/2"					G. % Crushed
3/8"		0.0	0.0	100.0	Specification (min.)
#4		1.6	1.2	98.8	H. Weight Soft Particles
#8		3.0	2.3	96.5	I. Weight Chert
#10		0.9	0.7	95.8	J. Weight Coal and Coke
#16					K. % Soft Particles
#20					Specification (max.)
#30		7.1	5.5	90.3	L. % Chert
#40		7.2	5.6	84.7	Specification (max.)
#50		16.0	12.4	72.3	M. % Soft Particle and Chert
#60					Specification (max.)
#80					N. % Coal and Coke
#100		49.6	38.5	33.8	Specification (max.)
#200		31.4	24.4	9.4	O. Fineness Modulus
PAN		1.3	9.4		Specification
Loss By Wash		10.8		8.4	P. Tare Weight
TOTAL SAMPLE		128.9	100.0	0.0	LAB TECHNICIAN: LS/DH

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SIEVE ANALYSIS (ASTM C117, C136, D421, D422)

PROJECT: Mt. Morris Dump Site | PROJECT NO.: F-11125 | DATE: 7-10-91

CLIENT: CRA Consulting Engineers | SAMPLE NO.: 5

SAMPLED OR SAMPLE SUBMITTED BY: Client

SOURCE: [X] ON-SITE [ ] PIT

DC-11C (wet brown stiff sand with trace of silt)

MEETS SPECIFICATIONS FOR | DOES NOT MEET SPECIFICATIONS FOR

		WASHED GRADATION			
SIEVE NO.	SPEC.	FRACTIONAL WT. RETAINED	FRACTIONAL % RETAINED	CUMULATIVE % PASSING	Brown sand with a trace of clay, silt and gravel.
3"					A. Crushed Count [ ] yes [X] no
2"					B. Deleterious Particle [ ] yes [X] no
1-3/4"					C. Sieve Requirement [ ] 3/8" [ ] #4
1-1/2"					D. Total Test Weight g
1"					E. Weight Obviously Crushed
3/4"					F. Weight Questionable
1/2"		0.0	0.0	100.0	G. % Crushed
3/8"		4.0	2.1	97.9	Specification (min.)
#4		0.0	0.0	97.9	H. Weight Soft Particles
#8		0.7	0.4	97.5	I. Weight Chert
#10		0.2	0.1	97.4	J. Weight Coal and Coke
#16					K. % Soft Particles
#20					Specification (max.)
#30		6.9	3.7	93.7	L. % Chert
#40		9.0	4.8	88.9	Specification (max.)
#50		26.7	14.2	74.7	M. % Soft Particle and Chert
#60					Specification (max.)
#80					N. % Coal and Coke
#100		100.1	52.9	21.8	Specification (max.)
#200		32.2	17.1	4.7	O. Fineness Modulus
PAN		1.2	4.7		Specification
Loss By Wash		7.6		4.0	P. Tare Weight
TOTAL SAMPLE		188.6	100.0	0.0	LAB TECHNICIAN: LS/DH

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SIEVE ANALYSIS (ASTM C117, C136, D421, D422)

PROJECT: Mt. Morris Dump Site | PROJECT NO.: F-11125 | DATE: 7-10-91

CLIENT: CRA Consulting Engineers | SAMPLE NO.: 6

SAMPLED OR SAMPLE SUBMITTED BY: Client

SOURCE: [X] ON-SITE [ ] PIT

(Brown silty clay)

MEETS SPECIFICATIONS FOR | DOES NOT MEET SPECIFICATIONS FOR

		WASHED GRADATION		
SIEVE NO.	SPEC.	FRACTIONAL WT. RETAINED	FRACTIONAL % RETAINED	CUMULATIVE % PASSING
3"				
2"				
1-3/4"				
1-1/2"				
1"				
3/4"				
1/2"				
3/8"		0.0	0.0	100.0
#4		2.3	0.6	99.4
#8				
#10		8.3	2.3	97.1
#16				
#20				
#30				
#40		16.0	4.5	92.6
#50				
#60				
#80				
#100		41.3	11.6	81.0
#200		33.5	9.4	71.6
PAN		0.6	71.6	
Loss By Wash		255.0		71.4
TOTAL SAMPLE		357.0	100.0	0.0

Brown silty clay with some sand and a trace of gravel

A. Crushed Count	[ ]	yes	[X]	no
B. Deleterious Particle	[ ]	yes	[X]	no
C. Sieve Requirement	[ ]	3/8"	[ ]	#4
D. Total Test Weight				g

