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VOLUME II OF III

REMEDIAL INVESTIGATION

REMEDIAL INVESTIGATION/FEASIBILITY STUDY
H.O.D. LANDFILL
ANTIOCH, ILLINOIS

Prepared For:

Waste Management of Illinois, Inc.
Westchester, Illinois

Prepared By:

Montgomery Watson
2100 Corporate Drive
Addison, Illinois

January 1997

MONTGOMERY WATSON

A

APPENDIX A

MUNICIPAL WELL CONSTRUCTION INFORMATION

EXCERPT FROM: "PUBLIC GROUNDWATER SUPPLIES IN LAKE COUNTY": STATE OF ILLINOIS, DEPARTMENT OF REGISTRATION AND EDUCATION, ILLINOIS STATE WATER SURVEY, BULLETIN 60-20, 1976, P. 10-12

ISWS/BUL-60C001/76
BULLETIN 60-20
STATE OF ILLINOIS
DEPARTMENT OF REGISTRATION AND EDUCATION

Public Groundwater Supplies in Lake County

by DOROTHY M. WOLLER and JAMES P. GIBB

ILLINOIS STATE WATER SURVEY
URBANA
1976

ANTIOCH

The village of Antioch (3189) installed a public water supply in 1907. Two wells (Nos. 3 and 4) are in use and two wells (Nos. 1 and 2) are available for emergency use. In 1949 there were 500 services, all metered; the estimated average and maximum daily pumpages were 25,000 and 50,000 gpd, respectively. In 1974 there were 1400 services, all metered; the average and maximum daily pumpages were 575,000 and 850,000 gpd, respectively. The water is chlorinated and treated with polyphosphate to keep iron in solution. The natural fluoride concentration in the water is adequate to satisfy state requirements.

WELL NO. 1, finished in sand and gravel, was completed in 1907 to a depth of 216 ft by Charles Thorne, DeKalb. This well is available for emergency use. The well is located at the southwest corner of Orchard and Broadway Sts., approximately 1900 ft N and 1200 ft E of the SW corner of Section 8, T46N, R10E. The land surface elevation at the well is approximately 780 ft.

A 6-in. diameter hole was drilled to a depth of 216 ft. The well is cased with 6-in. steel pipe from 0.8 ft above the pumphouse floor to a depth of 207 ft followed by 9 ft of 4.5-in. Johnson screen.

On November 3, 1932, the nonpumping water level was reported to be 40 ft below the pump base.

The pumping equipment presently installed consists of a 20-hp U.S. electric motor (Serial No. 915264), a 6-in., 20 stage Peerless turbine pump set at 150 ft, rated at 150 gpm, and has 150 ft of 4-in. column pipe. A 30-ft section of 4-in. suction pipe is attached to the pump intake. The well is equipped with 150 ft of airline.

A mineral analysis made by the Illinois Environmental Protection Agency (Lab. No. B100780) of a sample collected July 15, 1974, after pumping for 1 hr, showed the water to have a hardness of 173 mg/l, total dissolved minerals of 327 mg/l, and an iron content of 0.16 mg/l.

WELL NO. 2, finished in sand and gravel, was completed in 1906 to a depth of 226 ft, and rebuilt in November 1949 to a depth of 231.5 ft by C. L. Wertz, Antioch. This well is available for emergency use. The well is located about 27 ft south of Well No. 1, approximately 1873 ft N and 1200 ft E of the SW corner of Section 8, T46N, R10E. The land surface elevation at the well is approximately 780 ft.

#2

A drillers log of Well No. 2 follows:

Strata	Thickness (ft)	Depth (ft)
Soil	15	15
Gravel and clay	141	156
Quicksand	50	206
Coarse gravel	20	226
No record	5.5	231.5

A 10-in. diameter hole was drilled to a depth of 210 ft and finished 6 in. in diameter from 210 to 231.5 ft. The well is cased with 10-in. steel pipe from 0.6 ft above the pumphouse floor to a depth of 207.5 ft and a 6-in. pipe from 198.5 ft to a depth of 220.5 ft followed by 11 ft of 6-in. No. 100 slot pipe base Johnson Everdur screen.

On July 11, 1938, the nonpumping water level was reported to be 40 ft below the pump base.

On August 30, 1946, after a 1-hr idle period, the nonpumping water level was reported to be 39 ft below the pump base and after 30 min of pumping at 200 gpm, the drawdown was 22 ft.

In November 1949, after new casing and screen were installed, the well reportedly produced 200 gpm with a drawdown of 70 ft from a nonpumping water level of 45 ft below land surface.

On July 10, 1952, the well reportedly produced 115 gpm with a drawdown of 74 ft from a nonpumping water level of 58 ft.

The pumping equipment presently installed consists of a 20-hp General Electric motor (Serial No. SFJ801S27), a 7-in., 7-stage Peerless turbine pump set at 130 ft, rated at 250 gpm, and has 130 ft of 5-in. column pipe. A 20-ft section of 4-in. suction pipe is attached to the pump intake. The well is equipped with 130 ft of airline.

A mineral analysis made by the Illinois Environmental Protection Agency (Lab. No. B100679) of a sample collected July 15, 1974, after pumping for 1 hr at 250 gpm, showed the water to have a hardness of 166 mg/l, total dissolved minerals of 311 mg/l, and an iron content of 0.26 mg/l.

Prior to the construction of Well No. 3, a 6-in. test well was drilled to a depth of 149 ft in December 1952 and had a nonpumping water level of 32.7 ft below land surface.

WELL NO. 3, finished in sand and gravel, was completed in October 1953 to a depth of 140.5 ft by the Layne-Western Co., Aurora. The well is located 500 ft south of Ida St. and 88 ft east of the Soo Line RR right-of-way, approximately 600 ft N and 2360 ft W of the SE corner of Section 8, T46N, R10E. The land surface elevation at the well is approximately 770 ft.

A sample study summary log of Well No. 3 furnished by the State Geological Survey follows:

#3

Strata	Thickness (ft)	Depth (ft)
PLEISTOCENE SERIES		
Silt, buff, yellow	50	50
Clay, gray, laminated	20	70
Till, buff, gray, very silty	20	90
Sand, very fine to fine, well sorted, clean	5	95
Gravel, coarse, poorly sorted; till, brownish gray, sandy	5	100
Sand, fine well sorted, clean	5	105
Till gray, very silty	10	115
Gravel, granular to coarse, clean; sand medium to very coarse	15	130
Sand, very fine to very coarse, well sorted, clean; little till brownish gray	15	145
Silt, brownish gray, clayey	5	150

A 28-in. diameter hole was drilled to a depth of 140.5 ft. The well is cased with 12-in. ID black steel pipe from 0.8 ft above the pumphouse floor to a depth of 120.5 ft followed by 20 ft of 12-in. ID No. 5 (0.105 in.) Layne stainless steel shutter screen. The annulus between the bore hole and casing-screen assembly is filled with cement grout from 0 to 40 ft, with clay from 40 to 90.5 ft, and with gravel from 90.5 to 140.5 ft.

Upon completion, the well reportedly produced 596 gpm with a drawdown of 9 ft from a nonpumping water level of 41 ft below land surface.

On May 29, 1958, after 2 hr of pumping at a rate of 415 gpm, the drawdown was 7 ft from a nonpumping water level of 45 ft below the pump base.

On March 7, 1967, the well reportedly produced 457 gpm with a drawdown of 19 ft from a nonpumping water level of 44 ft.

In December 1970, the well reportedly produced 525 gpm with a drawdown of 9 ft from a nonpumping water level of 56 ft.

The pumping equipment presently installed consists of a 40-hp 1800 rpm U.S. electric motor (Serial No. 2308221), a 10-in., 7-stage Layne turbine pump (Serial No. 26899) set at 70 ft, rated at 400 gpm at about 235 ft TDH, and has 70 ft of 6-in. column pipe. A 10-ft section of 6-in. suction pipe is attached to the pump intake. The well is equipped with 70 ft of airline.

A mineral analysis made by the Illinois Environmental Protection Agency (Lab. No. B34773) of a sample collected March 1, 1976, after pumping for 1 hr at 500 gpm, showed the water to have a hardness of 237 mg/l, total dissolved minerals of 363 mg/l, and an iron content of 0.6 mg/l.

WELL NO. 4, finished in sand and gravel, was completed in June 1965 to a depth of 129 ft by the Layne-Western Co., Aurora. The well is located on Bartlett Road at the end

of McMillen Drive, approximately 350 ft N and 1500 ft W of the SE corner of Section 8, T46N, R10E. The land surface elevation at the well is approximately 770 ft.

A drillers log of Well No. 4 follows:

Strata	*Thickness (ft)*	*Depth (ft)*
Fill	3	3
Soft sandy yellow clay	5	8
Sand and gravel and boulders	16	24
Soft sticky gray clay, some thin sand streaks	56	80
Fine to coarse sand and gray clay	5	35
Fine gray sand	5	90
Blue clay	4	94
Very fine gray sand	8	102
Soft gray clay	3	105
Medium fine to coarse sand, some gravel and boulders 115 to 121 ft very coarse	16	121
Medium fine to coarse sand, gravel and boulders, not as much coarse stuff, also not as tight	4	125
Very coarse sand and gravel, some fine showing at 129 ft	4	129
Very fine gray sand	12	141

A 34-in. diameter hole was drilled to a depth of 15 ft, reduced to 30 in. between 15 and 26 ft, and finished 28 in. in diameter from 26 to 141 ft. The well is cased with 12-in. welded steel pipe from 2 ft above land surface to a depth of 109 ft followed by 20 ft of 12-in. No. 5 (0.105 in.) Layne stainless steel shutter screen. The annulus between the bore hole and casing-screen assembly is filled with cement grout from 0 to 40 ft, with pea gravel from 40 to 86 ft, and with Muscatine No. 3 gravel from 86 to 141 ft.

A production test using one observation well was conducted by the driller on June 22, 1965. After 8 hr of pumping at a rate of 632 gpm, the drawdown was 12 ft from a nonpumping water level of 32 ft below land surface.

On March 1, 1967, the well reportedly produced 800 gpm with a drawdown of 15 ft from a nonpumping water level of 34 ft.

In December 1970, the well reportedly produced 825 gpm with a drawdown of 14 ft from a nonpumping water level of 33 ft.

The pumping equipment presently installed is a 5-stage Jacuzzi oil-lubricated turbine pump (Model No. 10HCA6T-490) set at 75 ft, rated at 775 gpm at about 175 ft TDH, and powered by a 60-hp General Electric motor (Model No. 5K6257XIIIA, Serial No. KAJ1006465).

The following mineral analysis made by the Illinois Environmental Protection Agency (Lab. No. B34770) is for a water sample from the well collected March 1, 1976, after 2 hr of pumping at 750 gpm.

WELL NO. 4, LABORATORY NO. B34770

		mg/l	*me/l*			*mg/l*	*me/l*
Iron	Fe	0.7		Silica	SiO_2	21	
Manganese	Mn	0.00		Fluoride	F	0.7	0.04
Ammonium	NH_4	1.2	0.07	Boron	B	0.4	
Sodium	Na	36	1.57	Nitrate	NO_3	0	0.00
Potassium	K	1.5	0.04	Chloride	Cl	4.5	0.12
Calcium	Ca	43	2.15	Sulfate	SO_4	43	0.89
Magnesium	Mg	29	2.39	Alkalinity (as $CaCO_3$)		256	5.12
Arsenic	As	0.00					
Barium	Ba	0.1		Hardness (as $CaCO_3$)		226	4.52
Copper	Cu	0.01					
Cadmium	Cd	0.00		Total dissolved minerals		329	
Chromium	Cr	0.00					
Lead	Pb	0.00					
Mercury	Hg	0.0000		pH (as rec'd)		8.4	
Nickel	Ni	0.0		Radioactivity			
Selenium	Se	0.00		Alpha *pc/l*		1.2	
Silver	Ag	0.00		± deviation		1.2	
Cyanide	CN	0.00		Beta *pc/l*		1.7	
Zinc	Zn	0.0		± deviation		1.2	

A 5-in. diameter test hole was constructed in July 1975 to a depth of 228 ft by the J. P. Miller Artesian Well Co., Brookfield. The test hole was located approximately 1320 ft S and 1250 ft W of the NE corner of Section 17, T46N, R10E. Upon completion, the nonpumping water level was reported to be 43 ft below land surface.

LAYNE-WESTERN CO., 1953
(MUNICIPAL WELL #3)

Data	Thickness	Top	Bottom
Summary Sample Study by Lidia Selkregg 7/58.			
PLEISTOCENE SERIES			
Silt, buff, yellow, calcareous, oxidized	10		10
Silt, buff yellow, gray, calcareous, oxidized	40		50
Clay, gray, laminated, calcareous	20		70
Till, buff gray, very silty, calcareous	20		90
Sand, very fine to fine, well sorted, clean	5		95
Gravel, coarse, poorly sorted; till, brownish gray sandy, calcareous	5		100
Sand, fine; well sorted, clean	5		105
Till, gray, very silty, calcareous	10		115
Gravel, granular to coarse, clean; sand, medium to very coarse, clean	10		125
Gravel, granular to coarse, clean	5		130
Sand, very coarse, well sorted, celan; gravel coarse	5		135
Sand, as above; little fill, brownish gray, silty calcareous	5		140
Sand, fine, well sorted, clean; little gravel	5		145
Silt, brownish gray, clayey, calcareous	5		150
Location corrected by Russ Brower.			

COMPANY Layne-Western Co.
WELL Village of Antioch NO. 3
DATE DRILLED October 1953 COUNTY NO. 1944
AUTHORITY Lidia Selkregg
LOCATION NE NE
COUNTY LAKE S. S. # 23797

8-46N-10E

GEOLOGICAL AND WATER SURVEYS WELL RECORD

10. Property owner CREGG WENNSTROM Well No. Silver Lake
Address 42066 N. Deep Lake Rd., Antioch, Il.
Driller GEORGE E. GAFFKE License No. 102-234
11. Permit No. 102976 Date 4/1/82
12. Water from Sand & Gravel (Formation) 13. County Lake
at depth 131 to 140 ft. Sec. 9 (.)
14. Screen: Diam. 5 in. Twp. 46N
Length: 3 ft. Slot 10 Rge. 10E
Elev.

SHOW LOCATION IN SECTION PLAT

15. Casing and Liner Pipe

Diam. (in.)	Kind and Weight	From (Ft.)	To (Ft.)
5	PVC	+1	137

16. Size Hole below casing: 5 in.
17. Static level 75 ft. below casing top which is 1 ft. above ground level. Pumping level ____ ft. when pumping at 15-20 gpm for ____ hours.

18. FORMATIONS PASSED THROUGH	THICKNESS	DEPTH OF BOTTOM
Topsoil	2	2
Brown Clay	10	12
Blue Clay	57	69
Gravel	3	71
Blue Clay	60	131
Sand & Gravel	9	140

(CONTINUE ON SEPARATE SHEET IF NECESSARY)

SIGNED George E. Gaffke DATE 12/14/82

9-46N-10E

LAYNE-WESTERN CO., 1965
(MUNICIPAL WELL #4)

Village Well 4

Layne-Western Company

721 ILLINOIS AVENUE AURORA, ILLINOIS

Well Information—Drift Wells

Name of Job Village of Antioch Date 7/6/65

City or Village Antioch State Ill.

Well No.: 4 Drillers: Siefers

Well Location: 200 ft. (N) and 1650 ft. (W) of the SE corner of

Section 8 Twp 46 (N). Range 10 (E) Lake County.

Otherwise located as Approx. 620' east of Well #3

Work Began: Work Completed: Well Depth: 129' + 2' above G.L.

All measurements made from existing ground level at time well was drilled.

Casing Record:

Amount	Dia.	Wt. or Thickness	Material				
111	12		Steel pipe	with Welded	joints from +2' above G.L.	to	109'
				with	joints from	to	

Screen Record: Type Shutter

Amount	Dia.	Opening	Material				
20	12	#5	Stainless Steel	with Welded	joints from 109'	to	129'
				with	joints from	to	

Type of Seal at Bottom Steel Plate

Hole Record:

34 inch from 0 to 15

30' inch from 15 to 26

28" 26 142

Gravel Pack Record:

Amount 13 ton Size #3 Source Muscatine From 132' To 86'

Cementing Record: Grout from 0' to 40'

Backfill Record: Pea gravel from 40' to 86'

Village Well 4

WELL LOG

Feet		Feet	Description
0	to	3	Fill
3	to	8	Soft sandy yellow clay
8	to	24	Sand and gravel and boulders
24	to	80	Soft sticky gray clay, some thin sand streaks
80	to	85	Fine to coarse sand and gray clay
85	to	90	Fine gray sand
90	to	94	Blue clay
94	to	102	Very fine gray sand
102	to	105	Soft gray clay
105	to	121	Med. fine to coarse sand, some gravel and boulders
	to		115' to 121', very coarse
121	to	125	Med. fine to coarse sand, gravel and boulders, not as
	to		much coarse stuff, also not as tight.
125	to	129	Very coarse sand and gravel, some fine showing at 129'
129	to	141	Very fine gray sand
	to		
	to		
	to		
	to		
	to		
	to		
	to		
	to		

Well Test Data: Static Level 24'; pumping level 44' after 8 hours pumping at 632 g.p.m.

Length of test 8 hrs. See Well Test Data Sheet Dated June 22, 1965

REMARKS:

~~Pump test on separate sheet.~~

	to	3	Fill
3	to	8	Soft sandy yellow clay
8	to	24	Sand and gravel and boulders
24	to	80	Soft sticky gray clay, some thin sand streaks
80	to	85	Fine to coarse sand and gray clay
85	to	90	Fine gray sand
90	to	94	Blue clay
94	to	102	Very fine gray sand
102	to	105	Soft gray clay
105	to	121	Med. fine to coarse sand, some gravel and boulders
	to		115' to 121', very coarse
121	to	125	Med. fine to coarse sand, gravel and boulders, not as
	to		much coarse stuff, also not as tight.
125	to	129	Very coarse sand and gravel, some fine showing at 129'
129	to	141	Very fine gray sand
	to		
	to		
	to		
	to		
	to		
	to		
	to		

Test Data: Static Level 34'; pumping level 46' after 8 hours pumping at 632 g.p.m.
Length of test 8 hrs. See Well Test Data Sheet Dated June 22, 1965

REMARKS:

~~Pump test on separate sheet.~~

From Illinois State Water Survey, Batavia, IL
Oct. 18, 1985

October 4, 1965

WELL PRODUCTION TEST
VILLAGE OF ANTIOCH
LAKE COUNTY
by

Layne-Western Company

Owner:	Village of Antioch
Location:	350'N, 1500'W, SEcor T46NR10E-Sec 8.3a
Date of Test:	June 22, 1965
Length of Test:	8 hours
Date Drilled:	June 1965
Aquifer:	Sand & Gravel

PUMPED WELL

WELL DATA

Well No:	4
Driller:	Layne-Western Co.
Depth:	129'
Hole Record:	34" 0-15', 30" 15-26', 28" 26-142'
Casing Record:	12" 0-109' (cemented grout 0-40')
Screen Record:	12" #5 Layne Shutter Screen 109-129' (gravel packed from 40-132').
Pump & Power:	Layne Turbine, Gasoline Engine
Surface Elevation:	LSD 770' MSL
Measuring Point:	Top of casing, 2' above LSD
Measuring Equipment:	6x5' orifice, 80' airline
Static Level:	34' below MP

Observation Wells

Well No.	Depth	Dia. (in.)	Hole, casing, screen record	Distance, direction from pumped well
3	149	28	12" 0-129' 12" Layne Shutter Screen 129-149'	620' W of #4

...o of Antioch - Well #4

DRILLER'S LOG

Formation	Depth (ft) From	To
Fill	0	3
Soft sandy yellow clay	3	8
Sand and gravel and boulders	8	24
Soft sticky grey clay, some thin sand streaks	24	80
Fine to coarse sand and grey clay	80	85
Fine grey sand	85	90
Blue clay	90	94
Very fine grey sand	94	102
Soft grey clay	102	105
Med. fine to coarse sand, some gravel and boulders 115 to 121' very coarse	105	121
Med. fine to coarse sand, gravel and boulders, not as much coarse stuff, also not as tight	121	125
Very coarse sand and gravel, some fine showing at 129'	125	129
Very fine grey sand	129	141

[illegible] of Antioch - Well #4

Date 1965	Hour	Time (min)	Air gage (lb)	Depth to water (ft)	Draw-down (ft)	Disch. rate (gpm)	Temp. rate (gpm)	Remarks
6/22	9:05 A		45	34				Started pumping
	9:10	5	36	44	10	27	632	Very, very cloudy
	9:15	10	35	44	10	27.5	632	
	9:30	25	36	44	10	27.5	632	
	10:00	55	35	45	11	27.5	632	Cloudy
	10:30	85	35	45	11	27	632	
	11:00	115	35	45	11	26.5	626	
	11:30	145	35	45	11	27	632	Clearing
	12:00 N	175	35	45	11	27	632	
	12:30 P	205	35	45	11	27	632	
	1:00	235	36	44	10	27	632	Well #3 off
	1:30	265	35	45	11	27	632	Well #3 on
	2:00	295	34	46	12	27	632	Dirty
	2:30	325	34	46	12	26.5	626	Clearing
	3:00	355	34	46	12	26.5	626	
	3:30	385	34	46	12	27	632	
	4:00	415	34	46	12	27	632	
	4:30	445	34	46	12	27	632	
	5:00	475	34	46	12	27	632	End of test

1st Hole Prior to Village Well 4

TEST HOLE No. 1-65

Layne-Western Company

721 ILLINOIS AVE. AURORA, ILL.

TEST WELL REPORT

1. Owner Village of Antioch Contract No. (CJ-254..) Date 4/8/65
2. City Antioch State Ill.
3. Drillers Name Art Rogers Helpers Jim Barker
4. Static Water Level How Obtained — Washed ( ) Pumped ( )
5. Size Mud Pit — Length 6' Width 4'

DRILLERS LOG

	BOTTOM FT.	MUD LOSS INCHES	MUD WEIGHT	DESCRIPTION OF FORMATION	REMARKS
	1			Brown top soil	
	15			Brown sand and gravel	
	18	9	9.8	Gray sand and gravel - boulders	
	19			Boulders	
	73			Gray clay	
	89			Very soft clay, streaks, will jet	
	98			Very fine sand	
	108			Fine sand and streaks of clay	
	161			Very fine sand to med. sand	
	237			Very very fine sand, streaks of clay	
	246			Very soft clay, gravel clay	
	251			Limestone	

Test Hole Prior to Village Well 7

Layne-Western Company

721 ILLINOIS AVE. AURORA, ILL.

TEST HOLE No. 2-65

TEST WELL REPORT

1. Owner Village of Antioch Contract No. (CJ-254) Date 4/10/65
2. City Antioch State Ill.
3. Drillers Name Art Rogers Helpers
4. Static Water Level How Obtained — Washed ( ) Pumped ( )
5. Size Mud Pit — Length 6, Width 4

DRILLERS LOG

BOTTOM FT.	MUD LOSS INCHES	MUD WEIGHT	DESCRIPTION OF FORMATION	REMARKS
10			Yellow Clay	
77			Gray clay, soft	
79			Gray sand	
81			Hard Clay, brownish gray	
92			Softer " " "	
96			Very soft silt, will jet	
103			Soft brownish clay	
104			Sand	
105			Clay	
107			Sand	
111			Clay	
121			Sand and gravel fine to med.	
129			Sand and gravel, med. to coarse gravel	
131			Sand	
132			Sand and gravel	
136			Sandy clay, streaks of sand	
140			Fine sand	
142			Clay	
236			Fine sand	
244			Brown clay, streaks of sand	
253			Sand and gravel and lime	
256			Limestone	

Test Hole Near
Village Well 4

Layne-Western Company

721 ILLINOIS AVE. AURORA, ILL.

TEST HOLE No. 3-65

TEST WELL REPORT

Owner: Village of Antioch, Contract No. (CJ-254) Date: 3/15/65

City: Antioch State: Ill.