E. Weight Obviously Crushed	
F. Weight Questionable	
G. % Crushed	
Specification (min.)	
H. Weight Soft Particles	
I. Weight Chert	
J. Weight Coal and Coke	
K. % Soft Particles	
Specification (max.)	
L. % Chert	
Specification (max.)	
M. % Soft Particle and Chert	
Specification (max.)	
N. % Coal and Coke	
Specification (max.)	
O. Fineness Modulus	
Specification	
P. Tare Weight	87.2

LAB TECHNICIAN: LS

and Associates, Inc.
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(313) 473-7530

SIEVE ANALYSIS (ASTM C117, C136, D421, D422)

PROJECT: Mt. Morris Dump Site | PROJECT NO.: F-11125 | DATE: 7-11

CLIENT: CRA Consulting Engineers | SAMPLE NO.: 7

SAMPLED OR SAMPLE SUBMITTED BY: Client

SOURCE: [X] ON-SITE [ ] PIT

(Variegated clay)

MEETS SPECIFICATIONS FOR | DOES NOT MEET SPECIFICATIONS FOR

		WASHED GRADATION		
SIEVE NO.	SPEC.	FRACTIONAL WT. RETAINED	FRACTIONAL % RETAINED	CUMULATIVE % PASSING
3"				
2"				
1-3/4"				
1-1/2"				
1"				
3/4"				
1/2"		0.0	0.0	100.0
3/8"		2.9	0.9	99.1
#4		3.5	1.1	98.0
#8				
#10		6.7	2.1	95.9
#16				
#20				
#30				
#40		15.1	4.7	91.2
#50				
#60				
#80				
#100		40.6	12.6	78.6
#200		20.4	8.2	70.4
PAN		0.2	70.4	
Loss By Wash		227.7		70.5
TOTAL SAMPLE		323.1	100.0	0.0

Variegated silty clay with some sand and a trace of gravel

A. Crushed Count	[ ]	yes	[X]	no
B. Deleterious Particle	[ ]	yes	[X]	no
C. Sieve Requirement	[ ]	3/8"	[ ]	#4
D. Total Test Weight				g

E. Weight Obviously Crushed	
F. Weight Questionable	
G. % Crushed	
Specification (min.)	
H. Weight Soft Particles	
I. Weight Chert	
J. Weight Coal and Coke	
K. % Soft Particles	
Specification (max.)	
L. % Chert	
Specification (max.)	
M. % Soft Particle and Chert	
Specification (max.)	
N. % Coal and Coke	
Specification (max.)	
O. Fineness Modulus	
Specification	
P. Tare Weight	74.3

LAB TECHNICIAN: LS

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(313) 473-7530

SIEVE ANALYSIS (ASTM C117, C136, D421, D422)

PROJECT: Mt. Morris Dump Site | PROJECT NO.: F-11125 | DATE: 7-11-91

CLIENT: CRA Consulting Engineers | SAMPLE NO.: 8

SAMPLED OR SAMPLE SUBMITTED BY: Client

SOURCE: [X] ON-SITE [ ] PIT (Gray sand)

MEETS SPECIFICATIONS FOR

DOES NOT MEET SPECIFICATIONS FOR

		WASHED GRADATION			Gray sand with little clay, silt and a trace of gravel
SIEVE NO.	SPEC.	FRACTIONAL WT. RETAINED	FRACTIONAL % RETAINED	CUMULATIVE % PASSING	
3"					A. Crushed Count [ ] yes [X] no
2"					B. Deleterious Particle [ ] yes [X] no
1-3/4"					C. Sieve Requirement [ ] 3/8" [ ] #4
1-1/2"					D. Total Test Weight g
1"					E. Weight Obviously Crushed
3/4"					F. Weight Questionable
1/2"					G. % Crushed
3/8"		0.0	0.0	100.0	Specification (min.)
#4		6.4	1.8	98.2	H. Weight Soft Particles
#8					I. Weight Chert
#10		17.9	5.0	93.2	J. Weight Coal and Coke
#16					K. % Soft Particles
#20					Specification (max.)
#30					L. % Chert
#40		44.0	12.4	80.8	Specification (max.)
#50					M. % Soft Particle and Chert
#60					Specification (max.)
#80					N. % Coal and Coke
#100		204.9	57.7	23.1	Specification (max.)
#200		55.7	15.7	7.4	O. Fineness Modulus
PAN		1.5	7.4		Specification
Loss By Wash		24.8		7.0	P. Tare Weight 78.0
TOTAL SAMPLE		355.2	100.0	0.0	LAB TECHNICIAN: LS