Drillers Name: Lyle Hill Helpers: John Siefers

4. Static Water Level ..... How Obtained — Washed ( ) Pumped ( )

Size Mud Pit — Length: 4' Width: 6'

DRILLERS LOG

BOTTOM FT.	MUD LOSS INCHES	MUD WEIGHT	DESCRIPTION OF FORMATION	REMARKS
2			Black sandy soil	
5			Brown sand	
23			Fine gravel and sand, gray	
104.5			Light Gray, clay	
109			Fine sand, gravel and broken lime	
122.5			Fine sand, gravel and boulders	
123			Fine sand	
129			Fine sand, gravel and boulders	
135			Very fine sand, some gravel	
158			Very fine sand, occasional streaks of clay	

This hole is next to the existing Well #4.

LAYNE-WESTERN CO., INC, 1978
(MUNICIPAL WELL #5)

Layne-Western Company, Inc.

WATER SUPPLY CONTRACTORS

721 West Illinois Avenue • Aurora, Illinois 60507 • Phone 312/897-6941

Name of Job: Village of Antioch C-2950B Date: Aug. 26, 1978

Town or Village: Antioch State: Illinois

Well No.: 5 Drillers: John Kopp, Carl Glidewell

Location: 35 ft. (S) and 628 ft. (E) of the NW corner of SW 1/4 of NE 1/4

Section 17, Twp. 46 (N), Range 10 (E) Lake County.

Otherwise located as

Work Began: 8/14/78 Work Completed: 9/11/78 Well Depth: 129'

All measurements made from existing ground level at time well was drilled.

Casing Record:

Amount	Dia.	Wt. or Thickness	Material					
112'	16"	3/8" wall	steel	with	welded	joints from	+3'	to 109'
				with		joints from		to

Screen Record: Type: Johnson

Amount	Dia.	Opening	Material					
20'	16" OD	0.060"	stainless	with	welded	joints from	109'	to 129'
				with		joints from		to

Type of Seal at Bottom: Stainless steel plate

Hole Record:

42" inch from 0 to 40'

38" inch from 40' to 131' T.D.

Gravel Pack Record:

Amount	Size	Source	From	To
App. 20 ton	#1 & #2 Mix	Northern Gravel Company	130'	84'

Cementing Record: Concrete from 20' to 0

Backfill Record: Sand and clay from 84' to 20'

Other: SEE OTHER SIDE

From Feet		To Feet	Description
0	to	7	Hard brown clay
7	to	10	Gray silty clay
10	to	25	Gray silty clay with sand seams
25	to	40	Gray very silty clay
40	to	45	Gray clay
45	to	54	Gray sandy silty clay, traces of gravel, boulder at 48'
54	to	63	Gray silty clay, sticky
63	to	76	Gray sandy silty with gravel intermixed, some small
	to		sand and gravel seams
76	to	91	Gray clay
91	to	93	Fine sand
93	to	97	Fine sand to coarse gravel
97	to	108.5	Very fine sand and/or silt (tight)
108.5	to	129	Fine sand to coarse gravel, tight, occasional boulders
129	to	131 T.D.	Fine to coarse sand
	to		
	to		
	to		
	to		
	to		
	to		
	to		
	to		

Data: Static Level 52' ; pumping level 62' after 24 hours pumping at 715 g.p.m.

Length of test 24 hrs. See Well Test Data Sheet Dated September 7 & 8, 1978

REMARKS:

B

APPENDIX B

USGS INVESTIGATION REPORT

U.S. DEPARTMENT OF THE INTERIOR

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U.S. GEOLOGICAL SURVEY

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DETERMINATION OF HYDRAULIC PROPERTIES IN THE VICINITY OF A LANDFILL NEAR ANTIOCH, ILLINOIS

By Robert T. Kay and John D. Earle

U.S. GEOLOGICAL SURVEY

Water-Resources Investigations Report 89-4124

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CONVERSION FACTORS AND ABBREVIATIONS

For the convenience of readers who may want to use metric (International System) units, the inch-pound values in this report may be converted by using the following factors:

Multiply inch-pound unit	By	To obtain metric unit
foot (ft)	0.3048	meter (m)
gallon per minute (gal/min)	0.06308	liter per second (L/s)
foot squared per day (ft^2/d)	0.09290	meter squared per day (m^2/d)
foot per day (ft/d)	0.3048	meter per day (m/d)
foot per day per foot [(ft/d)/ft]	0.3048	meter per day per meter [(m/d)/m]
cubic foot per day (ft^3/d)	0.02832	cubic meter per day (m^3/d)

Sea level: In this report, "sea level" refers to the National Geodetic Vertical Datum of 1929 (NGVD of 1929)--a geodetic datum derived from a general adjustment of the first-order level nets of both the United States and Canada, formerly called Sea Level Datum of 1929.

DETERMINATION OF HYDRAULIC PROPERTIES IN THE VICINITY OF A LANDFILL NEAR ANTIOCH, ILLINOIS

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ABSTRACT

A hydrogeologic investigation was conducted in and around a landfill near Antioch, Illinois, in December 1987. The investigation consisted, in part, of an aquifer test that was designed to determine the hydraulic connection between the hydrogeologic units in the area. The hydrogeologic units consist of a shallow, unconfined, sand and gravel aquifer of variable thickness that overlies an intermediate confining unit of variable thickness composed predominantly of till. Underlying the till is a deep, confined, sand and gravel aquifer that serves as the water supply for the village of Antioch. The aquifer test was conducted in the confined aquifer.

Aquifer-test data were analyzed using the Hantush and Jacob method for a leaky confined aquifer with no storage in the confining unit. Calculated transmissivity of the confined aquifer ranged from 1.96×10^{4} to 2.52×10^{4} foot squared per day and storativity ranged from 2.10×10^{-4} to 8.71×10^{-4}. Leakage through the confining unit ranged from 1.29×10^{-4} to 7.84×10^{-4} foot per day per foot, and hydraulic conductivity of the confining unit ranged from 3.22×10^{-3} to 1.96×10^{-2} foot per day.

The Hantush method for analysis of a leaky confined aquifer with storage in the confining unit also was used to estimate aquifer and confining-unit properties. Transmissivity and storativity values calculated using the Hantush method are in good agreement with the values calculated from the Hantush and Jacob method.

Properties of the confining unit were estimated using the ratio method of Neuman and Witherspoon. The estimated diffusivity of the confining unit ranged from 50.36 to 68.13 feet squared per day. A value for the vertical hydraulic conductivity of the confining unit calculated from data obtained using both the Hantush and the Neuman and Witherspoon methods was within the range of values calculated by the Hantush and Jacob method.

The aquifer-test data clearly showed that the confining unit is hydraulically connected to the confined aquifer. The aquifer-test data also indicated that the unconfined aquifer becomes hydraulically connected to the deep sand and gravel aquifer within 24 hours after the start of pumping in the confined aquifer.

INTRODUCTION

A hydrogeologic investigation was conducted during December 1987 to estimate the hydraulic connection between the hydrogeologic units in the vicinity of a landfill located near the southeastern corner of the village of Antioch, Lake County, Illinois (fig. 1). The investigation was conducted by the U.S. Environmental Protection Agency (USEPA); their consultants, Ecology and Environment, Inc.[1]; and the U.S. Geological Survey (USGS). The USGS participated in the investigation as part of an Interagency Agreement with USEPA.

The landfill was in operation from 1963 through 1984. During that time, an unknown quantity of wastes were deposited at the landfill. These wastes are alledged to have included solvents, heavy metals, cutting oils, and hydraulic oils. Polychlorinated biphenols have been determined to be present at the landfill (Ecology and Environment, Inc., 1987, sec. 2, p. 1).

Wells used by the village of Antioch for its public water supply are located about 500, 1,000, and 1,400 ft (feet) from the southwestern corner of the landfill (fig. 2) and draw water from a confined sand and gravel aquifer (henceforth referred to as the confined aquifer) that underlies the landfill. Because of the close proximity of the water-supply wells to the landfill, the USEPA felt that the hazardous substances deposited in the landfill could present a threat to human health if they were to enter the confined aquifer.

The investigation was designed to determine the potential for ground-water migration from the landfill into the confined aquifer. Thirteen observation wells were used in the investigation; their locations are shown in figure 2. The investigation had two phases. The first phase consisted of monitoring water levels in observation wells while monitoring pumping of the municipal wells in the area. The first phase was designed to determine what phenomena, other than pumping in Antioch municipal well AMW4, were capable of influencing the magnitude of drawdown in each of the hydrogeologic units in the area. The second phase consisted of a constant-discharge aquifer test in which well AMW4 was pumped for 24 hours and water-level response in selected observation wells was measured. The second phase was designed to quantify the hydraulic properties of the hydrogeologic units in the area and to determine the potential for ground-water migration from the landfill into the confined aquifer.

Purpose and Scope

This report describes the hydraulic properties of the confined aquifer and an overlying confining unit (henceforth referred to as the confining unit) in the vicinity of a landfill near Antioch, Illinois, and establishes the existence of hydraulic connection between the primary hydrogeologic units near the landfill. A description of the hydrogeology of the study area is given, and the results and interpretation of water-level monitoring and aquifer testing are presented.

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[1]Use of firm names in this report is for identification purposes only and does not constitute endorsement by the U.S. Geological Survey.

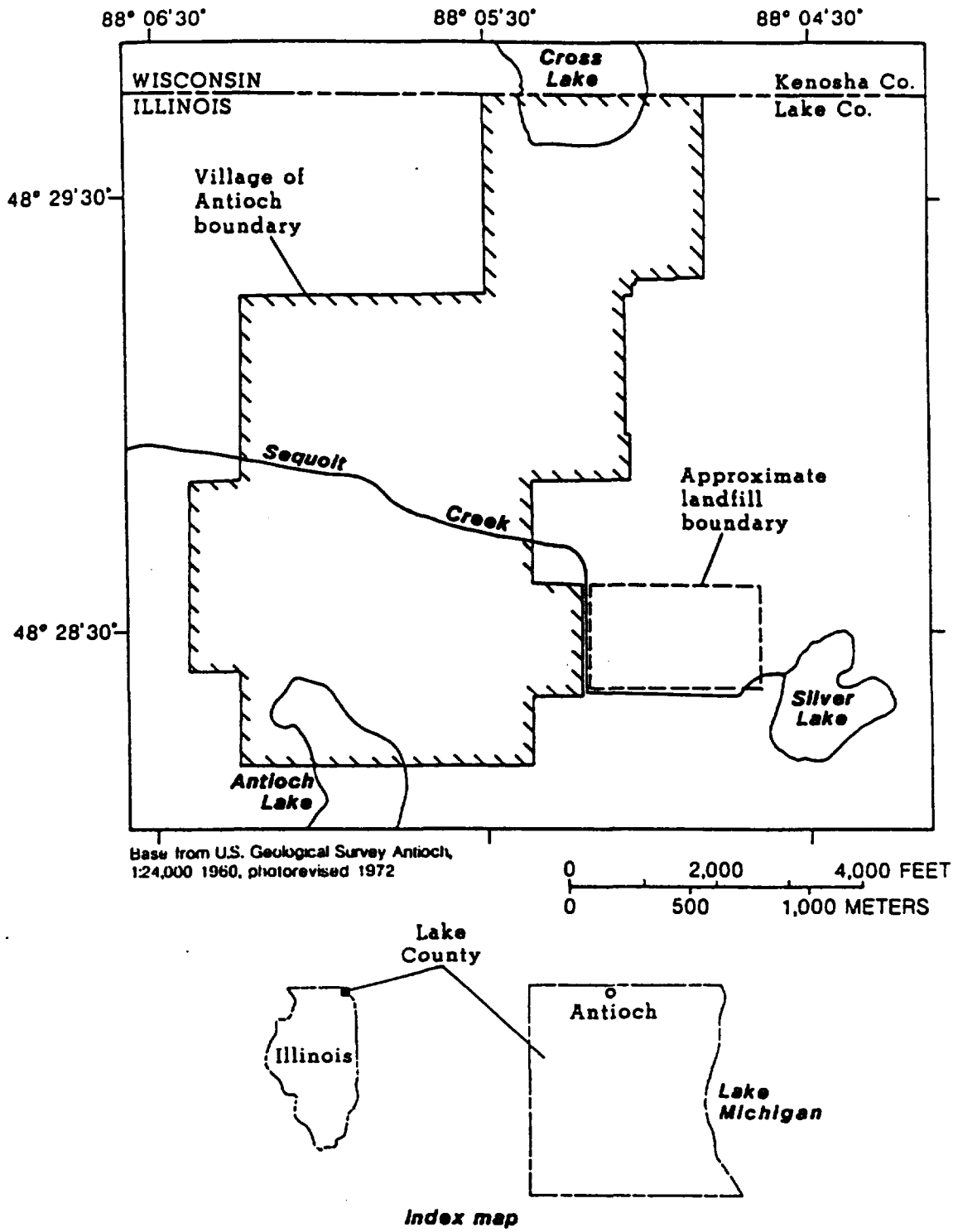
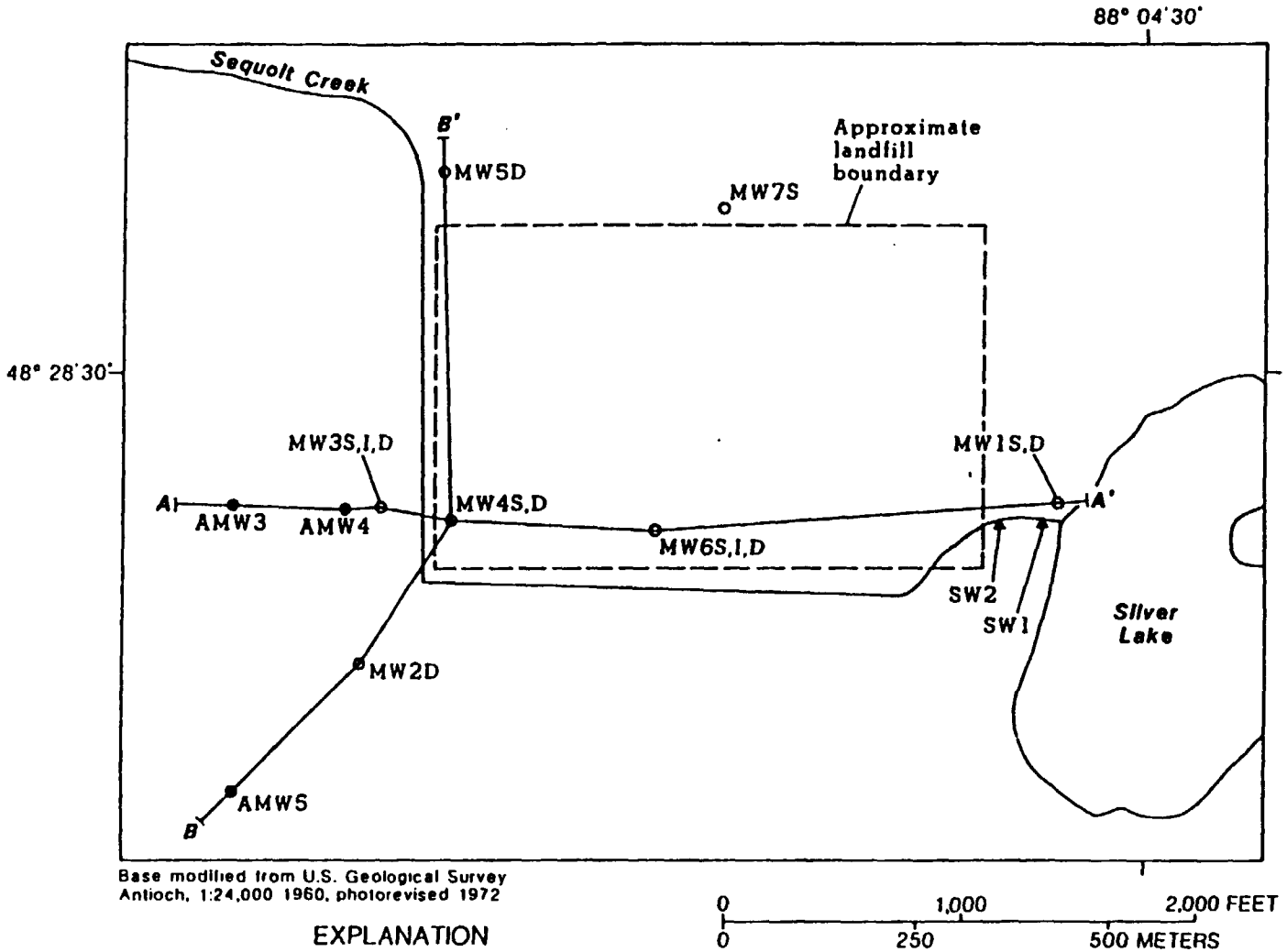


Figure 1.--Location of landfill site near Antioch, Illinois.



EXPLANATION

AMW4 ● ANTIOCH MUNICIPAL WELL AND NUMBER

MW3S,I,D ○ U.S. ENVIRONMENTAL PROTECTION AGENCY OBSERVATION WELL AND NUMBER--*Letter following number refers to well-screen placement in (S) shallow sand and gravel aquifer; (I) intermediate confining unit; (D) deep sand and gravel aquifer*

SW1 ▲ SURFACE-WATER GAGING STATION AND NUMBER

A ⊢—⊣ A' TRACE OF GEOLOGIC SECTION

Figure 2.--Location of wells, gaging stations, and lines of geologic section.

Hydrogeology

The geologic deposits in the area consist of about 200 ft of unconsolidated materials overlying bedrock of Silurian dolomite (Piskin and Bergstrom, 1967, plate 1; Willman and others, 1967, map). The four hydrogeologic units in the area are a shallow, unconfined sand and gravel aquifer (henceforth referred to as the unconfined aquifer), an intermediate confining unit of till (confining unit), a deep confined sand and gravel aquifer (confined aquifer) that is used by the village of Antioch for its water supply, and a deep confining unit of till (figs. 3 and 4). Well logs obtained from Ecology and Environment, Inc., describe 1.5-ft sections of material collected from a split-spoon sampler at 3.5-ft intervals. The logs indicate that the unconfined aquifer ranges in thickness from zero in the area of USEPA observation wells MW5D, MW7, and MW2D to about 30 ft at well MW6D. The confining unit ranges in thickness from about 25 ft in the area of well MW6D to about 85 ft at well MW5D. The cited values for confining-unit thickness at wells MW3D and MW6D are the maximum values possible from the well-log data; the actual values may be as much as 3.5 ft less. The thickness of the confined aquifer in the area of the landfill is unknown, but logs of well AMW3 and a test hole for well AMW5, obtained from the Illinois State Water Survey, indicate a thickness of about 55 to 60 ft. The thickness of the deep confining unit is unknown, but the log of the test hole indicates that it is at least 60 ft thick at well AMW5.

Water-level data from the hydrogeologic units in the area indicate that ground-water flow has both vertical and horizontal components (table 1). Head values from wells MW1S, MW3S, MW4S, MW6S, and MW7 indicate that the ground water flows in a southerly direction beneath the landfill and discharges into Sequoit Creek (D. J. Yeskis, U.S. Environmental Protection Agency, oral commun., 1988). Head values in the unconfined aquifer indicate that ground water in that aquifer has the potential to flow downward into the confining unit. Head values in the confining unit indicate that ground water there has the potential for flow into the confined aquifer. No wells are open to the deep confining unit, so the potential for flow within that unit is unknown.

Locally, the direction of ground-water flow in the confined aquifer is controlled by pumping of the municipal wells. Because water levels in the confined aquifer were continually responding to pumping, or the termination of pumping, in these wells, unstressed flow directions in the confined aquifer could not be determined during the investigation. The water-level data indicate that flow in the confined aquifer is toward the well that had been pumped most recently (D. J. Yeskis, U.S. Environmental Protection Agency, oral commun., 1988).

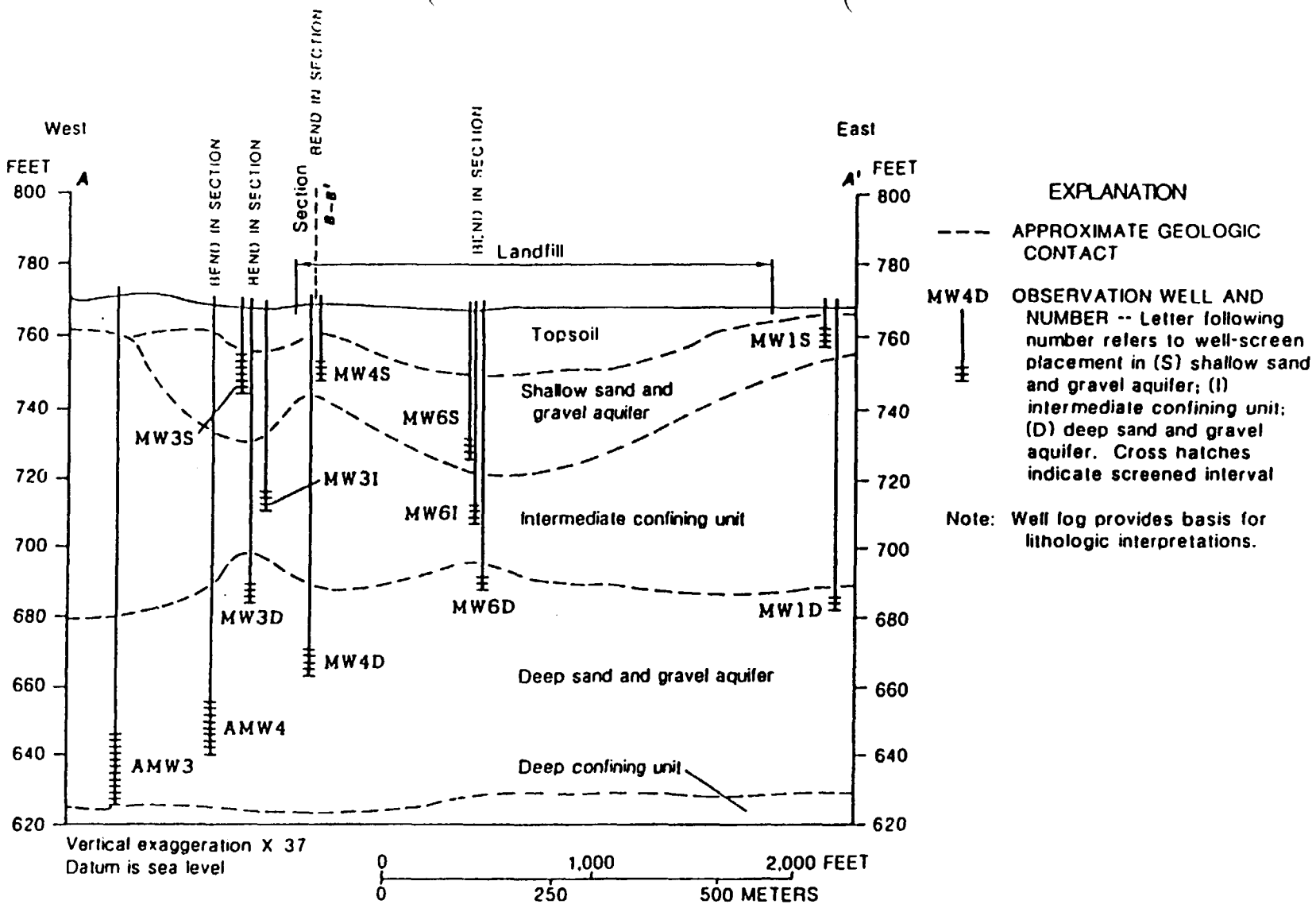


Figure 3.--Geologic section A-A'.

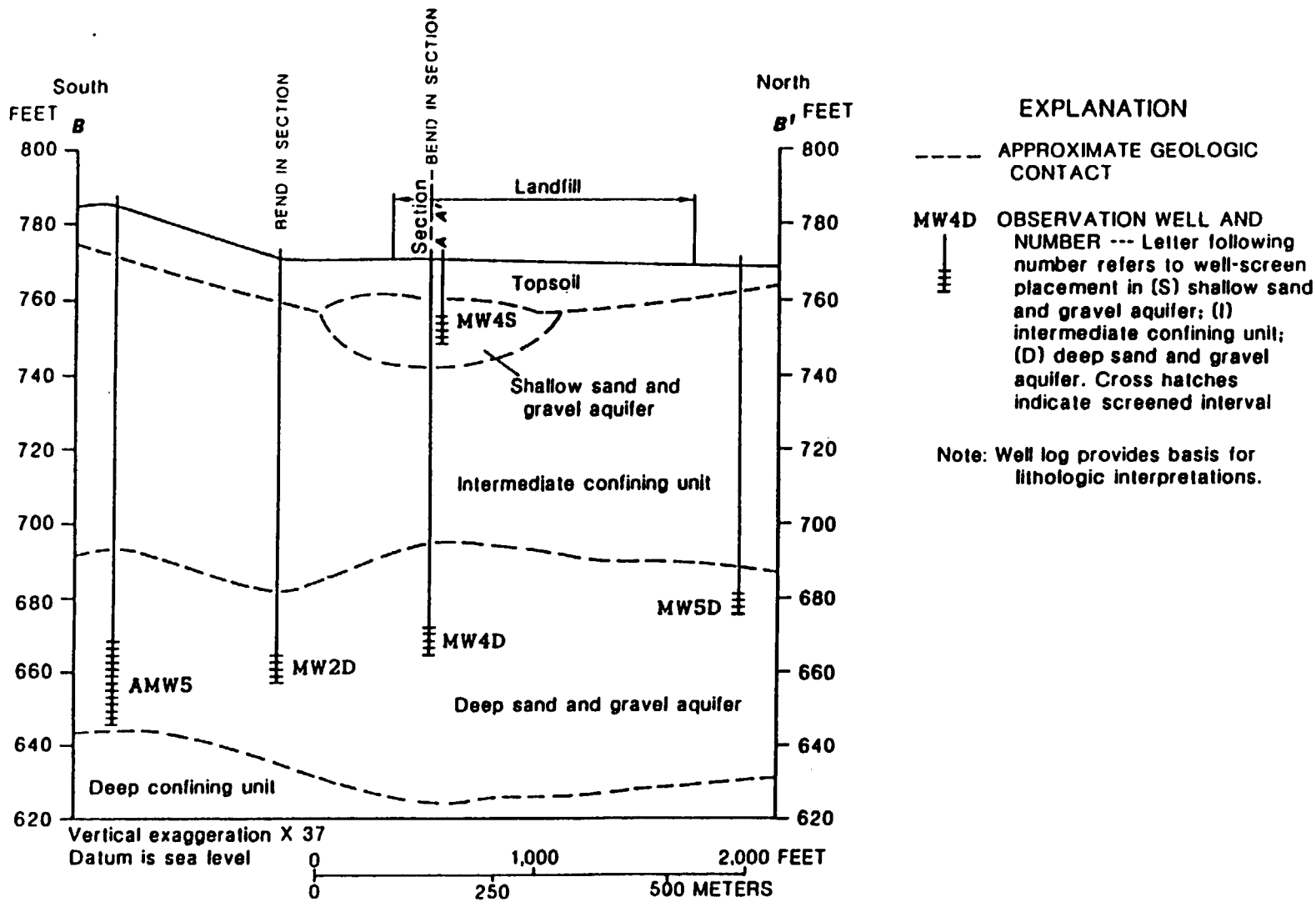


Figure 4.--Geologic section B-B'.

Table 1.--Observation-well data and water levels at 1130 hours on December 16, 1987

Well number	Altitude of measuring point, in feet above sea level	Screened interval, in feet below land surface	Depth to water, in feet below measuring point	Water-level altitude, in feet above sea level
MW1S	768.60	6.71- 12.41	4.30	764.30
MW1D	768.60	86.71- 92.41	37.89	730.71
MW2D	770.72	107.41-112.77	40.70	730.02
MW3S	770.10	16.81- 22.51	6.98	763.12
MW3I	769.89	55.00- 58.00	35.66	734.23
MW3D	769.63	77.28- 82.58	39.31	730.32
MW4S	773.63	17.17- 22.87	10.76	762.81
MW4D	772.66	98.14-103.84	41.92	730.74
MW5D	767.74	87.44- 93.14	36.40	731.34
MW6S	769.89	36.00- 41.70	6.68	763.21
MW6I	770.20	59.06- 62.76	22.57	747.63
MW6D	770.09	77.47- 83.17	39.22	730.87
MW7	767.48	3.61- 9.46	3.36	764.12

DETERMINATION OF HYDRAULIC PROPERTIES

Data Collection

Ground- and surface-water levels, as well as barometric pressure, were monitored throughout the investigation. Water levels in observation wells MW1S and 1D; MW2D; MW3S, 3I, and 3D; MW4S and 4D; and MW6S, 6I, and 6D were monitored with pressure transducers. The accuracy of the water levels obtained from the pressure transducers was checked periodically with steel-tape measurements. Water-level measurements were taken periodically at two surface-water-altitude measuring stations in Sequoit Creek near Silver Lake (fig. 2). Barometric-pressure readings were continuously recorded at the site and checked daily with readings from a weather station about 20 miles to the east.

The municipal wells were checked periodically to determine if they were pumping, and the rate of discharge and total discharge was recorded from readings of in-line totalizing flow meters. The accuracy of the flow-meter

readings could not be verified. This enabled the pumping history of the municipal wells to be determined to within a few minutes of when the pumping at each well began and ended. These readings showed that well AMW3 was not pumped at any time during the investigation, that well AMW4 was pumped only during the aquifer test, and that well AMW5 was not pumped while the aquifer test was being conducted.

The hydraulic properties of the confined aquifer and the confining unit were estimated from data obtained during a pumping test at well AMW4. The aquifer test began at 1035 hours on December 17, when well AMW4 began to be pumped at a constant rate of 575 gallons per minute (110,952 cubic feet per day), and ended at 1100 hours on December 18.

Results of Water-Level Monitoring

All the water-level data obtained during the investigation were collected and plotted on hydrographs. When water-level measurements were compared to the pumping sequence of the municipal wells and barometric pressure, a qualitative idea of the phenomena that influence the water-level response in the hydrogeologic units in the area was obtained. Recognition of the presence of these influences was essential for obtaining accurate estimates of the confined aquifer and confining-unit properties.

Water levels in the confined aquifer were influenced by pumping the aquifer and by barometric pressure changes (figs. 5-7). When the confined aquifer was pumped, water levels declined; when the confined aquifer was not pumped, water levels rose. The only exception to this trend was the rise in water level that occurred from approximately 1800 hours on December 14 to 2400 hours on December 15 while well AMW5 was pumped continuously. The rise and subsequent decline in water level that took place during that time mirrors the decline and eventual rise in barometric pressure (fig. 5). The strong correlation between water-level elevation and barometric pressure during the first 30 hours of the investigation suggests that variations in the barometric pressure produced the changes in water level during this time.

Water levels in the wells open to the confining unit showed no significant response to barometric pressure changes but did respond to pumping during the aquifer test (fig. 8). When well AMW4 was pumped, water levels in wells MW3D, MW3I, and MW6I showed an initial rise, then fell continuously until pumping ceased. The initial rise in water level in these wells was probably the result of an increase in pore-water pressure brought on by shear stress induced by pumping the confined aquifer (Wolff, 1970, p. 1726). When pumping in well AMW4 ceased, water levels in the confining unit stopped falling and began to rise. Water-level response during the aquifer test indicates that the confining unit is hydraulically connected to the confined aquifer.

Water levels in the unconfined aquifer showed some correlation with barometric pressure fluctuations but showed no clearly defined response to pumping in the confined aquifer (figs. 9 and 10). Water levels in wells MW1S and MW6S showed an overall rise during the aquifer test while water levels in well MW4S declined. These trends were continuations of background trends and show no

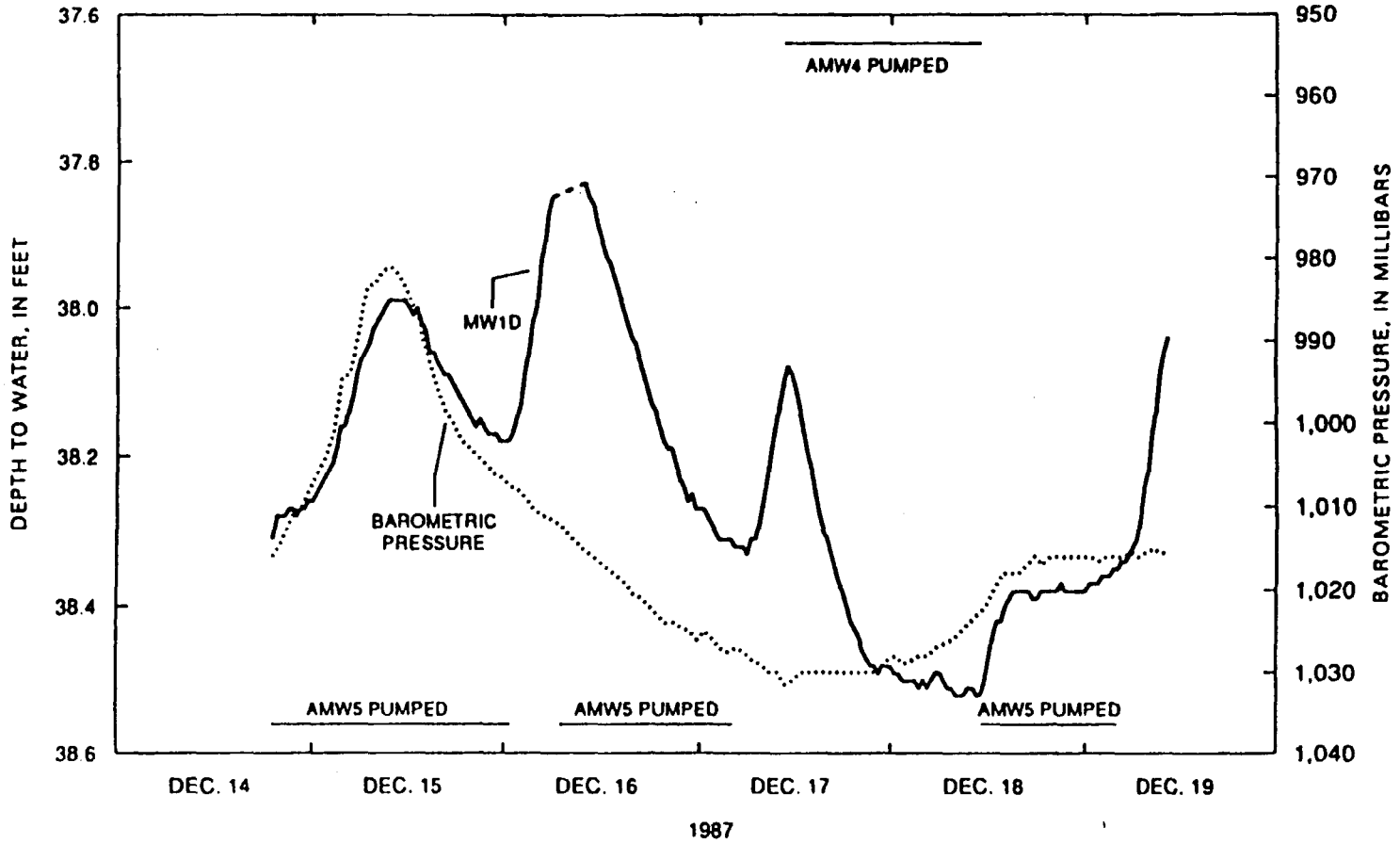


Figure 5.--Depth to water in observation well MW1D and barometric pressure at the landfill, December 14-19, 1987. Water-level data dashed where inferred.

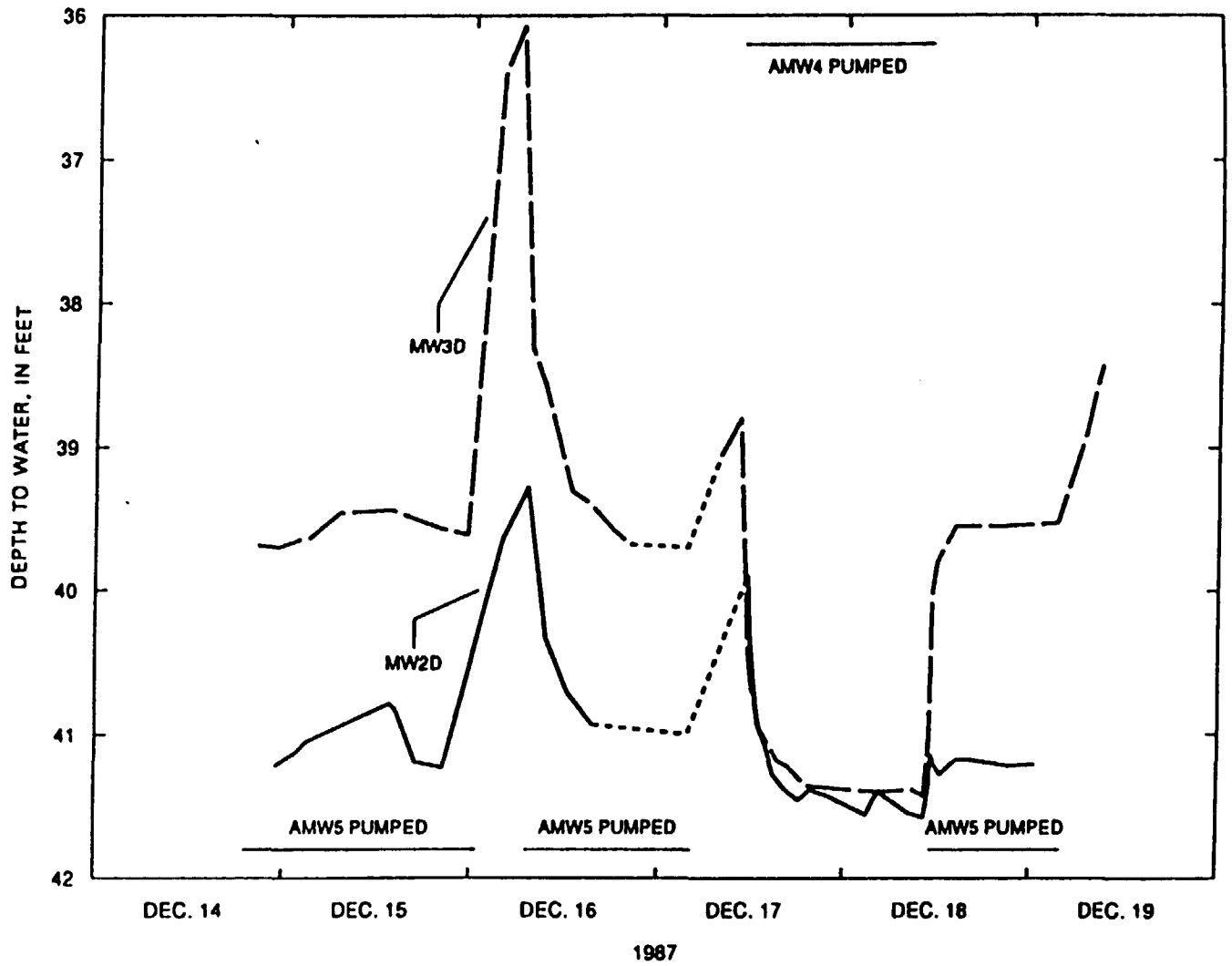


Figure 6.--Depth to water in observation wells MW2D and MW3D, December 14-19, 1987. Dashed where inferred.

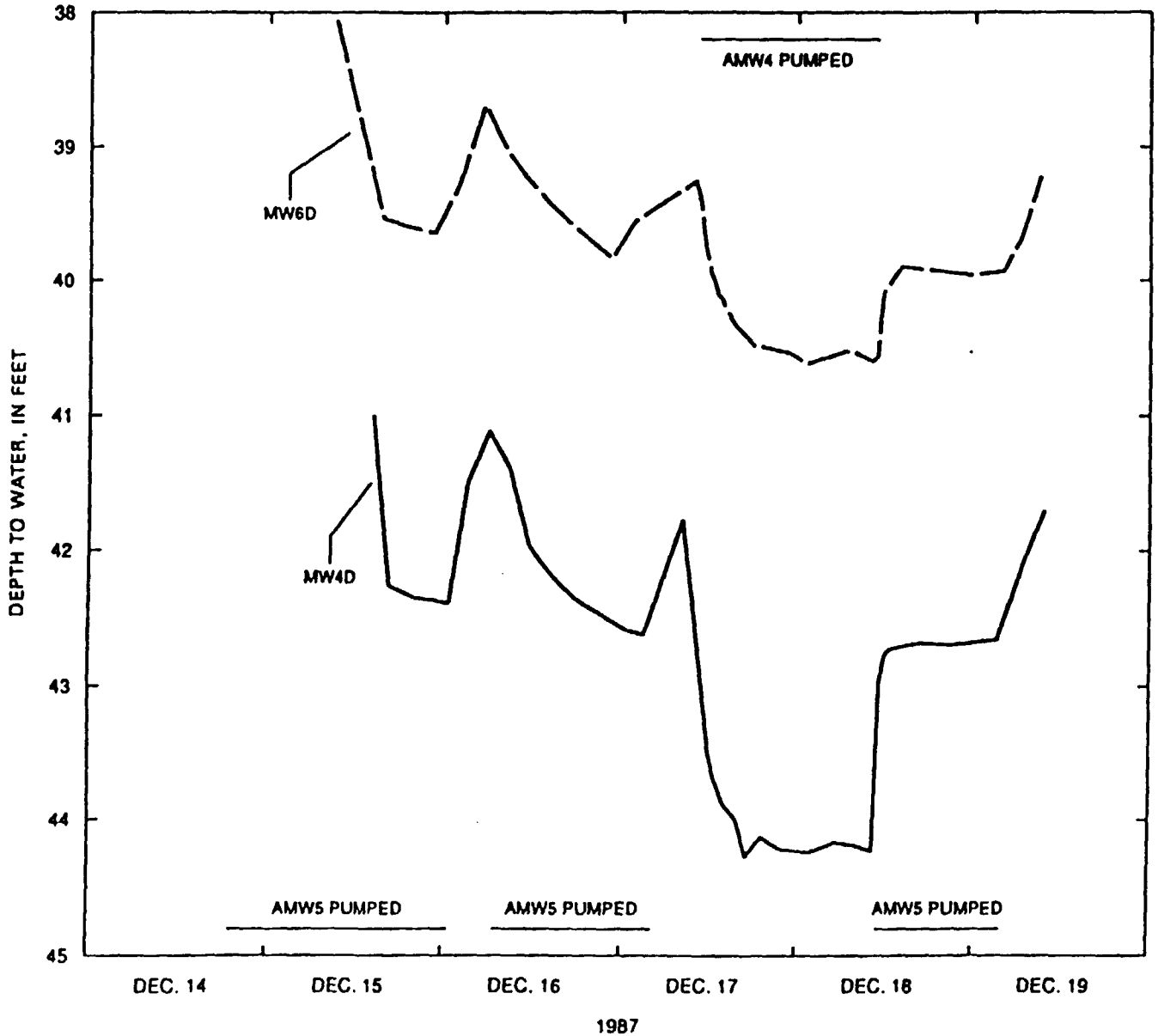


Figure 7.--Depth to water in observation wells MW4D and MW6D, December 15-19, 1987. Dashed where inferred.

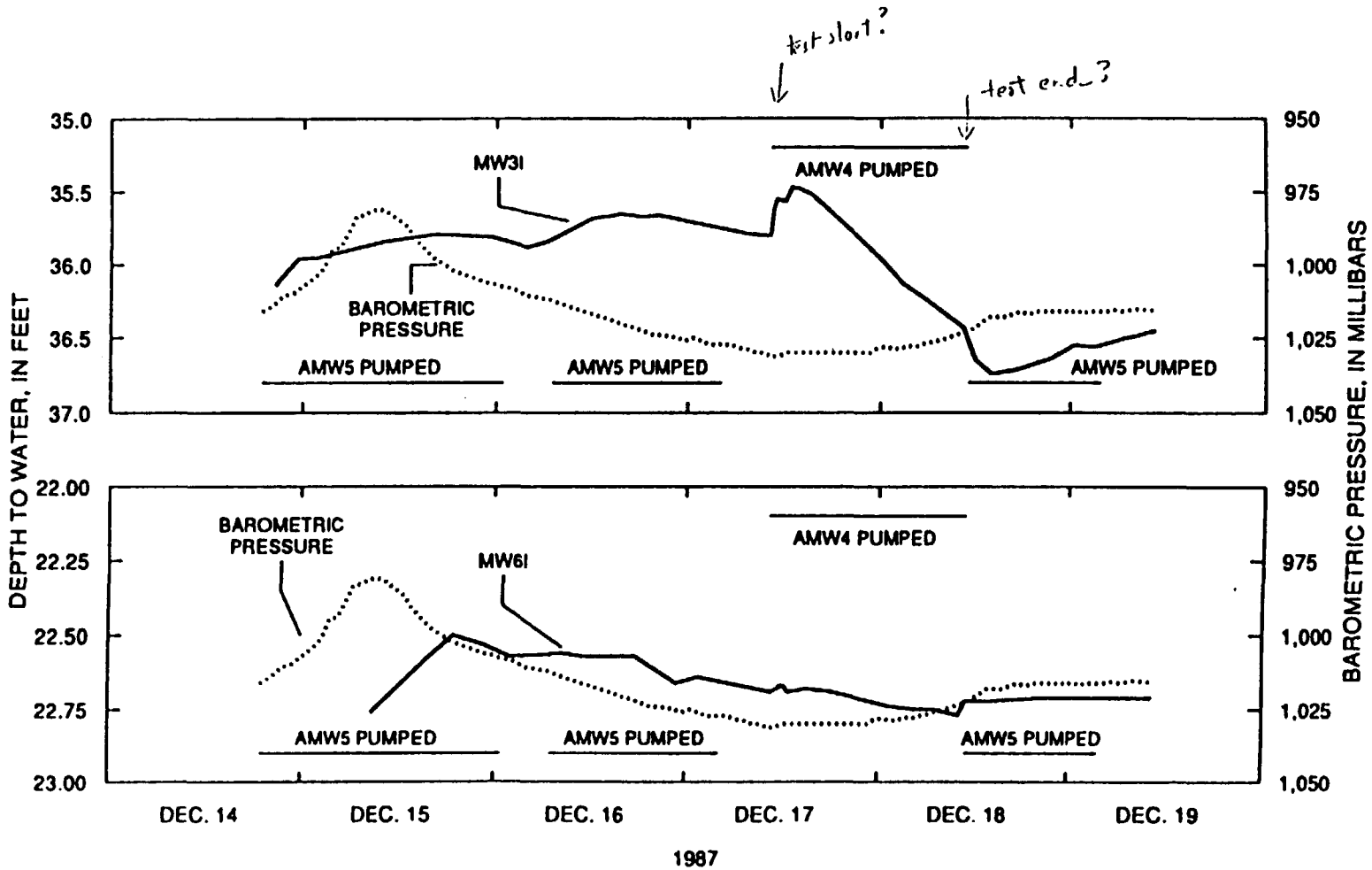


Figure 8.--Water levels in observation wells MW3I and MW6I and barometric pressure at the landfill, December 14-19, 1987.