Branch Offices
Ann Arbor Office - 6400 Jackson Road, Ann Arbor, Michigan 48103 • (313) 995-3777
Rochester Hills Office - 2293 Star Court, Rochester Hills, Michigan 48309 • (313) 299-8050

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Farmington Hills Office - 24684 Hathaway Court, Farmington Hills, MI 48335
(313) 473-7530

SIEVE ANALYSIS (ASTM C117, C136, D421, D422)

PROJECT: Mt. Morris Dump Site | PROJECT NO.: F-11125 | DATE: 7-11-91

CLIENT: CRA Consulting Engineers | SAMPLE NO.: 9

SAMPLED OR SAMPLE SUBMITTED BY: Client

SOURCE: [X] ON-SITE [ ] PIT

(Brown silty sand)

MEETS SPECIFICATIONS FOR

DOES NOT MEET SPECIFICATIONS FOR

		WASHED GRADATION			Brown fine sand with a trace of clay
SIEVE NO.	SPEC.	FRACTIONAL WT. RETAINED	FRACTIONAL % RETAINED	CUMULATIVE % PASSING	
3"					A. Crushed Count [ ] yes [X] no
2"					B. Deleterious Particle [ ] yes [X] no
1-3/4"					C. Sieve Requirement [ ] 3/8" [ ] #4
1-1/2"					D. Total Test Weight g
1"					E. Weight Obviously Crushed
3/4"					F. Weight Questionable
1/2"					G. % Crushed
3/8"		0.0	0.0	100.0	Specification (min.)
#4		0.0	0.0	100.0	H. Weight Soft Particles
#8					I. Weight Chert
#10		0.2	0.1	99.9	J. Weight Coal and Coke
#16					K. % Soft Particles
#20					Specification (max.)
#30					L. % Chert
#40		0.2	0.1	99.8	Specification (max.)
#50					M. % Soft Particle and Chert
#60					Specification (max.)
#80					N. % Coal and Coke
#100		228.6	59.6	40.2	Specification (max.)
#200		116.3	30.4	9.8	O. Fineness Modulus
PAN		5.8	9.8		Specification
Loss By Wash		31.9		8.3	P. Tare Weight 90.2
TOTAL SAMPLE		383.0	100.0	0.0	LAB TECHNICIAN: LS

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Farmington Hills Office - 24684 Hathaway Court, Farmington Hills, MI 48335
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SIEVE ANALYSIS (ASTM C117, C136, D421, D422)

PROJECT: Mt. Morris Dump Site | PROJECT NO.: F-11125 | DATE: 7-13-91

CLIENT: CRA Consulting Engineers | SAMPLE NO.: 10

SAMPLED OR SAMPLE SUBMITTED BY: Client

SOURCE: [X] ON-SITE [ ] PIT

(Gray stiff clay)

MEETS SPECIFICATIONS FOR | DOES NOT MEET SPECIFICATIONS FOR

		WASHED GRADATION			
SIEVE NO.	SPEC.	FRACTIONAL WT. RETAINED	FRACTIONAL % RETAINED	CUMULATIVE % PASSING	Gray clayey silt with little sand and a trace of gravel
3"					A. Crushed Count [ ] yes [X] no
2"					B. Deleterious Particle [ ] yes [X] no
1-3/4"					C. Sieve Requirement [ ] 3/8" [ ] #4
1-1/2"					D. Total Test Weight g
1"					E. Weight Obviously Crushed
3/4"					F. Weight Questionable
1/2"		0.0	0.0	100.0	G. % Crushed
3/8"		1.4	0.3	99.7	Specification (min.)
#4		7.8	1.5	98.2	H. Weight Soft Particles
#8					I. Weight Chert
#10		6.8	1.3	96.9	J. Weight Coal and Coke
#16					K. % Soft Particles
#20					Specification (max.)
#30					L. % Chert
#40		17.1	3.4	93.5	Specification (max.)
#50					M. % Soft Particle and Chert
#60					Specification (max.)
#80					N. % Coal and Coke
#100		31.6	6.3	87.2	Specification (max.)
#200		22.8	4.5	82.7	O. Fineness Modulus
PAN		0.2	82.7		Specification
Loss By Wash		416.1		82.6	P. Tare Weight 70.9
TOTAL SAMPLE		503.8	100.0	0.0	LAB TECHNICIAN: LS

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(313) 473-7530

SIEVE ANALYSIS (ASTM C117, C136, D421, D422)