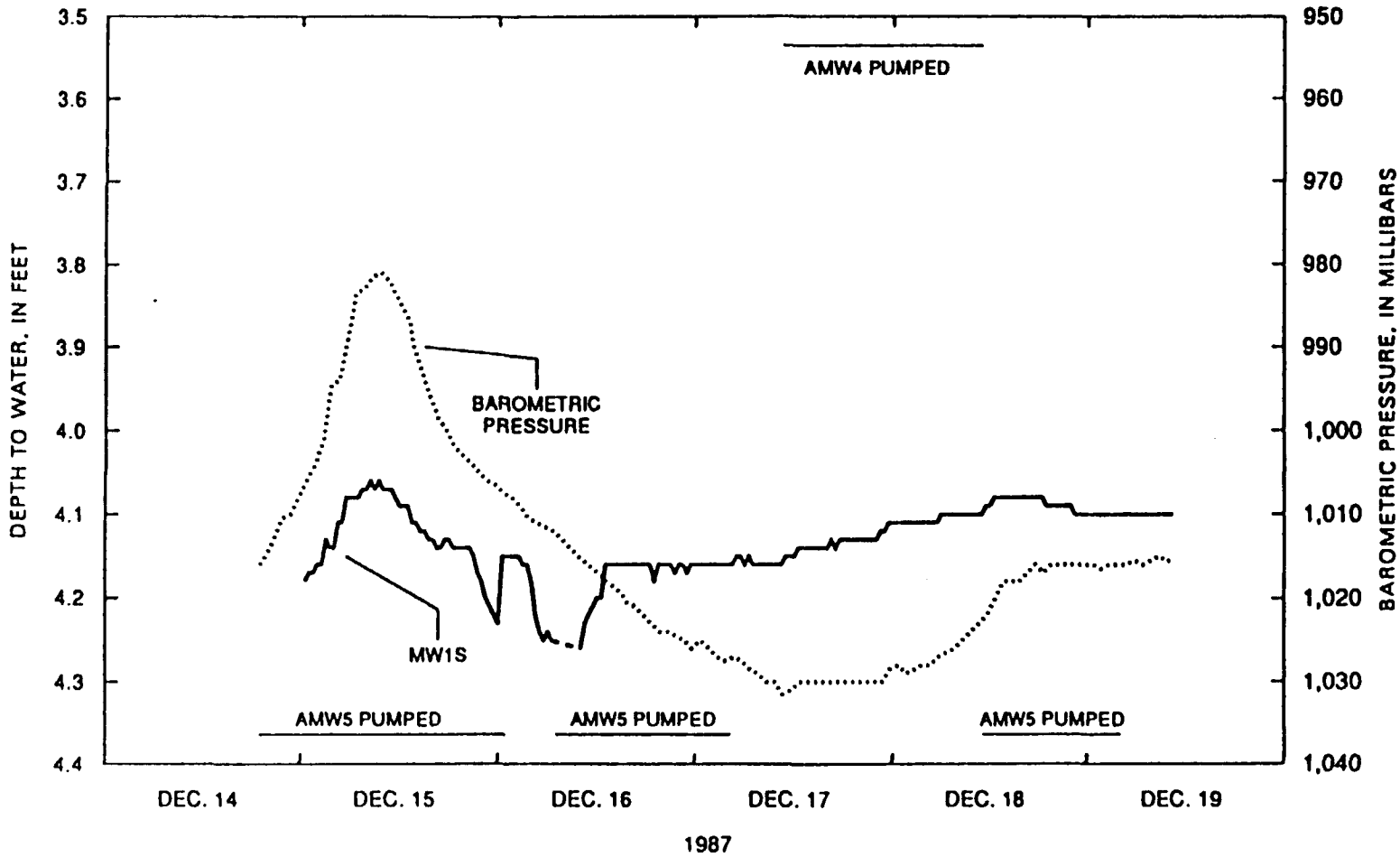


Figure 9.--Depth to water in observation well MW1S and barometric pressure at the landfill, December 14-19, 1987. Water level dashed where inferred.

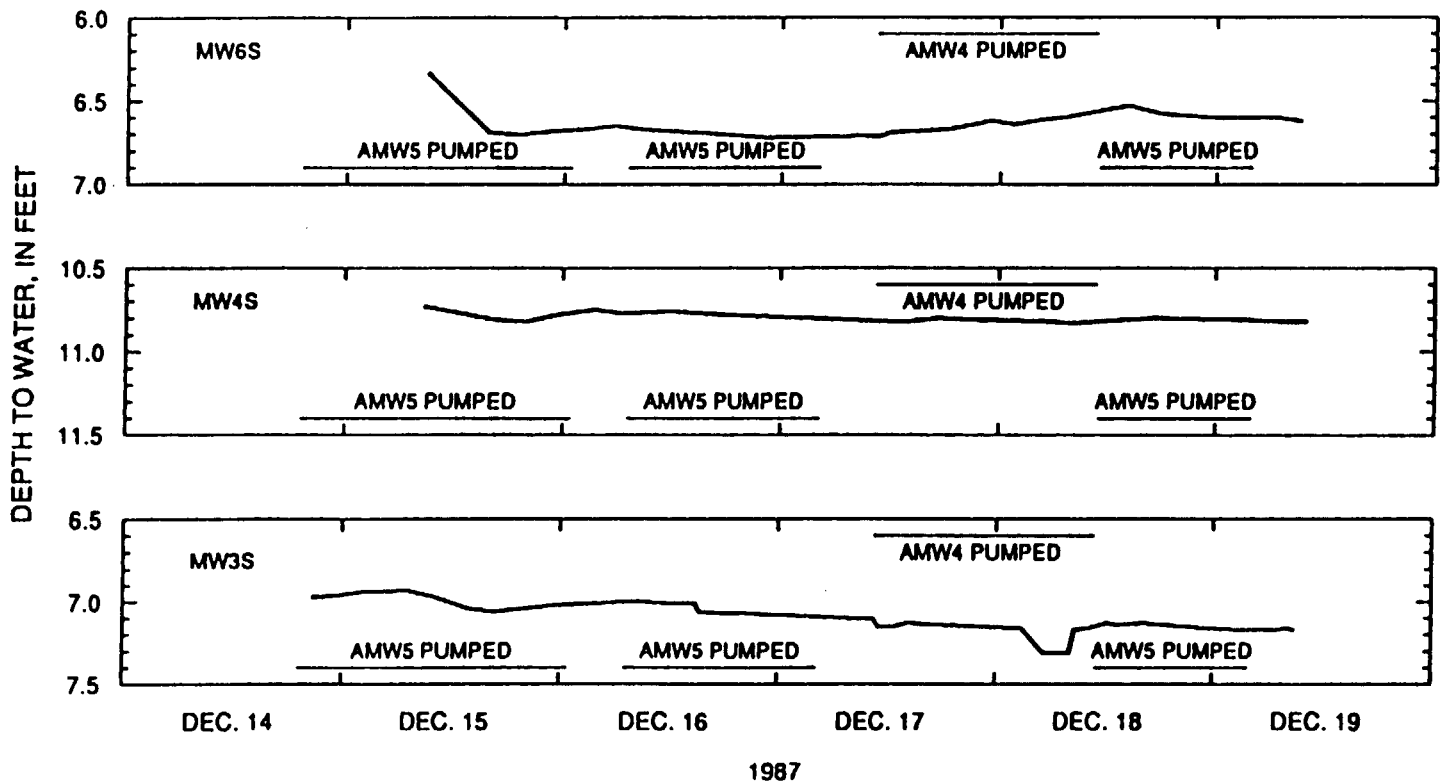


Figure 10.--Water-level readings in observation wells MW6S, MW4S, and MW3S, December 14-19, 1987.

clearly defined relation to pumping in the confined aquifer. The water level in well MW3S showed an overall decline during the aquifer test and a significant drop approximately 19 hours after the test began. The water level in well MW3S rose after this drop while well AMW4 was still being pumped, indicating that pumping in the confined aquifer was probably not the cause of the water-level decline.

Results of Aquifer Testing

Time-drawdown data from the pumping phase of the aquifer test departed from the Theis-type curve, which also indicated that the confined aquifer is hydraulically connected with the confining unit (fig. 11). To quantify the hydraulic properties of the confined aquifer and the confining unit, the aquifer-test data were analyzed using the Hantush and Jacob (1955) method for a leaky confined aquifer with no storage in the confining unit, the Hantush (1960) method for a leaky confined aquifer with storage in the confining unit, and the ratio method of Neuman and Witherspoon (1972). Because pumping at well AMW5 began 13 minutes after the termination of pumping at well AMW4, data from the recovery phase of the aquifer test was not analyzed to determine aquifer properties.

The methods of aquifer-test-data analysis used in this report assume the following conditions:

1. Constant discharge (Q) from the pumped well.

2. The pumped well is of infinitesimal diameter and fully penetrates the aquifer.

3. The confined aquifer is overlain everywhere by a confining unit having uniform hydraulic conductivity (k'), specific storage (Ss'), and thickness (b') and underlain by an impermeable boundary.

4. The confining unit is overlain by an infinite constant-head plane source.

5. Flow in the aquifer is two dimensional and radial in the horizontal plane, and flow in the confining unit is vertical.

Most of the assumptions were met or closely approximated at the site. The assumptions of a confining unit of uniform thickness and a fully penetrating pumped well were not met. The assumption of radial horizontal flow in the aquifer was not met in the area of well MW3D. The assumption of no leakage from underlying deposits into the pumped aquifer cannot be tested with available data.

In an effort to correct for, or eliminate, the presence of extraneous effects on the time-drawdown data, several assumptions were made:

1. The wells in the deep aquifer had a barometric efficiency of 50 percent;

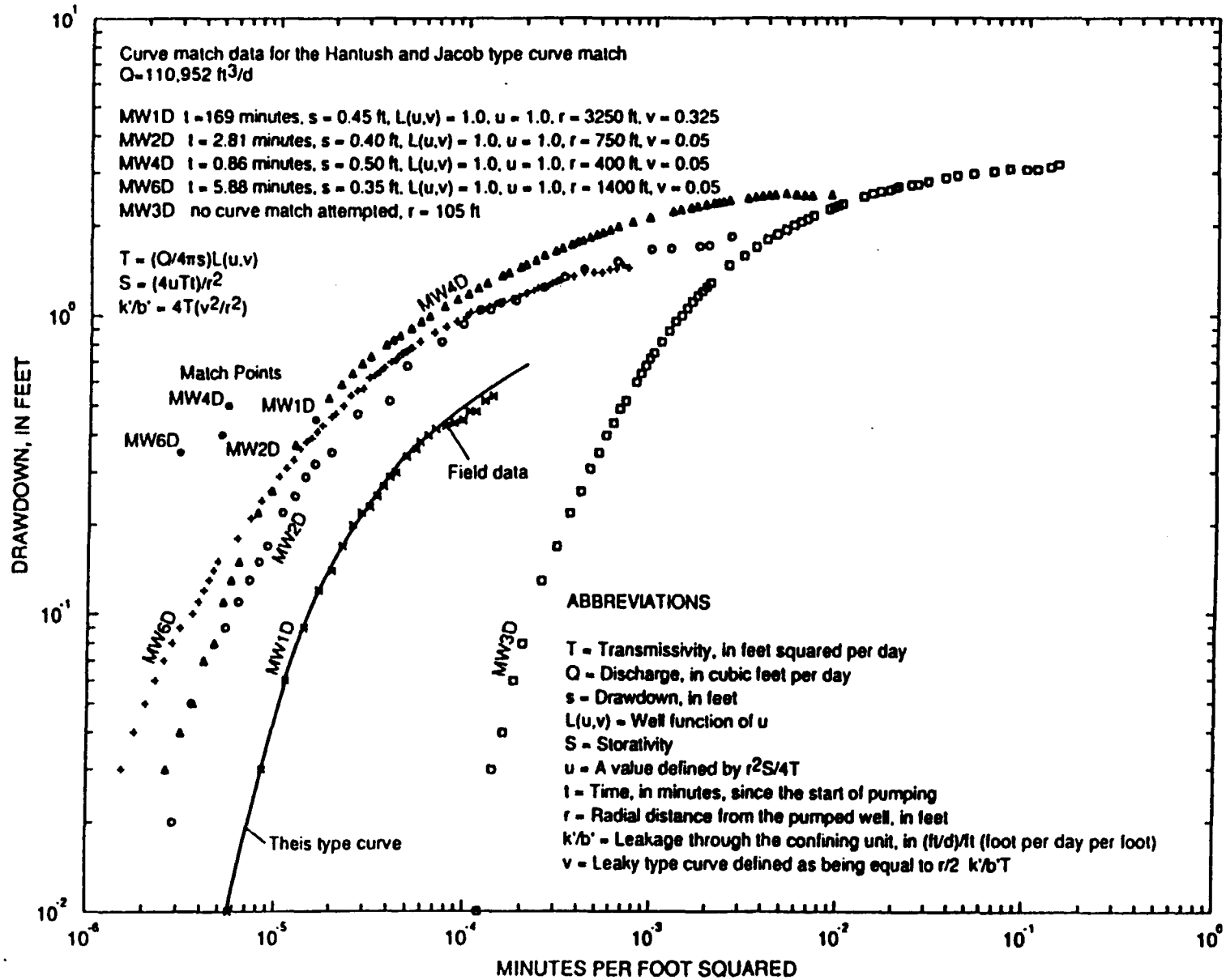


Figure 11.--Curve-match data for observation wells MW1D, MW2D, MW4D, and MW6D using the Hantush and Jacob method.

2. there was no hydraulic connection between surface-water bodies and the confined aquifer;

3. recovery from pumping at well AMW5 had no influence on the drawdown data during the early and late phases of the aquifer test; and

4. the effects of partial penetration of the pumped well are insignificant in wells MW1D, MW2D, and MW6D.

A barometric efficiency of 50 percent represents the probable maximum for the aquifer (E. P. Weeks, U.S. Geological Survey, oral commun., 1988) and results in estimates of confining-unit properties that are probably slightly lower than the actual values. The assumption that there was no hydraulic connection between the confined aquifer and surface-water bodies was based on data that showed no changes in surface-water altitudes in Sequoit Creek during the test. The assumption that recovery after pumping well AMW5 did not affect drawdown in the observation wells during the early and late phases of the test was based on calculations indicating that water-level changes in the observation wells caused by recovery of well AMW5 would be less than 0.01 ft until approximately 330 minutes into the aquifer test (Rushton, 1985, p. 364). Pumping-history data indicate that recovery effects ceased approximately 1,000 minutes into the aquifer test. Calculations presented by Walton (1978, p. 314) showed that, if the confined aquifer is 100 ft thick and the horizontal-to-vertical hydraulic-conductivity ratio is less than 21:1, then partial penetration effects are insignificant at distances greater than 700 ft from the pumped well. Wells MW1D, MW2D, and MW6D are greater than 700 ft from the pumped well. Horizontal-to-vertical hydraulic-conductivity ratios calculated by Weeks (1969, p. 213) for confined sand and gravel aquifers indicate that ratios less than 21:1 are realistic.

The hydraulic properties of the confined aquifer and confining unit were estimated using the Hantush and Jacob (1955) method for a leaky confined aquifer with no storage in the confining unit. Plots of drawdown in the confined aquifer (s) as a function of time (t) since the start of pumping, divided by the square of the radial distance (r) from the pumped well, were constructed on log-log graph paper and matched against the type curve (fig. 11). The match-point data represent the values of the four coordinate points--L(u,v), u, s, and t/r^2--obtained from the type curve and field-data curve at a point common to both curves when they are matched. The values for the confined aquifer transmissivity (T) and storativity (S), leakage through the confining unit (k'/b'), and confining-unit hydraulic conductivity (k') calculated using the Hantush and Jacob method, are presented in table 2. Because partial-penetration effects have significantly influenced the magnitude of the drawdown at well MW3D, the hydraulic properties of the confined aquifer and confining unit were not estimated with this data. Because partial-penetration effects may or may not have significantly influenced the drawdown data at well MW4D, the hydraulic properties of the confined aquifer and confining unit were estimated from the well MW4D data; those values are not included in the discussion. Because flow in the confining unit is assumed to be vertical, all estimates of confining-unit hydraulic conductivity made from the aquifer-test data are estimates of the vertical hydraulic conductivity of the confining unit.

Table 2.--Confined-aquifer transmissivity and storativity, leakage through the confining unit, and confining-unit hydraulic conductivity calculated using the Hantush and Jacob (1955) method

Well number	Transmissivity (foot squared per day)	Storativity	Leakage (foot per day per foot)	Confining unit hydraulic conductivity (foot per day)
MW1D	1.96×10^{4}	8.71×10^{-4}	7.84×10^{-4}	1.96×10^{-2}
MW2D	2.21×10^{4}	3.07×10^{-4}	3.93×10^{-4}	9.82×10^{-3}
MW4D[1]	1.77×10^{4}	2.64×10^{-4}	1.11×10^{-3}	2.78×10^{-2}
MW6D	2.52×10^{4}	2.10×10^{-4}	1.29×10^{-4}	3.22×10^{-3}

[1]Well in which partial penetration effects are assumed to be significant.

Calculated transmissivity of the confined aquifer ranged from 1.96×10^{4} to 2.52×10^{4} ft^2/d (feet squared per day). Estimated storativity of the confined aquifer ranged from 2.10×10^{-4} to 8.71×10^{-4}. Estimates for leakage through the confining unit ranged from 1.29×10^{-4} to 7.84×10^{-4} (ft/d)/ft (foot per day per foot).

In the Hantush and Jacob (1955) method, the hydraulic conductivity of a confining unit is equal to the rate of leakage through the confining unit multiplied by the thickness of the confining unit. If the confining unit is assumed to be 25 ft thick, the minimum thickness observed in the area, the calculated hydraulic conductivity of the confining unit ranged from 3.22×10^{-3} to 1.96×10^{-2} ft/d (feet per day).

A better estimate of the confined-aquifer and confining-unit properties was obtained when the aquifer-test data were analyzed using the Hantush (1960) method for a leaky confined aquifer with storage in the confining unit (fig. 12). Using equations modified from Javendel (1984, p. 73 and 75), transmissivity and storativity of the confined aquifer, and the product of the hydraulic conductivity of the confining unit and specific storage of the confining unit, were determined.

The product of the specific storage of the confining unit and the hydraulic conductivity of the confining unit is obtained from

$$k'Ss' = \{(\Delta)^2 TS\}, \qquad (1)$$

where

$$\Delta = (4B)/r, \qquad (2)$$

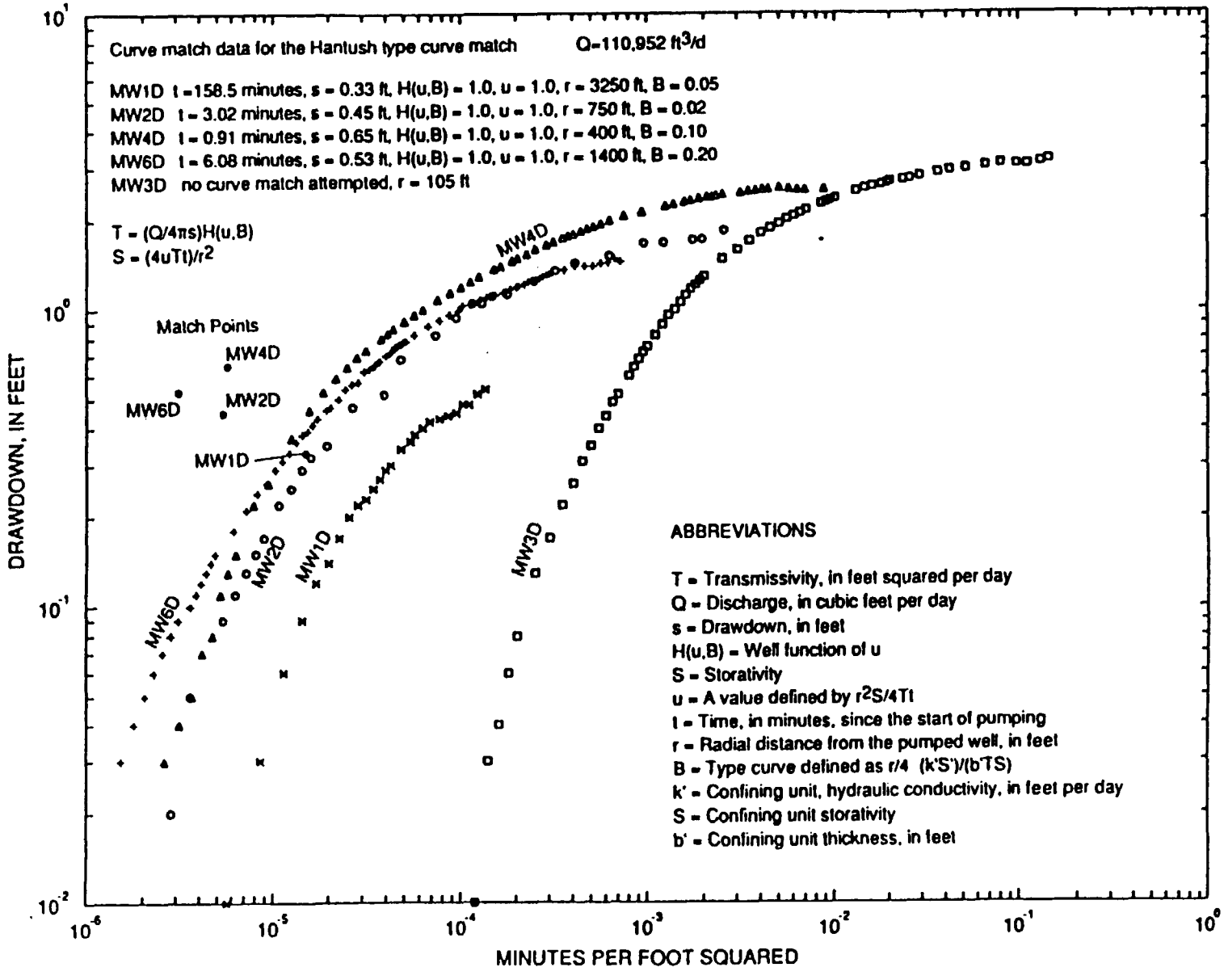


Figure 12.--Curve-match data for observation wells MW1D, MW2D, MW4D, and MW6D using the Hantush method.

and

k' is the hydraulic conductivity of the confining unit, in feet per day;

T is the transmissivity of the confined aquifer, in feet squared per day;

S is the storativity of the confined aquifer (dimensionless);

Ss' is the specific storage of the confining unit, in ft^{-1};

B is the value of the type-curve match (dimensionless); and

r is the radial distance of the observation well from the pumped well, in feet.

The results of the aquifer-test analysis using the Hantush (1960) method are presented in table 3.

Table 3.--Confined-aquifer transmissivity and storativity, and the product of the confining-unit hydraulic conductivity and specific storage determined from the Hantush (1960) method

Well number	Transmissivity (foot squared per day)	Storativity	Product of confining layer hydraulic conductivity and specific storage (per day)
MW1D	2.68×10^{4}	1.12×10^{-3}	1.14×10^{-7}
MW2D	1.96×10^{4}	2.93×10^{-4}	6.55×10^{-8}
MW4D[1]	1.36×10^{4}	2.14×10^{-4}	2.91×10^{-6}
MW6D	1.67×10^{4}	1.44×10^{-4}	7.84×10^{-7}

[1]Well in which partial-penetration effects are assumed to be significant.

Calculated transmissivity of the confined aquifer ranged from 1.67×10^{4} to 2.68×10^{4} ft^2/d, storativity of the confined aquifer ranged from 1.44×10^{-4} to 1.12×10^{-3}, and the product of k' and Ss' ranged from 6.55×10^{-8} to 7.84×10^{-7} day^{-1}. Transmissivity and storativity of the confined aquifer calculated by the Hantush (1960) method are in good agreement with the values calculated from the Hantush and Jacob (1955) method (table 2).

The aquifer-test data also were analyzed using the ratio method of Neuman and Witherspoon (1972). The ratio method relies primarily on drawdown data from a confining unit to determine the hydraulic properties of the confining unit. Because drawdown in the confining unit is not influenced by leakage from underlying deposits, the intermediate properties calculated using the ratio method is considered to be more accurate than those calculated from the Hantush and Jacob (1955) and Hantush (1960) methods.

The ratio method relies on a family of type curves constructed from a plot of the ratio of drawdown in a confining unit to the drawdown in a confined aquifer (s'/s) as a function of dimensionless time in the confining unit (t'D) at a given distance (r) from the pumped well and at a given time (t) (fig. 13). Each curve of s'/s as a function of t'D corresponds to a different value of dimensionless time in the confined aquifer (tD) where

$$tD = Tt/Sr^2, \tag{3}$$

and

$$t'D = (k't)/(Ss'z^2), \tag{4}$$

where

z is the vertical distance of any point in the confining unit above the confined aquifer, in feet.

The first step in using the ratio method was to obtain estimates of transmissivity (T) and storativity (S) that were representative of the confined aquifer. Values of $T = 2.00 \times 10^4$ ft^2/d and $S = 5.10 \times 10^{-4}$ were chosen. These values are slightly lower than the average values obtained from the Hantush (1960) method and provide conservative estimates of tD.

Once representative values of T and S were obtained, the value of tD was calculated using equation 3 for wells MW3D and MW6D at selected values of time (t) since the start of pumping. The value of tD at well MW3D ranged from 817 to 3,813 during the period when drawdown was measured in the wells open to the confining unit (table 4); tD at well MW6D ranged from 4.72 to 19.45 (table 5). When the data from wells MW3I and MW3D were analyzed, a tD of 1,000 was assumed to improve the curve match. When the data from wells MW6I and MW6D were analyzed, a tD of 10 was assumed to improve the curve match.

Once tD was determined, the value of s'/s at selected values of t was calculated from the data for wells MW3I, MW3D, MW6I, and MW6D (fig. 14 and tables 4 and 5). When s'/s was calculated from the MW3I and MW3D well data, it was assumed that partial penetration of the pumped well influenced the amount of drawdown in both wells to the same degree. Therefore, partial penetration of the pumped well did not affect the value of s'/s calculated from the MW3I and MW3D well data (E. P. Weeks, U.S. Geological Survey, oral commun., 1989). With the values of tD and s'/s known, t'D was found from the curve match (fig. 13 and tables 4 and 5).

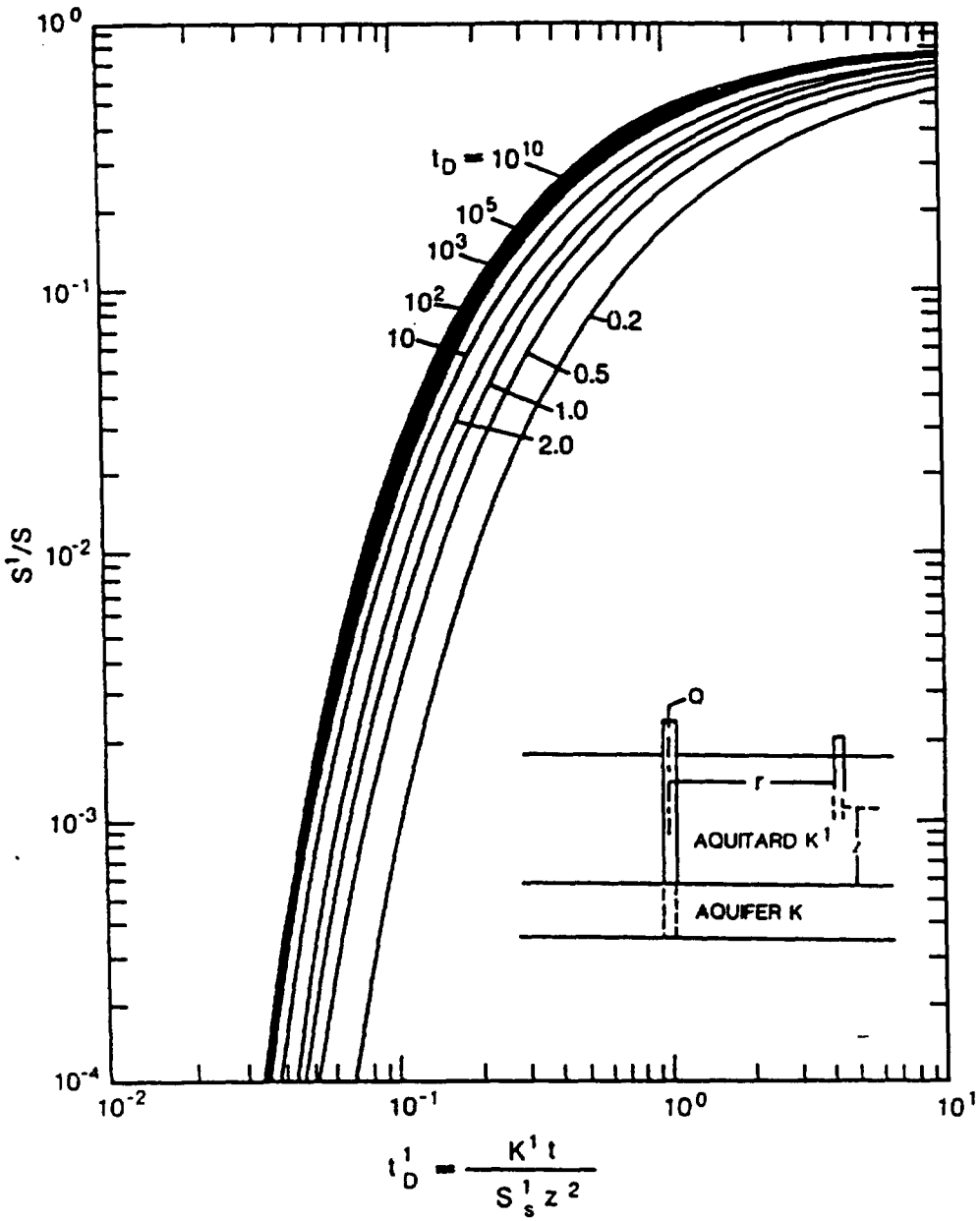


Figure 13.--The variation of s'/s with t'D for a semi-infinite confining unit (from Javendel, 1984, p. 81). Reprinted with permission of the National Water Well Association.

Table 4.--Calculated dimmensionless time in the aquifer (tD), ratio of drawdown in the confining unit to drawdown in the aquifer (s'/s), dimensionless time in the confining unit (t'D), and confining-unit diffusivity (a') from the data for wells MW3I and MW3D

[ft^2/d, feet squared per day]

Time (minutes)	tD	s'/s	t'D	a' (ft^2/d)
300	817	1.23×10^{-2}	0.09	62.21
400	1,089	3.73×10^{-2}	.12	62.21
500	1,362	5.43×10^{-2}	.14	58.06
600	1,632	8.00×10^{-2}	.18	62.21
700	1,906	1.09×10^{-1}	.23	68.13
800	2,179	1.34×10^{-1}	.26	67.39
900	2,451	1.54×10^{-1}	.29	66.82
1,000	2,723	1.77×10^{-1}	.33	68.43
1,100	2,996	2.00×10^{-1}	.35	65.99
1,200	3,268	2.23×10^{-1}	.42	72.58
1,400	3,813	2.79×10^{-1}	.52	77.02

Table 5.--Calculated dimensionless time in the aquifer (tD), ratio of drawdown in the confining unit to drawdown in the aquifer (s'/s), dimensionless time in the confining unit (t'D), and confining-unit diffusivity (a') from the data for wells MW6I and MW6D

[ft^2/d, feet squared per day]

Time (minutes)	tD	s'/s	t'D	a' (ft^2/d)
340	4.72	8.69×10^{-3}	0.09	54.89
400	5.56	1.46×10^{-2}	.10	51.84
500	6.95	2.80×10^{-2}	.14	58.06
600	8.34	3.79×10^{-2}	.15	51.84
700	9.73	4.74×10^{-2}	.17	50.36
800	11.12	5.18×10^{-2}	.18	46.66
900	12.50	5.92×10^{-2}	.19	43.78
1,100	15.72	7.41×10^{-2}	.21	39.59
1,400	19.45	8.15×10^{-2}	.22	32.58

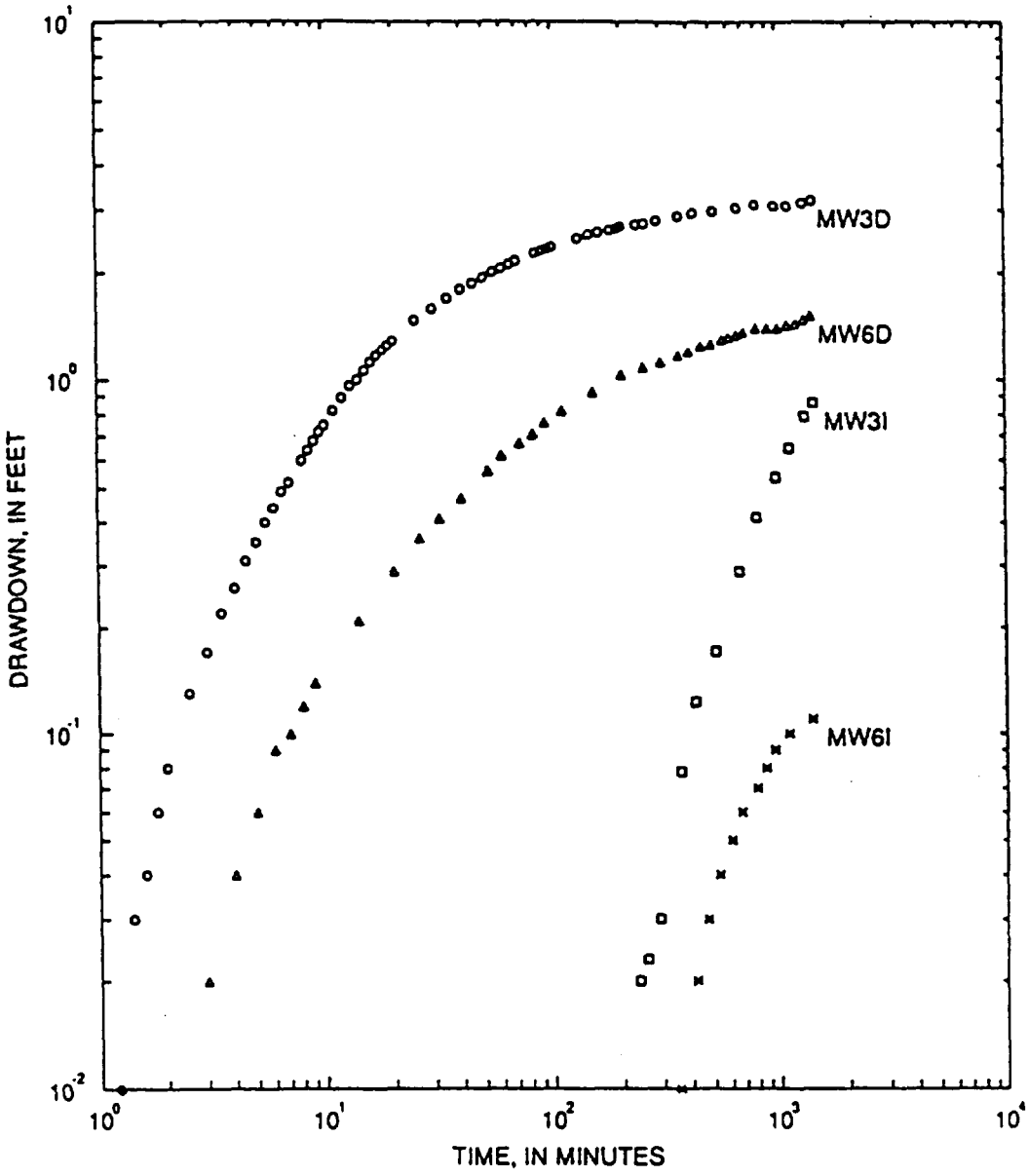


Figure 14.--Time-drawdown plots for observation wells MW3I, MW3D, MW6I, and MW6D during the aquifer test, December 17-18, 1987.

Knowing t'D, t, and z^2 (z = 12 ft, the maximum possible distance, based on the well and lithologic logs, from the base of the intermediate confining unit to the bottom of wells MW3I and MW6I), the confining-unit diffusivity (a') was calculated from the MW3I, MW3D, MW6I, and MW6D well data by solving the following equation:

$$a' = k'/Ss' = (t'Dz^2)/t. \qquad (5)$$

As table 4 indicates, the a' determined from the MW3I and MW3D well data is fairly consistent throughout the duration of the aquifer test. Diffusivity values calculated from the MW6I and MW6D well data are consistent for approximately the first 700 minutes of the test then decline steadily for the remainder of the test (table 5). Because the calculated values of a' decreased with increasing time at wells MW6S, 6I, and 6D, the value of a' calculated at t = 700 minutes was chosen as the representative value for the confining unit at each location. The values calculated at t = 700 minutes were chosen because the early time values are generally the most representative (Neuman and Witherspoon, 1972, p. 1294). At t = 700 minutes, the value of a' in the area of wells MW3S, 3I, and 3D was calculated to be 68.13 ft^2/d. The value of a' in the area of wells MW6S, 6I, and 6D at t = 700 minutes was estimated to be 50.36 ft^2/d.

Having obtained values for the product of the confining-unit hydraulic conductivity from the Hantush (1960) method and the quotient of the confining-unit hydraulic conductivity and specific storage from the Neuman and Witherspoon (1972) method, the value of the confining-unit hydraulic conductivity (k') can be calculated from

$$k'^2 = (k'/Ss')(k'Ss'). \qquad (6)$$

Using the data in table 3 for well MW6D, $k'Ss' = 7.84 \times 10^{-7}$ 1/d. Using the data in table 5 at t = 700 minutes, $a' = k'/Ss' = 50.36$ ft^2/d. Substituting these values and solving equation 6 gives a value of $k' = 6.28 \times 10^{-3}$ ft/d. This value is within the range of values for k' determined from the Hantush and Jacob (1955) method. This value also is within the range of laboratory-determined k' values of 2.27×10^{-3} ft/d and 1.13×10^{-1} ft/d for two samples from the intermediate confining unit (Douglas Yeskis, U.S. Environmental Protection Agency, written commun., 1988).

Hydraulic connection between the confining unit and the confined aquifer has been established by the aquifer test. Hydraulic connection between the unconfined aquifer and the confined aquifer has yet to be proven because water levels in wells MW3S, MW4S, and MW6S, open to the unconfined aquifer, showed no clearly defined response to pumping in the confined aquifer (fig. 10).

The most likely reasons for the lack of water-level response in the unconfined aquifer during the aquifer test are

1. The confined aquifer was not pumped long enough for the effects of pumping to be transmitted through the confining unit, or

2. the transmissivity and specific yield of the unconfined aquifer are high enough that the leakage induced by pumping in the confined aquifer was too slight to induce drawdown.

The time needed to induce drawdown in the unconfined aquifer because of pumping from the confined aquifer was calculated to determine which phenomena best explains the lack of water-level response in the unconfined aquifer.

The time required to induce drawdown at a given point in the confining unit can be estimated by solving equation 5 for t. At well MW3D, the confining unit is about 30 ft thick (fig. 3). If drawdown at the top of the confining unit at well MW3D is assumed to be 0.01 ft and drawdown in the confined aquifer is observed to be 3.0 ft (fig. 14), $s'/s = 3.33 \times 10^{-3}$ and $t'D = 6.00 \times 10^{-2}$ is obtained from the curve match (fig. 13). If $a' = 68.13$ ft^2/d, $t'D = 6.00 \times 10^{-2}$, and $z = 30$ ft, by solving equation 5 for t, it is estimated that it would take about 19 hours of pumping in the confined aquifer to produce 0.01 ft of drawdown at the top of the confining unit at well MW3D. At well MW6D, the confining unit is about 25 ft thick (fig. 3). If drawdown at the top of the confining unit at well MW6D is assumed to be 0.01 ft and drawdown in the confined aquifer is observed to be 1.35 ft (fig. 14), $s'/s = 7.14 \times 10^{-3}$ and $t'D = 0.08$ is obtained form the curve match (fig. 13). If $a' = 50.36$ ft^2/d, $t'D = 0.08$, and $z = 25$ ft, by solving equation 5 for t, it is estimated that it would take about 24 hours of pumping in the confined aquifer to produce 0.01 ft of drawdown at the top of the confining unit at well MW6D.

The calculations indicate that leakage from the unconfined aquifer was induced by pumping the confined aquifer during the aquifer test. This indicates that no drawdown was detected because the transmissivity and specific yield of the unconfined shallow aquifer are large compared to leakage. If leakage from the unconfined aquifer through the confining unit has, in fact, been induced by pumping in the confined aquifer, then any contaminants present in both the unconfined aquifer and the confining unit can flow into the confined aquifer.

SUMMARY AND CONCLUSIONS

Aquifer-test data in the vicinity of a landfill near Antioch, Illinois, were analyzed using three different techniques. The Hantush and Jacob (1955) method indicates that the calculated transmissivity of the confined aquifer ranged from 1.96×10^4 to 2.52×10^4 ft^2/d, the storativity of the confined aquifer ranged from 2.10×10^{-4} to 8.71×10^{-4}, the calculated leakage through the confining unit ranged between 1.29×10^{-4} and 7.84×10^{-3} (ft/d)/ft, and the hydraulic conductivity of the confining unit ranged from 3.22×10^{-4} to 1.96×10^{-2} ft/d. The Hantush (1960) method calculates similar values for aquifer transmissivity and storativity. The Neuman and Witherspoon (1972) ratio method indicates that the diffusivity of the confining unit ranges from 50.36 to 68.13 ft^2/d. The vertical hydraulic conductivity of the confining unit was calculated to be 6.28×10^{-3} ft/d using data obtained from both the Hantush and the Neuman and Witherspoon methods.

Aquifer-test data indicate that the confining unit is hydraulically connected to the confined aquifer. Although no clear evidence exists to prove that the unconfined aquifer is hydraulically connected to the confined aquifer, it is calculated that the unconfined aquifer became hydraulically connected to the confined aquifer within 24 hours after pumping began in the confined aquifer.

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C

APPENDIX C

TEST PIT LOGS

Test Pit 1

A- 0 to 2 inches; very dark gray (10YR 3/1) silt loam (ML); moderate fine granular structure; many fine roots; clear smooth boundary.

B- 2 to 12 inches; light brownish gray (10YR 6/2) clay (CL); weak coarse angular blocky structure; many fine roots; clear wavy boundary.

C- 12 to 24 inches; gray (10YR 5/1) silty clay (CL); weak very coarse angular blocky structure; few fine roots; clear wavy boundary.

D- 24 to 31 inches; gray (10YR 5/1) silty clay (CL); massive structure; no roots; abrupt wavy boundary.

E- 31 to 43 inches; gray (10YR 5/1) and brownish yellow (10YR 6/6) silt loam (ML); few fine distinct mottles; structureless; few fine roots; clear wavy boundary.

F- 43 to 50 inches; very dark gray (10YR 3/1) loam (ML); weak medium angular blocky structure; no roots; abrupt wavy boundary.

G- 50 to 53 inches; white chalky material with pottery fragments; abrupt wavy boundary.

H- 53 to 80 inches; dark brown grading to black clay loam (ML); structureless; abrupt wavy boundary.

REFUSE 80+ inches

Vegetative cover-100 percent, grasses
Root penetration-24 inches
No fissures or deformities

Test Pit 2

A- 0 to 14 inches; black (10YR 2/1) silty clay loam (ML-CL); moderate fine granular structure; many fine roots; clear wavy boundary.

B- 14 to 23 inches; gray (10YR 5/1) and yellowish brown (10YR 5/6) silty clay (CL); weak medium angular blocky structure; common fine roots; clear wavy boundary.

C- 23 to 34 inches; gray (10YR 5/1) and yellowish brown (10YR 5/6) silty clay (CL); no structure; few fine roots; clear wavy boundary.

D- 34 to 40 inches; brownish yellow (10YR 6/6) loam (ML); few fine distinct gray (10YR 6/1) and yellowish red (5YR 5/8) mottles; massive structure; no roots; clear wavy boundary.

E- 40 to 50 inches; very dark gray (10YR 3/1) loam (ML); no structure; common fine roots; clear wavy boundary.

F- 50 to 70 inches; gray (10YR 5/1) silt loam (ML); massive structure; no roots; abrupt wavy boundary.

REFUSE 70+ inches

Vegetative cover-100 percent, grasses
Root penetration-34 inches
No fissures or deformities

Test Pit 3

A- 0 to 8 inches; very dark gray (5Y 3/1) silty clay loam (ML-MC); structureless; many fine roots; clear wavy boundary.

B- 8 to 15 inches; very dark gray (10YR 3/1) loam (ML); moderate fine granular structure; many fine roots; clear wavy boundary.

C- 15 to 26 inches; gray (10YR 5/1) clay loam (MC-ML) and clay (CL); moderate and weak medium platy structure; common fine roots; clear wavy boundary.

D- 26 to 36 inches; gray (10YR 5/1) and yellowish brown (10YR 5/6) clay (CL); structureless; no roots; clear wavy boundary.

E- 36 to 43 inches; very dark gray (10YR 3/1) silt loam (ML); weak fine granular structure; common fine roots; clear wavy boundary.

F- 43 to 56 inches; pale brown (10YR 6/3) clay (CL) with many medium distinct gray (10YR 5/1) mottles; massive structure; no roots; abrupt wavy boundary.

G- 56 to 87 inches; black (10YR 2/1) silt loam (ML); structureless; no roots; abrupt wavy boundary.

REFUSE 87+ inches.

Vegetative cover- 50 to 100 percent; grasses, Queen Anne's Lace
Root penetration-26 inches
No fissures or deformities

Test Pit 4

A- 0 to 3 inches; very dark gray (10YR 3/1) silt loam (ML); moderate fine granular structure; common fine roots; gradual wavy boundary.

B- 3 to 17 inches; brown (10YR 5/3) silt loam (ML) and silty clay loam (ML-CL); common medium distinct yellowish brown (10YR 5/6) and gray (10YR 5/1) mottles; weak and moderate, fine and medium, angular blocky structure; few fine roots; gradual wavy boundary.

C- 17 to 30 inches; gray (10YR 5/1) silty clay (CL); few fine distinct yellowish red (5YR 5/8) mottles; weak very coarse angular blocky structure; few fine roots; common distinct brown (10YR 5/3) clay films on faces of peds; gradual wavy boundary.

D- 30 to 41 inches; gray (10YR 5/1) and brown (10YR 5/3) silty clay (CL); few fine yellowish brown (10YR 5/6) mottles; weak coarse angular blocky structure; common fine roots; gradual wavy boundary; about 3 percent gravel.

E- 41 to 55 inches; gray (10YR 5/1) and brown (10YR 5/3) silty clay (CL); few fine yellowish brown (10YR 5/6) mottles; structureless; no roots; clear wavy boundary; about 3 percent gravel.

F- 55 to 62 inches; black (10YR 2/1) silt loam (ML), structureless, no roots; abrupt wavy boundary.

REFUSE 62+ inches

Vegetative cover-100 percent, grasses
Root penetration-41 inches
No fissures or deformities

Test Pit 5

A- 0 to 8 inches; dark gray (10YR 4/1) silt loam (ML); moderate fine granular structure; many fine roots; clear smooth boundary.

B - 8 to 17 inches; gray (10YR 5/1) silty clay (CL); moderate medium angular blocky and strong fine angular blocky structure; common fine roots; clear wavy boundary.

C- 17 to 20 inches; brown (10YR 5/3) and gray (10YR 5/1) silty clay (CL); weak fine and medium angular blocky structure; few fine roots; clear wavy boundary.

D- 20 to 26 inches; gray (10YR 5/1) silt loam (ML); weak medium blocky structure; few fine roots; about 3 percent coarse sand particles; gradual wavy boundary.

E- 26 to 31 inches; gray (10YR 5/1) silt loam (ML); weak medium platy structure few fine roots; common distinct yellowish brown (10YR 5/6) clay films on faces of peds; clear wavy boundary.

F- 31 to 40 inches; very dark gray (10YR 3/1) loam (ML); structureless; no roots; abrupt wavy boundary.

G- 40 to 49 inches; white chalky material with pottery fragments; abrupt wavy boundary.

REFUSE 49+ inches.

Vegetative cover-75 percent, grasses
Root penetration-31 inches
No fissures or deformities

Test Pit 6

A- 0 to 7 inches; very dark gray (7.5YR 3/1) loam (ML); moderate fine granular structure; common fine roots; clear wavy boundary.

B- 7 to 20 inches; brown (10YR 5/3) and gray (10YR 5/1) clay loam (ML-CL); few medium distinct reddish yellow (7.5YR 6/6) mottles; weak fine subangular blocky structure; few fine roots; clear wavy boundary.

C- 20 to 41 inches; light yellowish brown (10YR 6/4) silty clay loam (ML-CL); few medium faint brownish yellow (10YR 6/6) and few medium distinct light gray (10YR 7/1) mottles; weak fine and medium subangular blocky structure; no roots; clear wavy boundary.

D- 41 to 65 inches; gray (10YR 5/1) silty clay (CL); weak and moderate medium and coarse angular blocky structure; no roots; abrupt wavy boundary.

REFUSE 65+ inches.