PROJECT: Mt. Morris Dump Site | PROJECT NO.: F-11125 | DATE: 7-13-91

CLIENT: CRA Consulting Engineers | SAMPLE NO.: 11

SAMPLED OR SAMPLE SUBMITTED BY: Client

SOURCE: [X] ON-SITE [ ] PIT

(wet gray sandy clay)

MEETS SPECIFICATIONS FOR | DOES NOT MEET SPECIFICATIONS FOR

		WASHED GRADATION			Gray silty clayey sand with a trace of gravel
SIEVE NO.	SPEC.	FRACTIONAL WT. RETAINED	FRACTIONAL % RETAINED	CUMULATIVE % PASSING	
3"					A. Crushed Count [ ] yes [X] no
2"					B. Deleterious Particle [ ] yes [X] no
1-3/4"					C. Sieve Requirement [ ] 3/8" [ ] #4
1-1/2"					D. Total Test Weight g
1"					E. Weight Obviously Crushed
3/4"					F. Weight Questionable
1/2"		0.0	0.0	100.0	G. % Crushed
3/8"		14.7	4.5	95.5	Specification (min.)
#4		5.0	1.5	94.0	H. Weight Soft Particles
#8					I. Weight Chert
#10		4.2	1.3	92.7	J. Weight Coal and Coke
#16					K. % Soft Particles
#20					Specification (max.)
#30					L. % Chert
#40		16.1	5.0	87.7	Specification (max.)
#50					M. % Soft Particle and Chert
#60					Specification (max.)
#80					N. % Coal and Coke
#100		117.2	36.3	51.4	Specification (max.)
#200		33.6	10.4	41.0	O. Fineness Modulus
PAN		0.9	41.0		Specification
Loss By Wash		131.5		40.7	P. Tare Weight 78.6
TOTAL SAMPLE		323.2	100.0	0.0	LAB TECHNICIAN: LS

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(313) 473-7530

SIEVE ANALYSIS (ASTM C117, C136, D421, D422)

PROJECT: Mt. Morris Dump Site | PROJECT NO.: F-11125 | DATE: 7-10-91

CLIENT: CRA Consulting Engineers | SAMPLE NO.: 12

SAMPLED OR SAMPLE SUBMITTED BY: Client

SOURCE: [X] ON-SITE [ ] PIT

(Brown very stiff silty clay with a trace of sand)

MEETS SPECIFICATIONS FOR | DOES NOT MEET SPECIFICATIONS FOR

		WASHED GRADATION			Brown clayey sand with little silt and a trace of gravel
SIEVE NO.	SPEC.	FRACTIONAL WT. RETAINED	FRACTIONAL % RETAINED	CUMULATIVE % PASSING	
3"					A. Crushed Count [ ] yes [X] no
2"					B. Deleterious Particle [ ] yes [X] no
1-3/4"					C. Sieve Requirement [ ] 3/8" [ ] #4
1-1/2"					D. Total Test Weight g
1"					E. Weight Obviously Crushed
3/4"					F. Weight Questionable
1/2"					G. % Crushed
3/8"		0.0	0.0	100.0	Specification (min.)
#4		7.2	1.6	98.4	H. Weight Soft Particles
#8					I. Weight Chert
#10		9.4	2.1	96.3	J. Weight Coal and Coke
#16					K. % Soft Particles
#20					Specification (max.)
#30					L. % Chert
#40		21.3	4.8	91.5	Specification (max.)
#50					M. % Soft Particle and Chert
#60					Specification (max.)
#80					N. % Coal and Coke
#100		53.4	12.0	79.5	Specification (max.)
#200		41.0	9.2	70.3	O. Fineness Modulus
PAN		0.4	70.3		Specification
Loss By Wash		314.1		70.3	P. Tare Weight 85.0
TOTAL SAMPLE		446.8	100.0	0.0	LAB TECHNICIAN: RC/LS

APPENDIX C

CHAIN OF CUSTODY

APPENDIX D

WADSWORTH/ALERT DATA PACKAGES

APPENDIX E

QA/QC DATA VALIDATION

APPENDIX F

PERMEABILITY TEST RESULTS

PERMEABILITY TESTS RESULTS

Procedure: Sample was placed in triaxial chamber and subjected to a confining pressure. Sample was saturated using back pressure. A differential pressure was applied across the sample and the flow was monitored until flow into the sample equaled flow out of the sample. Permeability was calculated using Darcy's Law.