Vegetative cover-5 to 75 percent; grasses, clover, chicory, Queen Anne's Lace
Root penetration-20 inches
No fissures or deformities

Test Pit 7

A- 0 to 8 inches; black (2.5Y 2.5/1) silt loam (ML); moderate fine granular structure; common fine roots; abrupt wavy boundary.

B- 8 to 35 inches; brown (10YR 4/3) clay loam (ML-CL); few medium faint strong brown (7.5YR 5/6) and many coarse distinct gray (7.5YR 5/1) mottles; moderate medium subangular blocky structure; few fine roots; clear wavy boundary.

C- 35 to 47 inches; brown (10YR 5/3) clay (CL); common medium distinct strong brown (7.5YR 5/6) mottles; massive structure; no roots; clear wavy boundary.

D- 47 to 56 inches; light yellowish brown (2.5Y 6/4) and gray (7.5YR 6/1) silt loam (ML); massive structure; no roots; clear wavy boundary.

E- 56 to 60 inches; black (N2.5/)clay (CL); common coarse distinct strong brown (7.5YR 5/6) mottles; massive structure; no roots; abrupt wavy boundary.

REFUSE 60+ inches.

Vegetative cover-100 percent, grasses
Root penetration-35 inches
No fissures or deformities

Test Pit 8

A- 0 to 10 inches; black (10YR 2/1) silt loam (ML); moderate fine granular structure; common fine roots; clear wavy boundary.

B- 10 to 33 inches; stratified brown and dark grayish brown sand (SP), loam (ML), sandy loam (SM), silty clay (CL), and clay (CL); moderate medium angular blocky and moderate fine granular structure; few fine roots; clear wavy boundary.

C- 33 to 56 inches; yellow (2.5Y 7/6) and light gray (2.5Y 7/1) clay (CL), silty clay (CL), and silty clay loam (ML-CL); structureless; no roots; common distinct brownish yellow (10YR 6/6) clay films on faces of peds; clear wavy boundary.

D- 56 to 82 inches; gray (10YR 5/1) silty clay (CL); massive structure; no roots; abrupt wavy boundary.

REFUSE 82+ inches.

Vegetative cover-100 percent, grasses
Root penetration-33 inches
No fissures or deformities

Test Pit 9

A- 0 to 6 inches; very dark gray (10YR 3/1) loam (ML); moderate fine granular structure; common fine roots; clear wavy boundary.

B- 6 to 14 inches; yellowish brown (10YR 5/6) loamy sand (SM); weak medium angular blocky structure; few fine roots; clear wavy boundary.

C- 14 to 21 inches; gray (10YR 5/1) silty clay (CL); strong small and medium angular blocky structure; few fine roots; common faint dark yellowish brown (10YR 4/4) clay films on faces of peds; gradual wavy boundary.

D- 21 to 29 inches; gray (10YR 5/1) silty clay (CL); strong medium angular blocky structure; no roots; common faint dark yellowish brown (10YR 4/4 clay films on faces of peds; about 3 percent gravel; clear wavy boundary.

E- 29 to 84 inches; gray (10YR 5/1) silty clay (CL); massive structure; no roots; about 3 percent gravel; abrupt wavy boundary.

REFUSE 84+ inches.

Vegetative cover-100 percent, grasses
Root penetration-21 inches
No fissures or deformities

Test Pit 10

A- 0-9 inches; black (10YR 2/1) silt loam (ML); moderate fine granular structure; many fine roots; clear wavy boundary.

B- 9 to 22 inches; gray (10YR 5/1) silty clay (CL); few medium faint brownish yellow (10YR 6/6) mottles; moderate medium angular blocky structure; few fine roots; gradual wavy boundary.

C- 22 to 30 inches; gray (10YR 5/1) silty clay (CL); few medium faint brownish yellow (10YR 6/6) mottles; weak medium columnar structure; few fine roots; common faint brown (10YR 5/3) clay films on faces of peds; clear wavy boundary.

D- 30 to 62 inches; gray (10YR 5/1) silty clay (CL); massive structure; no roots; common faint light brownish gray (10YR 6/2) clay films on faces of peds; abrupt wavy boundary.

REFUSE 62+ inches.

Vegetative cover-100 percent; grasses, Queen Anne's Lace
Root penetration-30 inches
No fissures or deformities

CCH/rcs/jrs/DAP
[chi 804 25]

D

APPENDIX D

RESULTS OF LANDFILL CAP EVALUATION

Western Atlas International
A Litton/Dresser Company

CORE LABORATORIES

Warzyn, Inc.
HUD Landfill

Table 1
X-ray Diffraction Analysis

File: 193113

Sample ID	Relative Abundance/ Net Clay (weight %)	Illite	Kaolinite	Fe-chlorite	Illite/smectite	Chlorite/smectite
HD-SCPT1-28"	Relative Abundance	84	2	14	0	0
	34	28	1	5	0	0
HD-SCPT3-32"	Relative Abundance	47	1	3	49	0
	34	16	tr	1	17	0
HD-SCPT4-50"	Relative Abundance	64	1	6	29	0
	37	24	tr	2	11	0
HD-SCPT6-52"	Relative Abundance	83	2	15	0	0
	34	28	1	5	0	0
HD-SCPT8-70"	Relative Abundance	84	2	14	0	0
	31	26	1	4	0	0
HD-SCPT9-50"	Relative Abundance	81	2	17	0	0
	34	27	1	6	0	0

% smectite in mixed-layer illite/smectite is 60%

ANALYTICAL PROCEDURES

A sample selected for X-ray diffraction analysis is dried and cleaned of obvious contaminants. The sample is dried, weighed, placed in water, and treated with a sonic probe for 5 minutes. The resultant slurry is centrifuged to fractionate the sample at 4 microns. The >4 micron fraction is dried and weighed to determine the percent of clay- and silt-sized material. The suspended <4 micron fraction is suctioned onto a pure silver substrate to orient the clay mineral particles. The <4 micron sample mount is run in an air-dried state and then treated with ethylene glycol vapor for 24 hours and run again. The diffractograms are then analyzed for mineral content using a profile-fitting algorithm. The integrated areas from the profile-fitting algorithm are entered into a spreadsheet which contains correction coefficients for numerous minerals. These coefficients were obtained according to the adiabatic method outlined by Chung (1974). Tabular data are reported in weight percent format.

Reference

Chung, F.H. (1974) Quantitative interpretation of X-ray diffraction patterns of mixtures. II. Adiabatic principle of X-ray diffraction analysis of mixtures. Journal of Applied Crystallography, 7, 526-531.

APPENDIX D-1

GEOTECHNICAL ANALYTICAL RESULTS

WARZYN

MADISON
ONE SCIENCE COURT
P.O. BOX 5385
MADISON, WI 53705
(608) 231-4747
FAX (608) 231-4777

LABORATORY RESULTS

Project: HOD

Project #: 10010201

Location: Antioch, Illinois

Sample Number	Location	Dry Unit Weight lb/cu ft
6979-0001	HD-SCTP1-18	115.5
6979-0002	HD-SCTP2-25	109.3
6979-0003	HD-SCTP5-22	117.7
6979-0004	HD-SCTP6-39	116.4
6979-0005	HD-SCTP8-58	128.3
6979-0006	HD-SCTP10-43	121.9

Ck'd: KJ **App'd:** [illegible]
Date Issued: 7/23/93

[vet-soils-97]
10010201-lab

SEP-23-'93 13:16 ID:WARZYN INC TEL NO:608/273-2813 #793 P02

Job No. 100102
Date: 07/16/93

FALLING HEAD PERMEABILITY TEST

Warzyn Inc., 1 Science Court, Madison, WI 53711 Phone: (608) 231-6955 or 231-4747

PROJECT	H.O.D. LANDFILL RI/FS
LOCATION	Antioch, Illinois
SAMPLE	HD-SCTP3-26
DEPTH (ft)	
SOIL DESCRIPTION (a)	Gray-Brown Lean CLAY, Some Sand, Little Gravel (CL)
SAMPLE DIAMETER (cm)	7.4
SAMPLE AREA, A (cm^2)	42.6

	INITIAL	FINAL
SAMPLE LENGTH, L (cm)	17.6	17.6
MOISTURE CONTENT, %	16.2	16.3
DRY DENSITY (lb/cu ft)	112.7	112.8
PERCENT COMPACTION	-	-

RUN	COEFFICIENT OF PERMEABILITY, k (cm/sec)
1	1.7E-08
2	1.1E-08
3	1.2E-08
4	1.4E-08
5	1.2E-08
6	1.1E-08
7	9.9E-09
8	9.6E-09
9	9.9E-09
10	9.1E-09
11	8.4E-09

AVERAGE COEFFICIENT OF PERMEABILITY = 9.3E-09 cm/sec
(Based on run numbers 3 through 11)

FORMULA: $k = \frac{2.3a}{At} \log_{10} \frac{h_0}{h_1}$, Where a = cross-sectional area of standpipe,
t = time for water level to fall from initial height, h_0, to final height, h_1
(All other terms are defined above)

FOOTNOTES: (a) Visual Soil Description.

REMARKS: This permeability test was performed on a relatively undisturbed 3-inch diameter Shelby tube sample.

CHECKED BY: CLS DATE: 7-16-93 APPROVED BY: VSR DATE: 7.22.93

Job No. 100102
Date: 07/16/93

FALLING HEAD PERMEABILITY TEST

Warzyn Inc., 1 Science Court, Madison, WI 53711 Phone: (608) 231-6955 or 231-4747

PROJECT	H.O.D. LANDFILL RI/FS
LOCATION	Antioch, Illinois
SAMPLE	HD-SCTP4-30
DEPTH (ft)	
SOIL DESCRIPTION (a)	Gray-Brown Lean CLAY, Some Sand, Trace Gravel (CL)
SAMPLE DIAMETER (cm)	7.4
SAMPLE AREA, A(cm²)	42.6

	INITIAL	FINAL
SAMPLE LENGTH, L(cm)	18.5	18.5
MOISTURE CONTENT, %	17.6	19.9
DRY DENSITY (lb/cu ft)	105.7	105.8
PERCENT COMPACTION	-	-

RUN	COEFFICIENT OF PERMEABILITY, k(cm/sec)
1	3.2E-08
2	2.1E-08
3	1.2E-08
4	1.7E-08
5	1.6E-08
6	1.5E-08
7	1.6E-08
8	1.6E-08
9	1.5E-08
10	1.2E-08

AVERAGE COEFFICIENT OF PERMEABILITY = 1.4E-08 cm/sec
(Based on run numbers 6 through 10)

FORMULA: $k = \frac{2.3aL}{At} \log_{10} \frac{h_0}{h_1}$, Where a = cross-sectional area of standpipe,
t = time for water level to fall from initial height, h_0, to final height, h_1
(All other terms are defined above)

FOOTNOTES: (a) Visual Soil Description.

REMARKS: This permeability test was performed on a relatively undisturbed 3-inch diameter Shelby tube sample.

CHECKED BY: CLS DATE: 7-16-93 APPROVED BY: VJR DATE: 7.22.93

Job No. 100102
Date: 07/16/93

FALLING HEAD PERMEABILITY TEST

Warzyn Inc., 1 Science Court, Madison, WI 53711 Phone: (608) 231-6955 or 231-4747

PROJECT	H.O.D. LANDFILL RI/FS
LOCATION	Antioch, Illinois
SAMPLE	HD-SC1P7-35
DEPTH (ft)	
SOIL DESCRIPTION (a)	Brown Lean CLAY, Some Sand, Trace Gravel (CL)
SAMPLE DIAMETER (cm)	7.4
SAMPLE AREA, A(cm²)	42.6

	INITIAL	FINAL
SAMPLE LENGTH, L(cm)	18.3	18.3
MOISTURE CONTENT, %	18.6	18.7
DRY DENSITY (lb/cu ft)	108.2	108.4
PERCENT COMPACTION	-	-

RUN	COEFFICIENT OF PERMEABILITY, k(cm/sec)
1	4.5E-08
2	4.6E-08
3	4.5E-08
4	4.1E-08
5	4.0E-08
6	3.9E-08
7	4.2E-08
8	3.6E-08
9	3.6E-08
10	3.6E-08

AVERAGE COEFFICIENT OF PERMEABILITY = 3.7E-08 cm/sec
(Based on run numbers 8 through 10)

FORMULA: $k = \frac{2.3aL}{At} \log_{10} \frac{h_0}{h_1}$, Where a = cross-sectional area of standpipe,
t = time for water level to fall from initial height, h_0, to final height, h_1
(All other terms are defined above)

FOOTNOTES: (a) Visual Soil Description. Bottom 2" of sample - Gray Lean CLAY, Trace Sand (CL)

REMARKS: This permeability test was performed on a relatively undisturbed 3-inch diameter Shelby tube sample.

CHECKED BY: CLS DATE: 7-16-93 APPROVED BY: VJR DATE: 7.22.93

Job No. 100102
Date: 07/16/93

FALLING HEAD PERMEABILITY TEST

Warzyn Inc., 1 Science Court, Madison, WI 53711 Phone: (608) 231-6955 or 231-4747

PROJECT	H.O.D. LANDFILL RI/FS
LOCATION	Antioch, Illinois
SAMPLE	HD-SCTP9-29
DEPTH (ft)	
SOIL DESCRIPTION	Gray Lean CLAY, Trace Sand and Gravel (CL)
SAMPLE DIAMETER (cm)	7.4
SAMPLE AREA, A(cm²)	42.6

	INITIAL	FINAL
SAMPLE LENGTH, L(cm)	18.2	18.2
MOISTURE CONTENT, %	14.5	15.1
DRY DENSITY (lb/cu ft)	114.7	114.9
PERCENT COMPACTION	-	-

RUN	COEFFICIENT OF PERMEABILITY, k(cm/sec)
1	1.0E-07
2	4.0E-08
3	3.7E-08
4	3.1E-08
5	3.2E-08
6	2.9E-08
7	3.1E-08
8	3.0E-08
9	3.0E-08
10	3.0E-08

AVERAGE COEFFICIENT OF PERMEABILITY = 3.0E-08 cm/sec
(Based on run numbers 8 through 10)

FORMULA: $k = \frac{2.3aL}{At} \log_{10} \frac{h_0}{h_1}$, where a = cross-sectional area of standpipe,
t = time for water level to fall from initial height, h_0, to final height, h_1
(All other terms are defined above)

REMARKS: This permeability test was performed on a relatively undisturbed 3-inch diameter Shelby tube sample.

CHECKED BY: CLS DATE: 7-16-93 APPROVED BY: VJR DATE: 7-22-93

WARZYN

MOISTURE - DENSITY CURVE

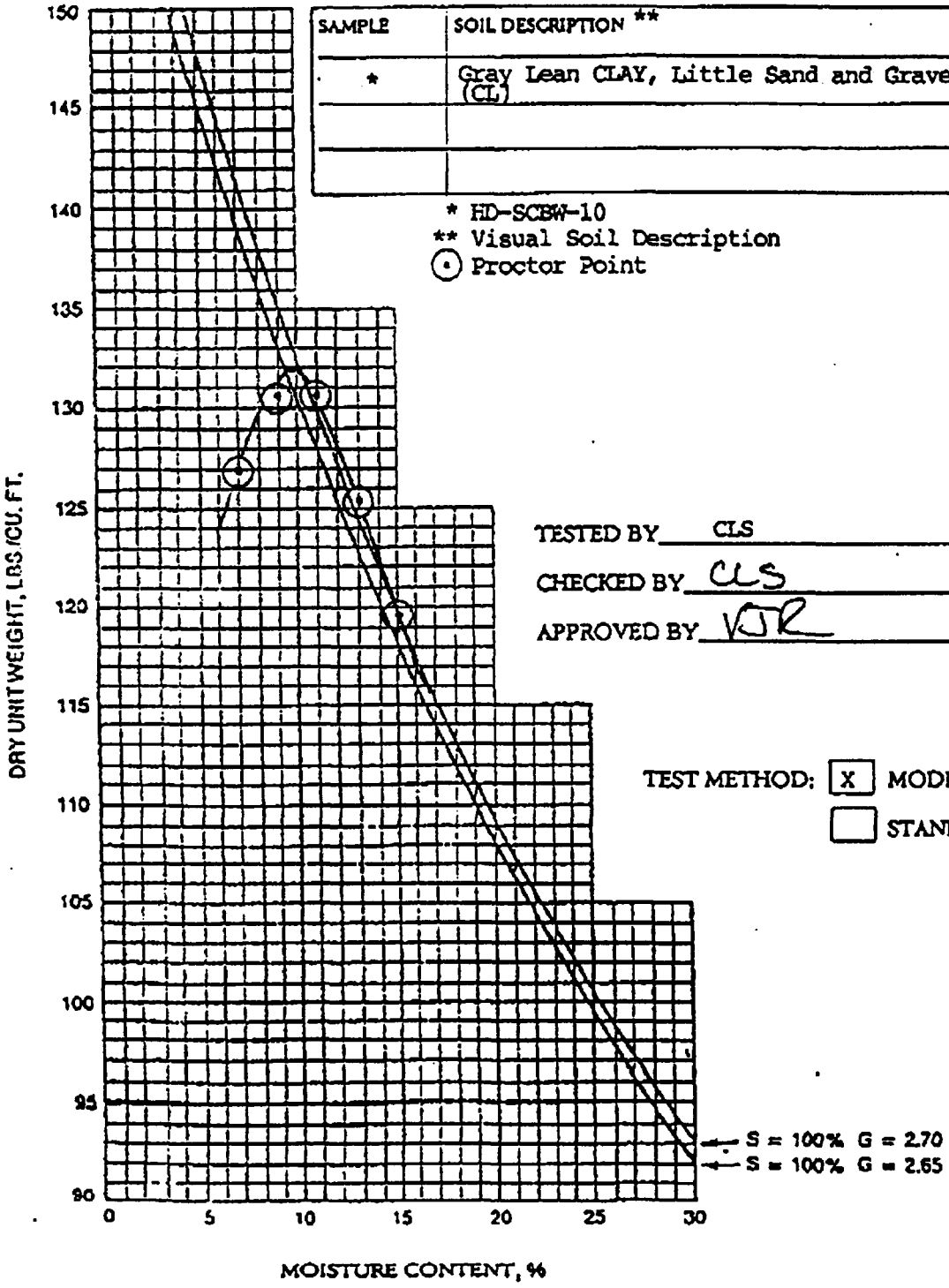
PROJECT: H.O.D. LANDFILL RI/FS LOCATION Antioch, Illinois

FDT REPORT No. _____ JOB No. 10010201 DATE: 7/16/93

SHEET 1 of 4

SAMPLE	SOIL DESCRIPTION **	MAXIMUM DENSITY	OPTIMUM MOISTURE
*	Gray Lean CLAY, Little Sand and Gravel (CL)	132 pcf	10 %

* HD-SCBW-10
** Visual Soil Description
⊙ Proctor Point



TESTED BY CLS

CHECKED BY CLS

APPROVED BY VJR

TEST METHOD: [X] MODIFIED PROCTOR

[ ] STANDARD PROCTOR

WARZYN

MOISTURE - DENSITY CURVE

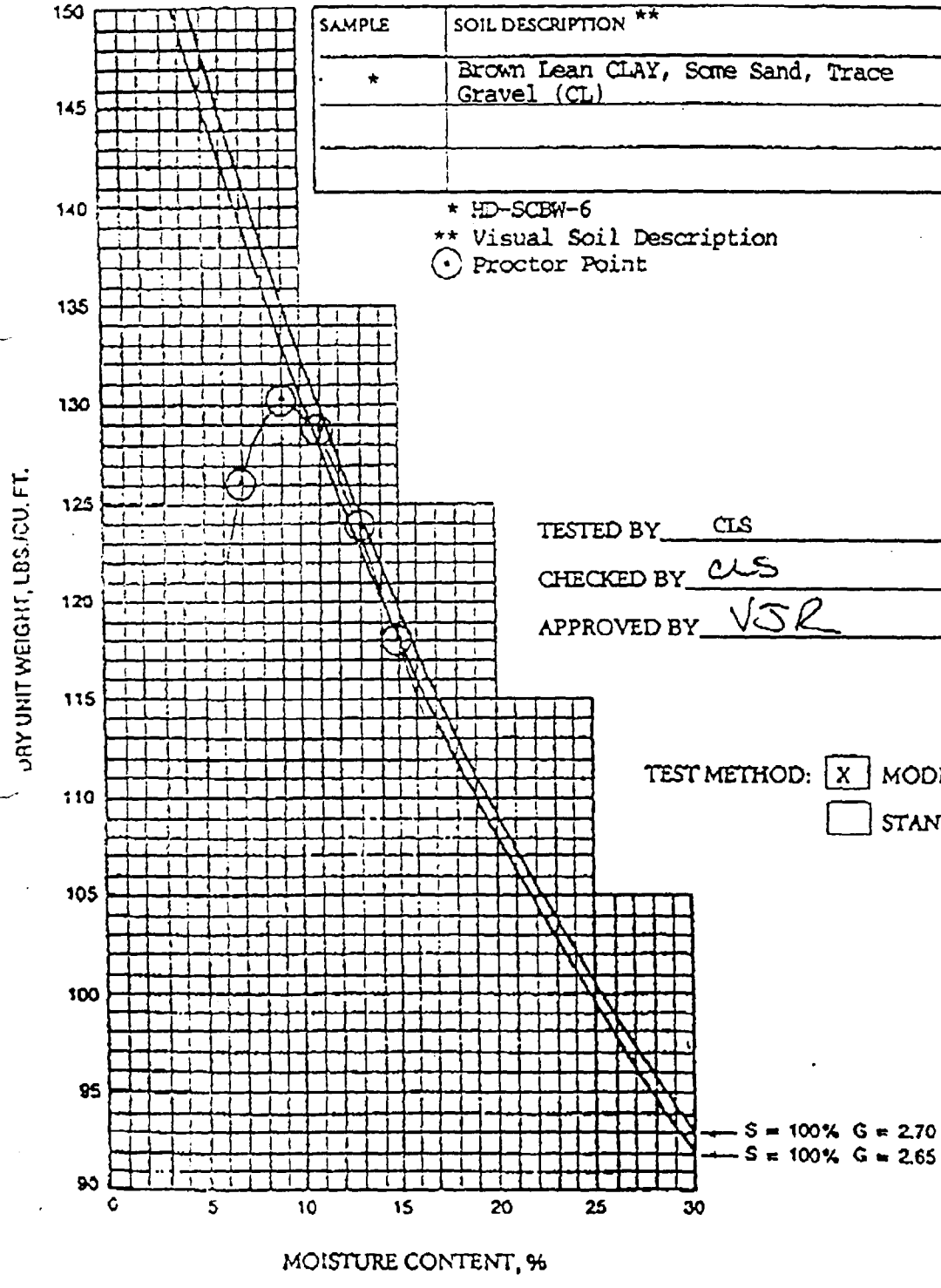
PROJECT: H.O.D. LANDFILL RI/FS LOCATION Antioch, Illinois

FDT REPORT No. _____ JOB No. 10010201 DATE: 7/16/93

SHEET 2 of 4

SAMPLE	SOIL DESCRIPTION **	MAXIMUM DENSITY	OPTIMUM MOISTURE
*	Brown Lean CLAY, Some Sand, Trace Gravel (CL)	130 pcf	9 %

* HD-SCBW-6
** Visual Soil Description
⊙ Proctor Point



TESTED BY CLS

CHECKED BY CLS

APPROVED BY VJR

TEST METHOD: [X] MODIFIED PROCTOR

[ ] STANDARD PROCTOR

WARZYN

MOISTURE - DENSITY CURVE

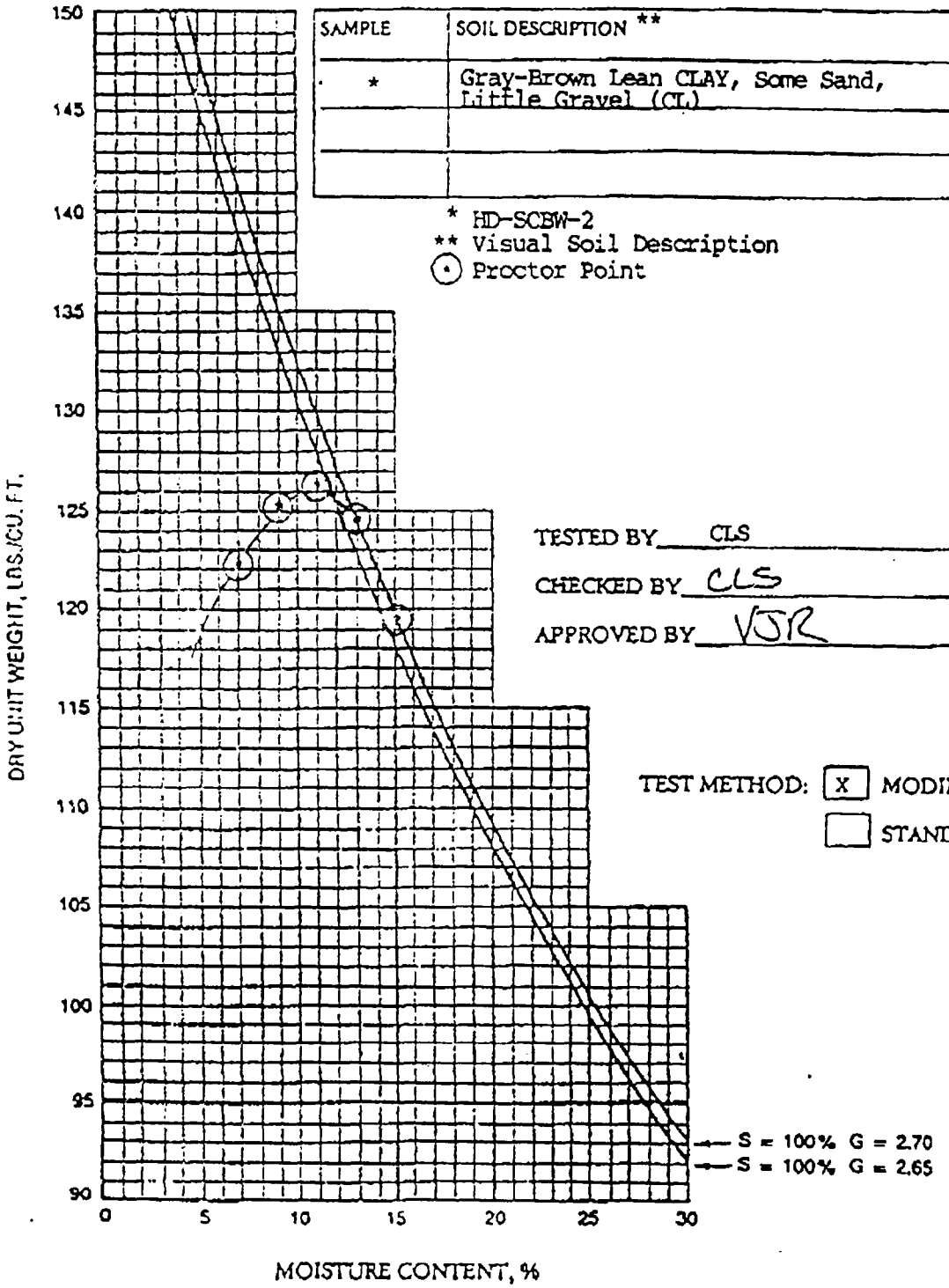
PROJECT: H.O.D. LANDFILL RI/FS LOCATION Antioch, Illinois

FDT REPORT No. _____ JOB No. 10010201 DATE: 7/16/93

SHEET 3 of 4

SAMPLE	SOIL DESCRIPTION **	MAXIMUM DENSITY	OPTIMUM MOISTURE
*	Gray-Brown Lean CLAY, Some Sand, Little Gravel (CL)	126 pcf	11 %

* HD-SCBW-2
** Visual Soil Description
⊙ Proctor Point



TESTED BY CLS

CHECKED BY CLS

APPROVED BY VJR

TEST METHOD: [X] MODIFIED PROCTOR

[ ] STANDARD PROCTOR

WARZYN

MOISTURE - DENSITY CURVE

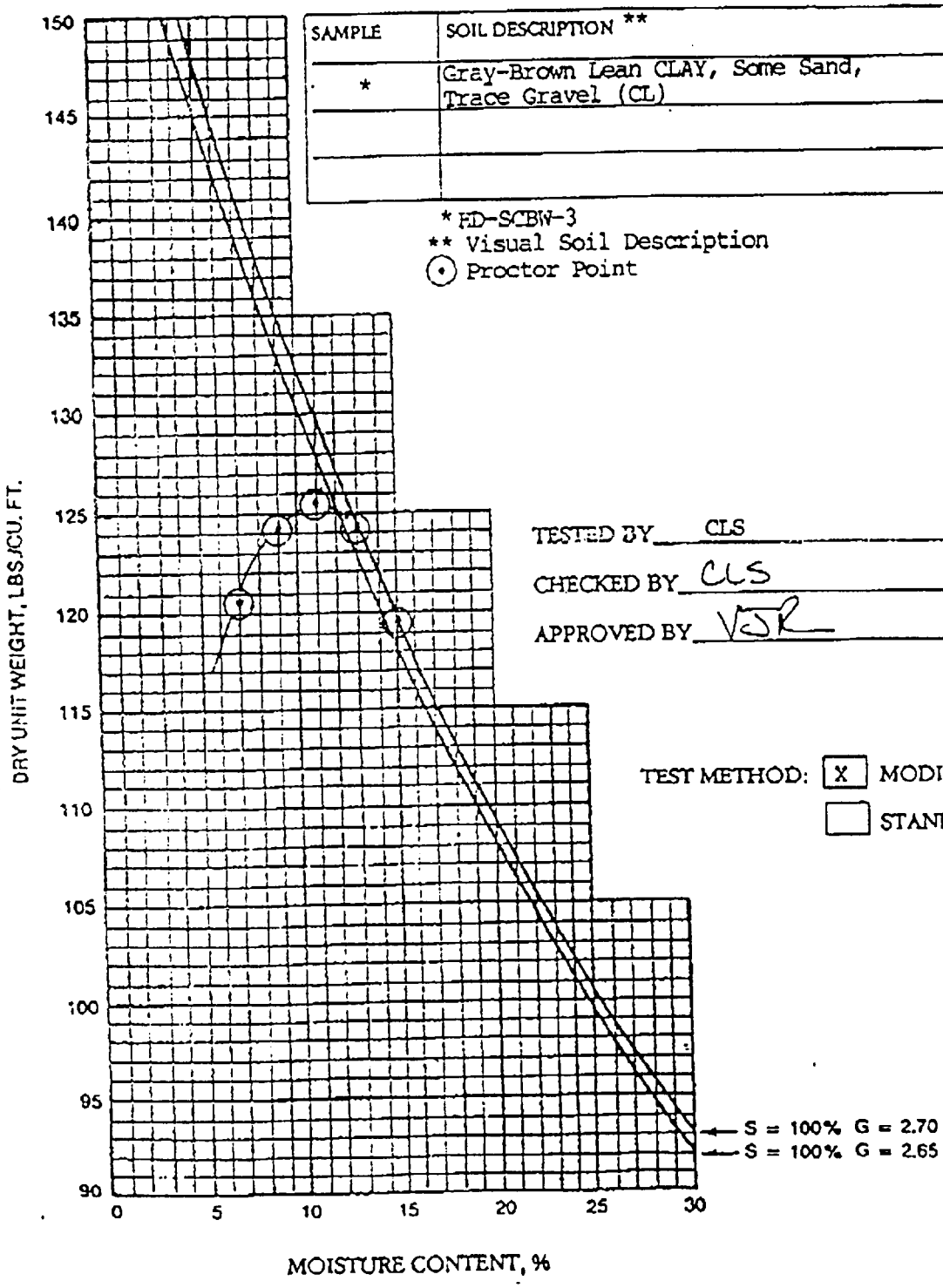
PROJECT: H.O.D. LANDFILL RI/FS LOCATION Antioch, Illinois

FDT REPORT No. _____ JOB No. 10010201 DATE: 7/16/93

SHEET 4 of 4

SAMPLE	SOIL DESCRIPTION **	MAXIMUM DENSITY	OPTIMUM MOISTURE
*	Gray-Brown Lean CLAY, Some Sand, Trace Gravel (CL)	126 pcf	11 %

* HD-SCBW-3
** Visual Soil Description
⊙ Proctor Point



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TEST METHOD: [X] MODIFIED PROCTOR

[ ] STANDARD PROCTOR

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MADISON
ONE SCIENCE COURT
P.O. BOX 5385
MADISON, WI 53705
(608) 231-4747
FAX (608) 231-4777

LABORATORY RESULTS

Project: HOD Landfill

Project #: 10010201

Location: Antioch, Illinois

Sample Number	Description	Natural Moisture
6838-0001	HD-SCTP1-28"	18.7
6838-0002	HD-SCTP2-38"	14.3
6838-0003	HD-SCTP3-32"	19.4
6838-0004	HD-SCTP4-50"	17.6
6838-0006	HD-SCTP6-52"	18.2
6838-0007	HD-SCTP5-19"	13.7
6838-0009	HD-SCTP8-70"	14.8
6838-0010	HD-SCTP9-50"	33.6
6838-0011	HD-SCTP10-45"	16.1
6838-0012	HD-SCTP10-45"-91	15.6
6838-0013	HD-SCTP7-20"	23.8

Ck'd: JMB **App'd:** DTL
Date Issued: 6-25-93

[var-soils-003]
10010201-lab

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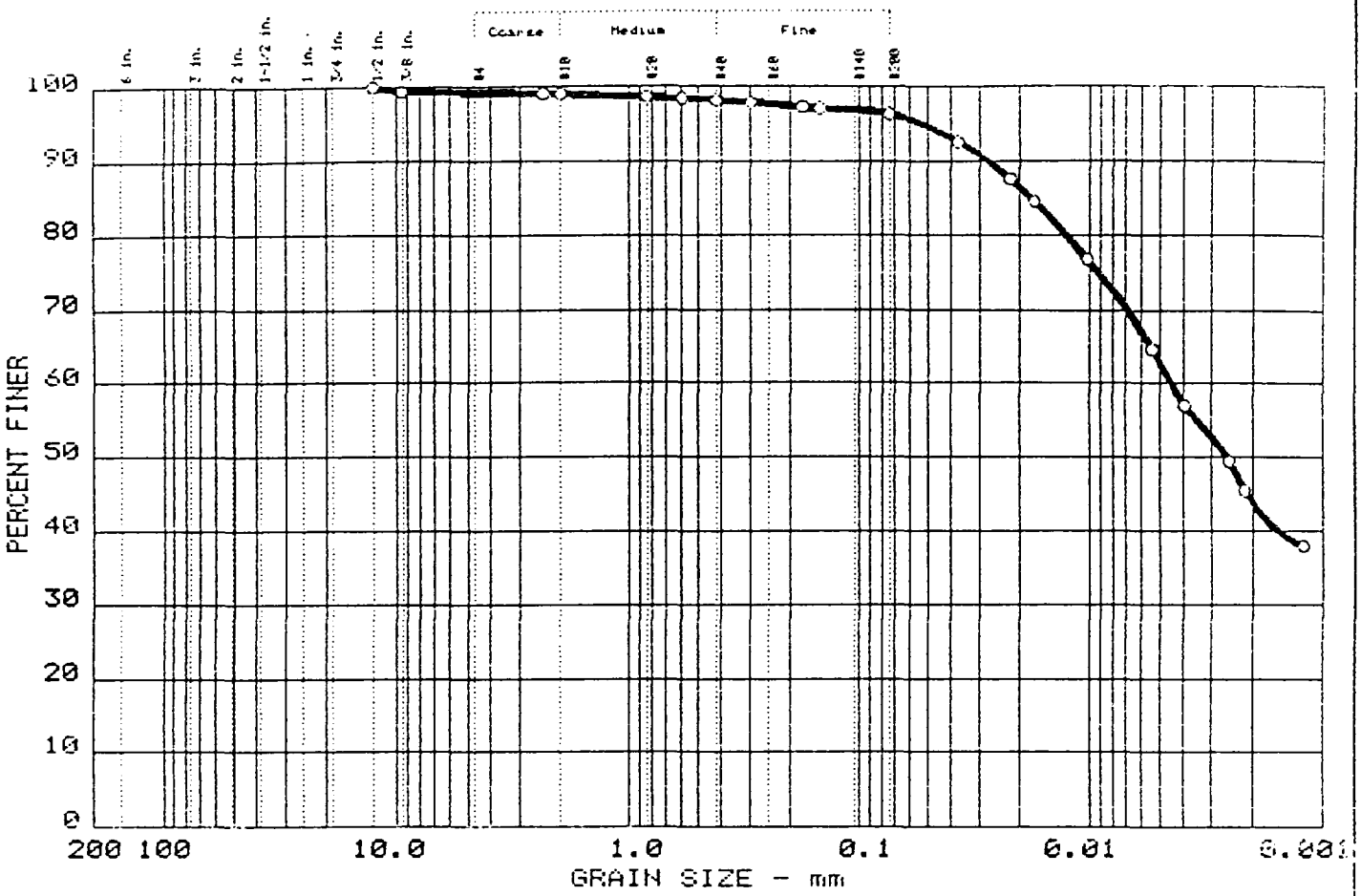

Symbol	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
○	0.0	0.7	2.9	33.6	62.8

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	34	15			0.00					

MATERIAL DESCRIPTION	USCS
○ Gray Lean CLAY, Trace Sand and Gravel	CL

Project No.: 10010201-38224
Project: H.O.D. LANDFILL RI/FS Antioch, Illinois
○ Sample: HD-SCTP1-28"

Date: 6/18/93

Remarks:
TESTED BY CLS
CHECKED BY CLS
APPROVED BY VJR

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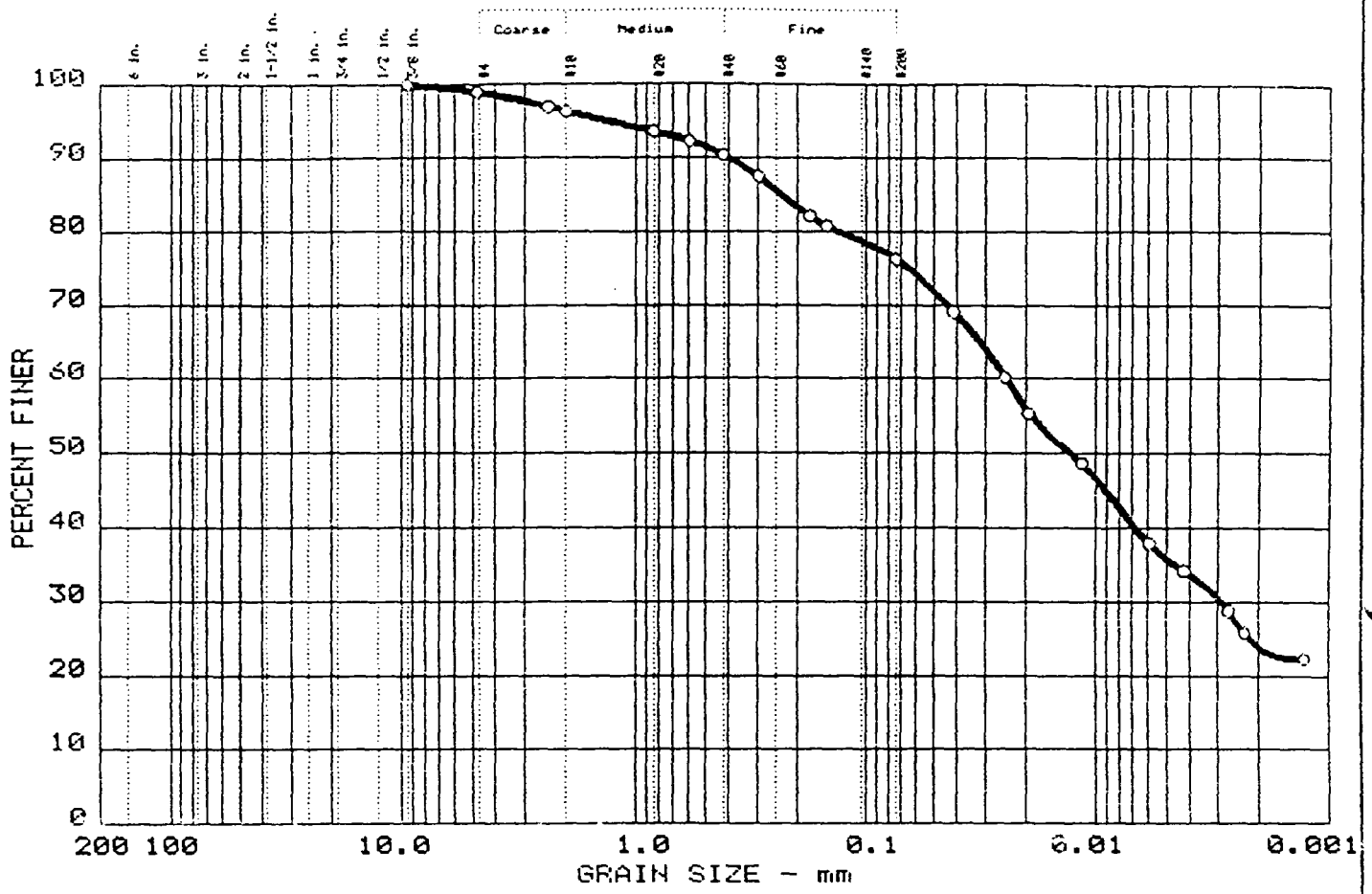

Symbol	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
○	0.0	1.0	22.6	40.6	35.8

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	31	14	0.23		0.01	0.003				

MATERIAL DESCRIPTION	USCS
○ Brown Lean CLAY, Some Sand, Trace Gravel	CL

Project No.: 10010201-38224
Project: H.O.D. LANDFILL RI/FS Antioch, Illinois
○ Sample: HD-SCTP2-38"

Date: 6/18/93

Remarks:
TESTED BY CLS
CHECKED BY CLS
APPROVED BY VJK

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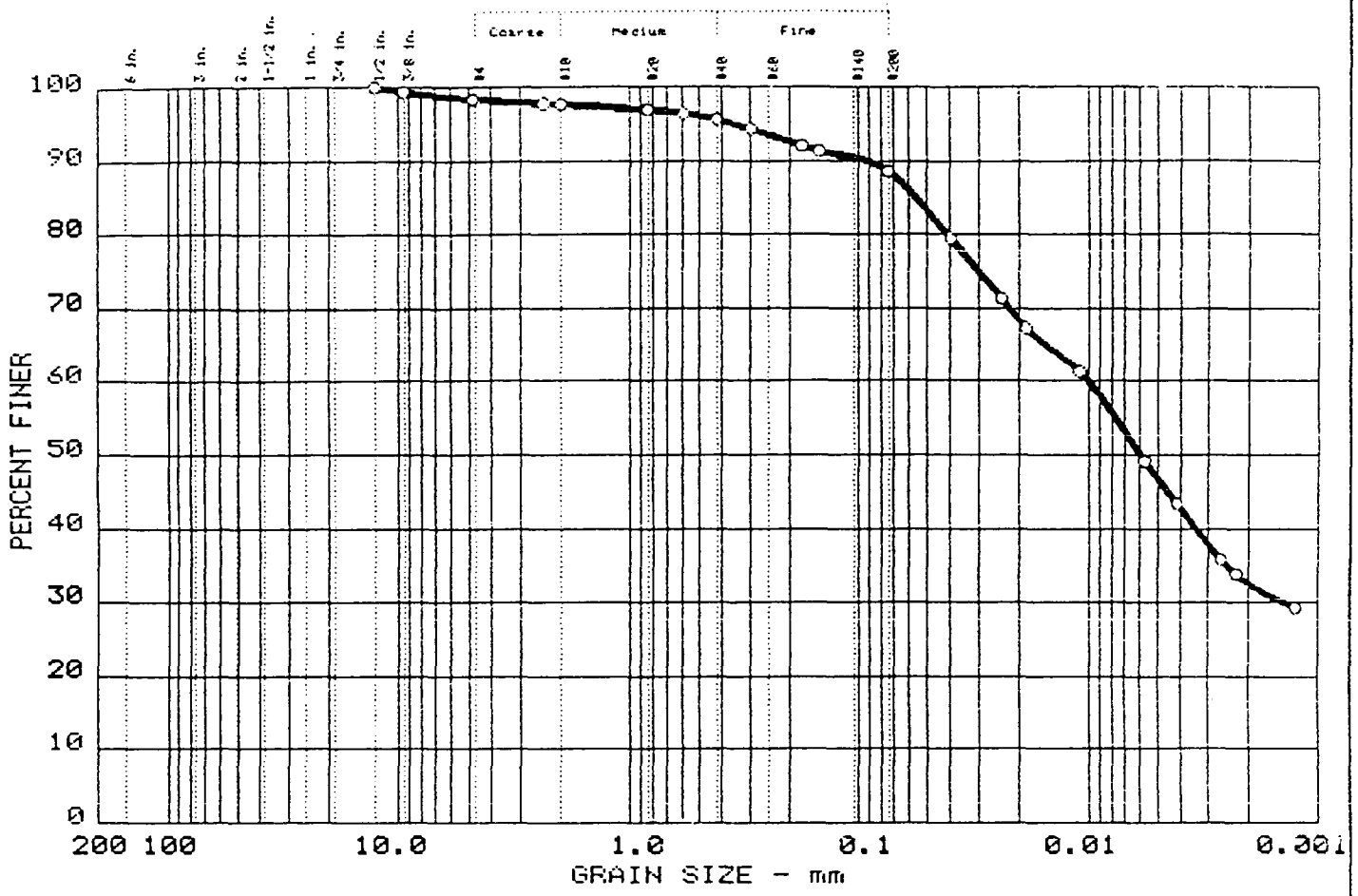

Symbol	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
○	0.0	1.6	9.7	41.9	46.8

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	38	21			0.01	0.001				

MATERIAL DESCRIPTION	USCS
○ Brown-Gray Lean CLAY, Little Sand, Trace Gravel	CL

Project No.: 10010201-38224
Project: H.O.D. LANDFILL RI/FS Antioch, Illinois
○ Sample: HD-SCTP3-32"

Date: 6/18/93

Remarks:
TESTED BY CLS
CHECKED BY CLS
APPROVED BY VSR

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WARZYN, INC.