Sample No: DC 12 Date Sampled: _____

Sample Location: CRA 406-14122

Height of Sample: 5.70 inches Dia. of Sample: 2.80 inches

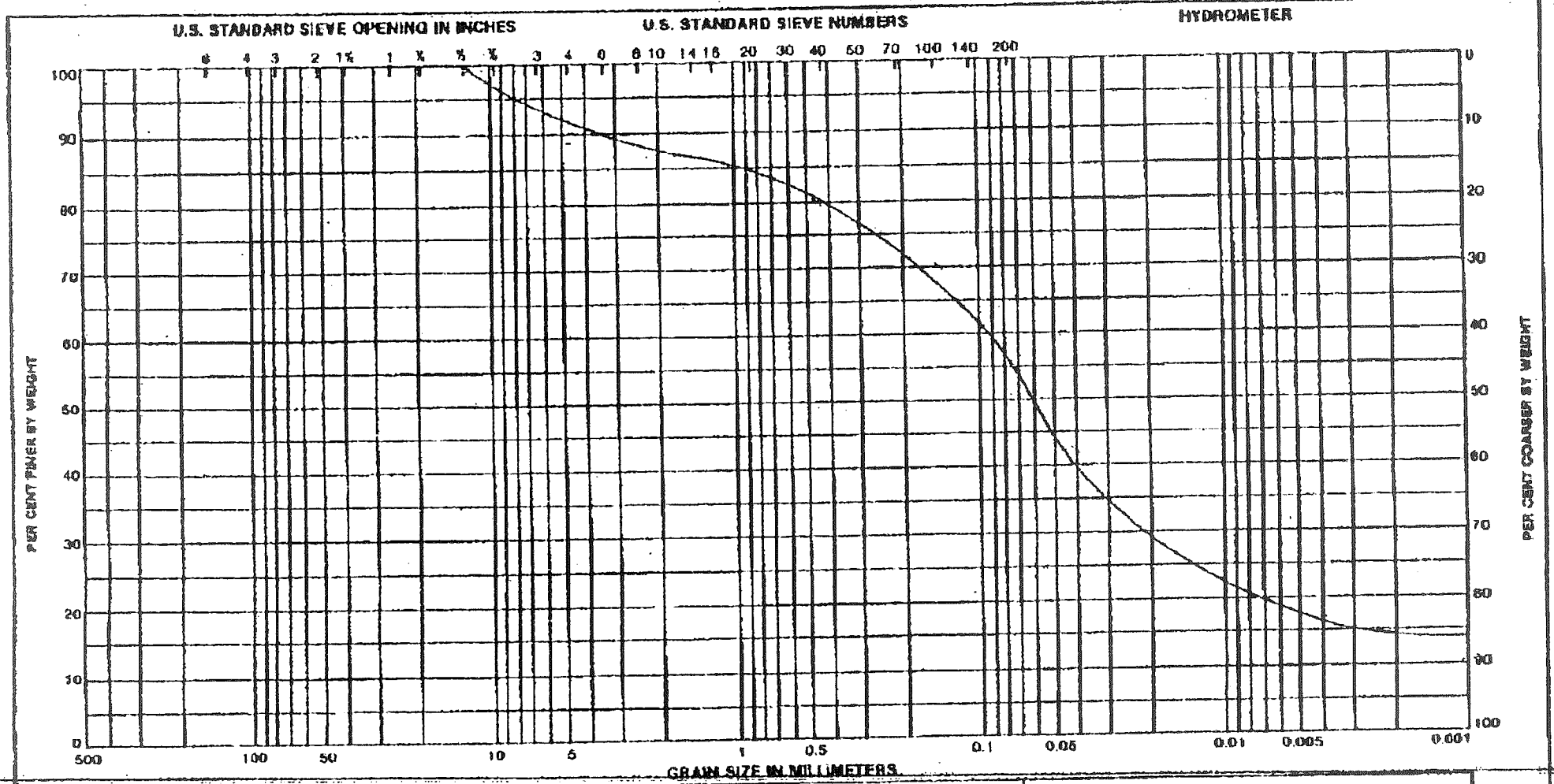
Initial Weight of Sample: 1293 g Initial Moisture Content: 14%

Confining Pressure: 23 psi Saturation Pressure: 20 psi

Bottom Pressure: 20 psi Top Pressure: 10 psi

Elapsed Time (min.)	Flow In (cc)	Flow Out (cc)	Remarks
288	2.25	2.25	Dry Unit Weight = 123 PCF

Permeability: 6.7×10^{-8} cm/s



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Boring No.	Sample No.	Elev. or Depth	Classification	Nat'l w %	LL	PL	PI	Project
DC-12				14				CRA

REPORT OF SOIL ANALYSIS

File No. 406-14122