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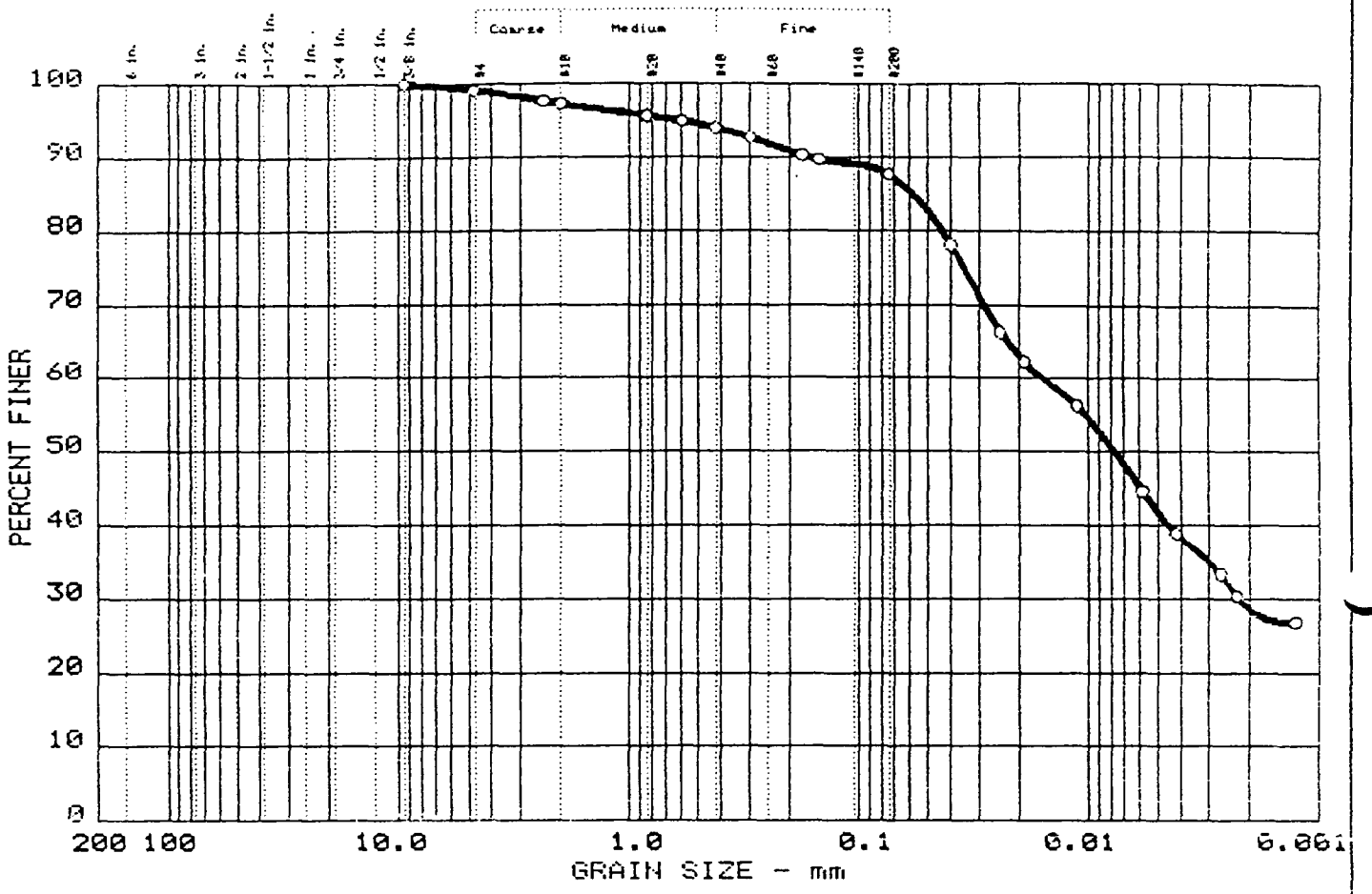

Symbol	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
○	0.0	0.8	11.5	46.1	41.6

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	33	16			0.01	0.002				

MATERIAL DESCRIPTION	USCS
○ Brown Lean CLAY, Little Sand, Trace Gravel	CL

Project No.: 10010201-38224
Project: H.O.D. LANDFILL RI/FS Antioch, Illinois
○ Sample: HD-SCTP4-50"

Date: 6/18/93

Remarks:
TESTED BY CLS
CHECKED BY CLS
APPROVED BY JR

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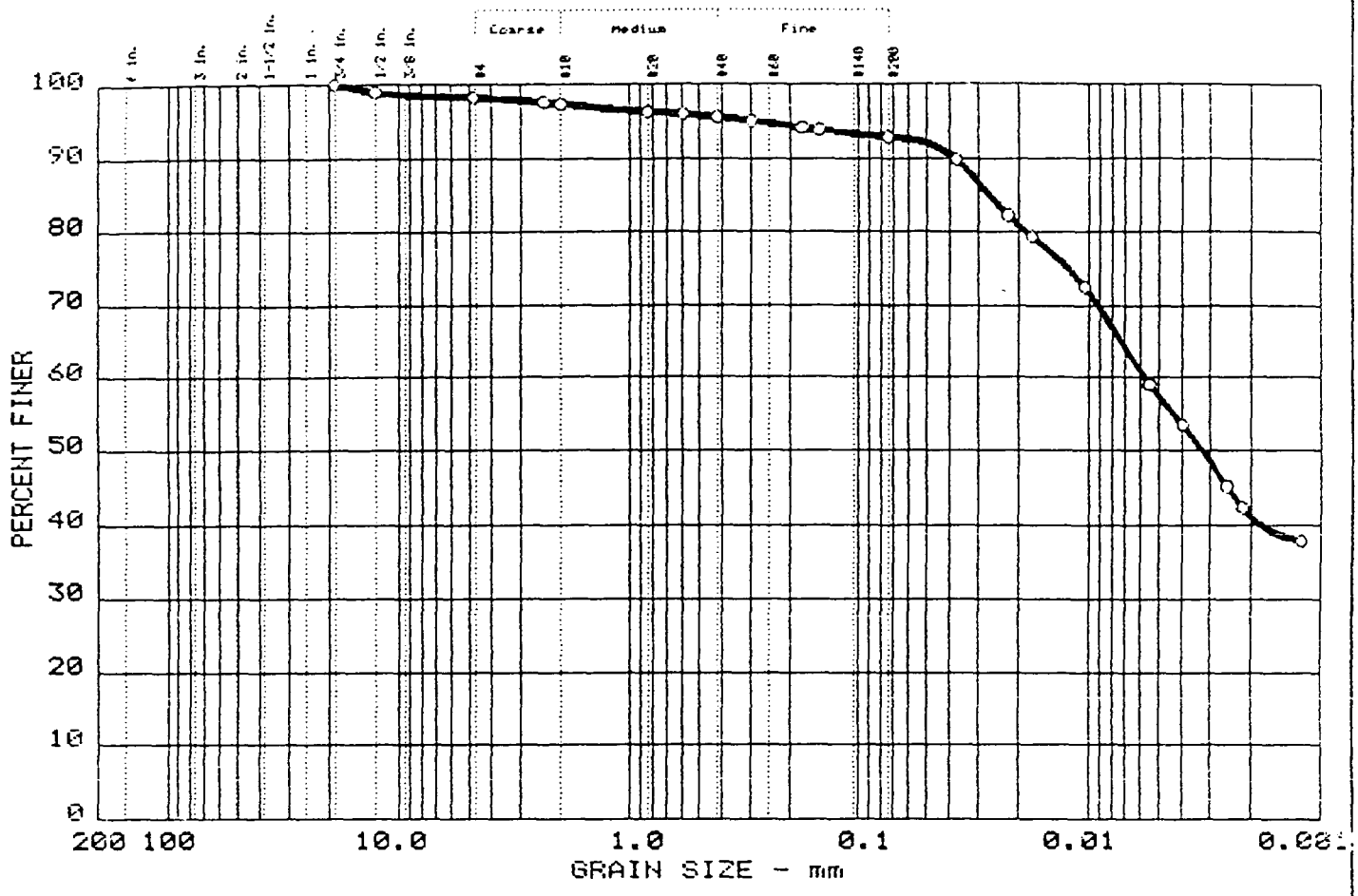

Symbol	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
○	0.0	1.7	5.4	35.5	57.4

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	38	19			0.00					

MATERIAL DESCRIPTION	USCS
○ Gray Lean CLAY, Little Sand, Trace Gravel	CL

Project No.: 10010201-38224
Project: H.O.D. LANDFILL RI/FS Antioch, Illinois
○ Sample: HD-SCTP6-52"

Date: 6/18/93

Remarks:
TESTED BY CLS
CHECKED BY CLS
APPROVED BY VJR

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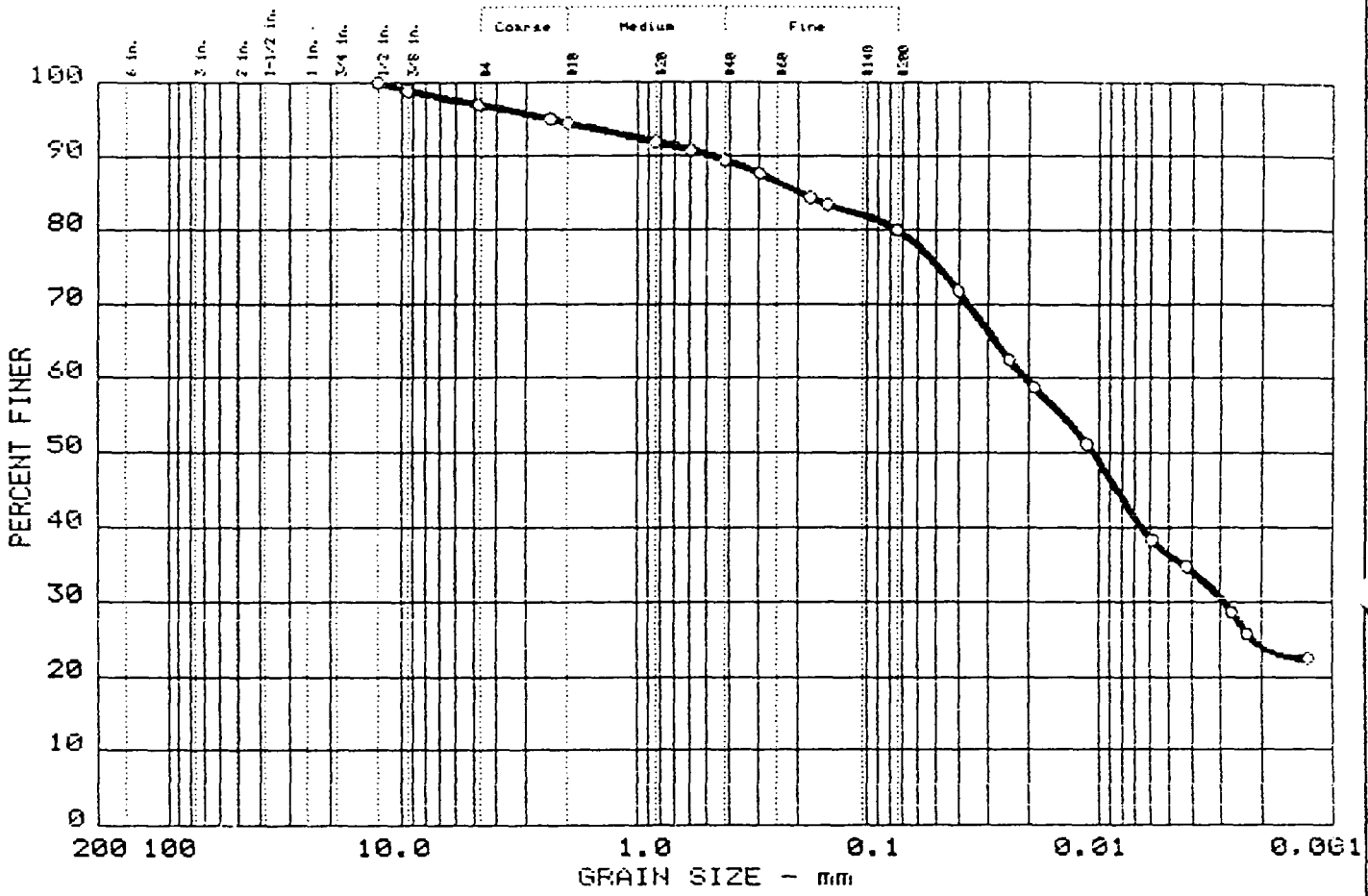

Symbol	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
○	0.0	3.0	17.1	43.6	36.3

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	33	16	0.19		0.01	0.003				

MATERIAL DESCRIPTION	USCS
○ Brown Lean CLAY, Some Sand, Trace Gravel	CL

Project No.: 10010201-38224
Project: H.O.D. LANDFILL RI/FS Antioch, Illinois
○ Sample: HD-SCTP5-19"

Date: 6/18/93

Remarks:
TESTED BY CLS
CHECKED BY CLS
APPROVED BY VJR

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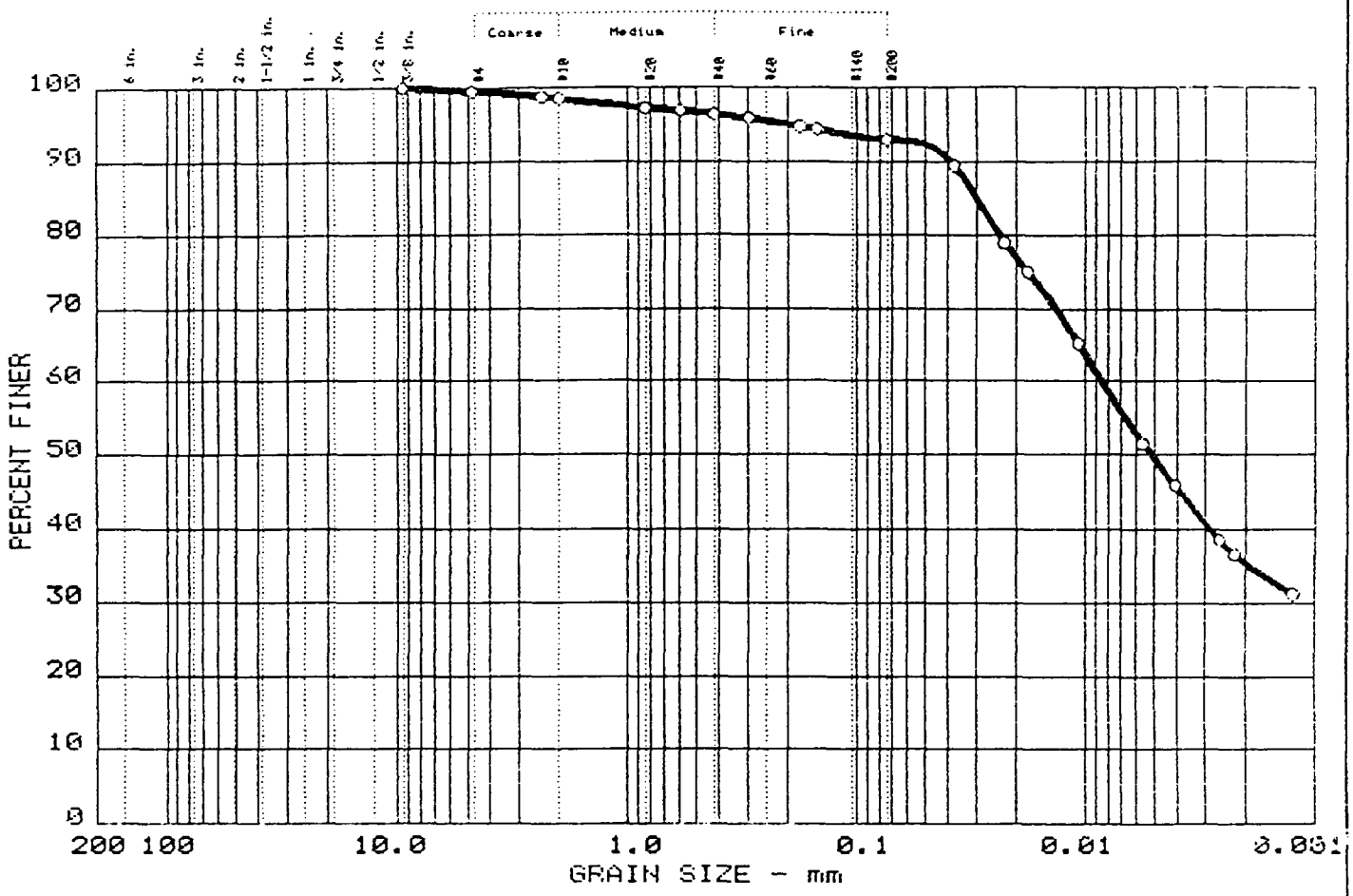


Symbol	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
○	0.0	0.4	6.6	43.7	49.3

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	34	16			0.01					

MATERIAL DESCRIPTION	USCS
○ Gray Lean CLAY, Little Sand, Trace Gravel	CL

Project No.: 10010201-38224
Project: H.O.D. LANDFILL RI/FS Antioch, Illinois
○ Sample: HD-SCTP8-70"

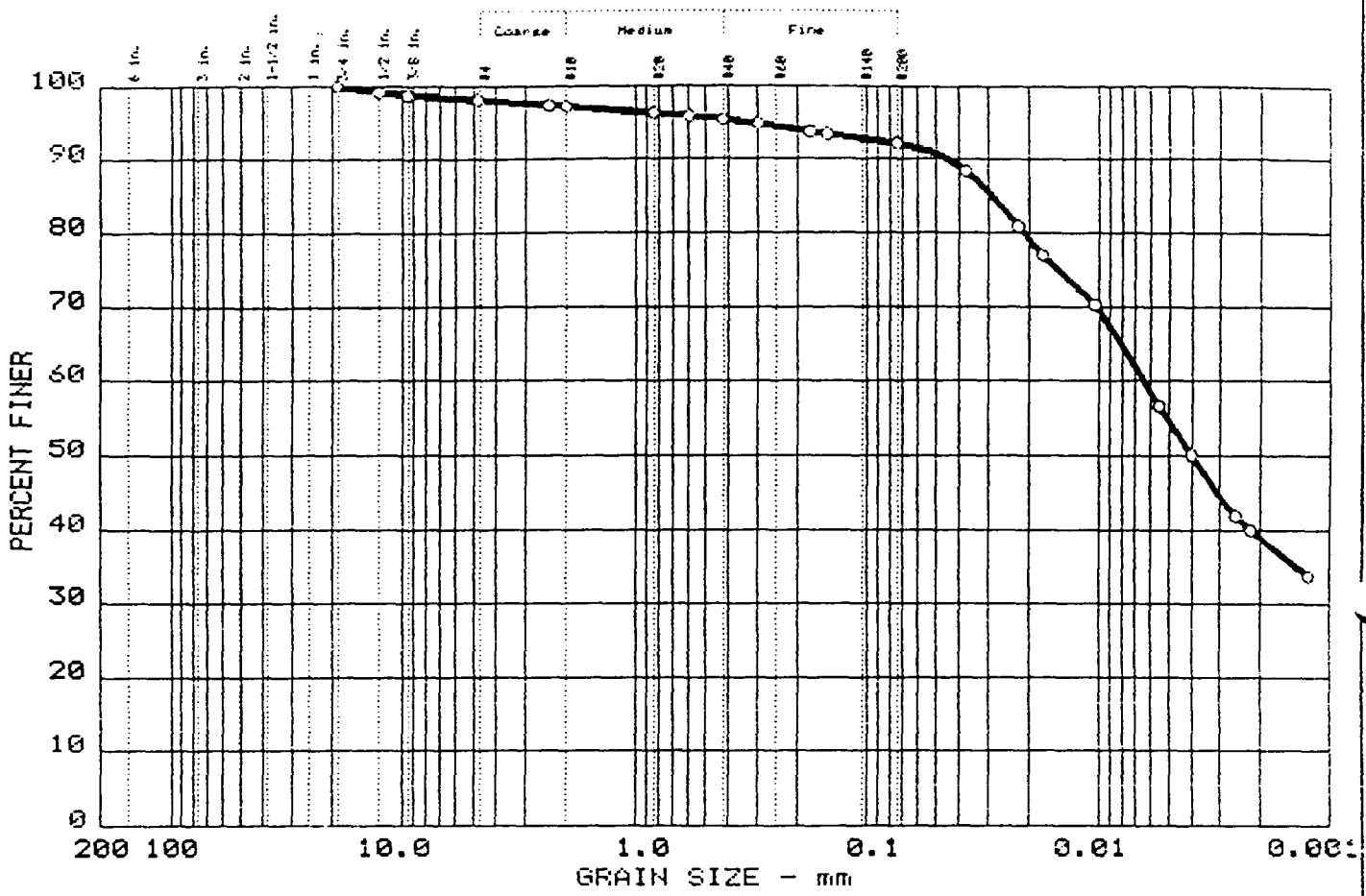
Date: 6/18/93

Remarks:
TESTED BY CLS
CHECKED BY CLS
APPROVED BY VSR

GRAIN SIZE DISTRIBUTION TEST REPORT
WARZYN, INC.

Sheet No.

GRAIN SIZE DISTRIBUTION TEST REPORT



Symbol	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
○	0.0	1.8	6.2	37.4	54.6

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	34	17			0.00					

MATERIAL DESCRIPTION	USCS
○ Gray Lean CLAY, Little Sand, Trace Gravel	CL

Project No.: 10010201-38224
Project: H.O.D. LANDFILL RI/FS Antioch, Illinois
○ Sample: HD-SCTP9-50"

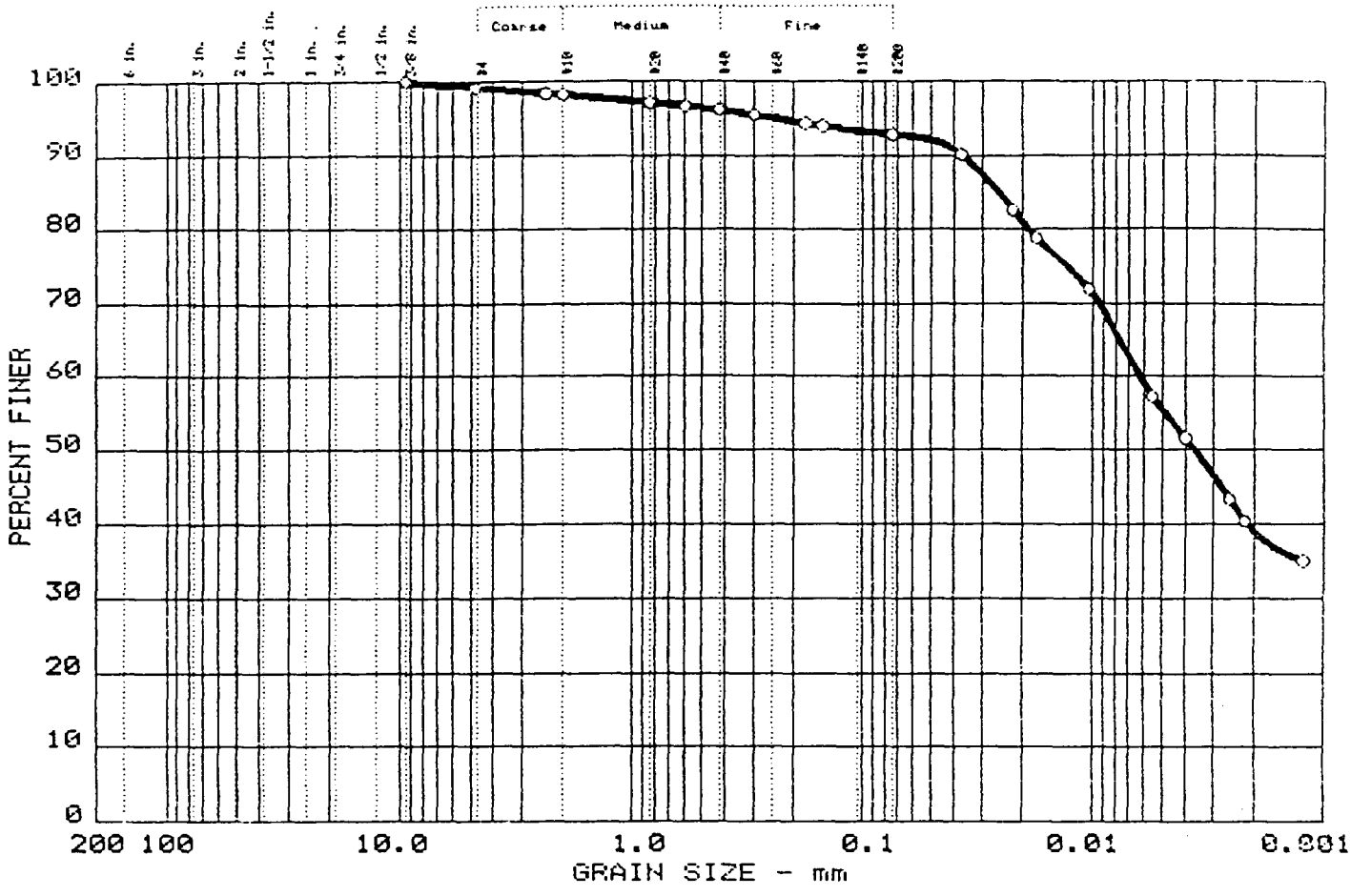
Date: 6/18/93

Remarks:
TESTED BY CLS
CHECKED BY CLS
APPROVED BY JSR

GRAIN SIZE DISTRIBUTION TEST REPORT
WARZYN, INC.

Sheet No.

GRAIN SIZE DISTRIBUTION TEST REPORT



Symbol	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
○	0.0	0.7	6.4	37.5	55.4

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	33	16			0.00					

MATERIAL DESCRIPTION	USCS
○ Gray Lean CLAY, Little Sand, Trace Gravel	CL

Project No.: 10010201-38224
Project: H.O.D. LANDFILL RI/FS Antioch, Illinois
○ Sample: HD-SCTP10-45"

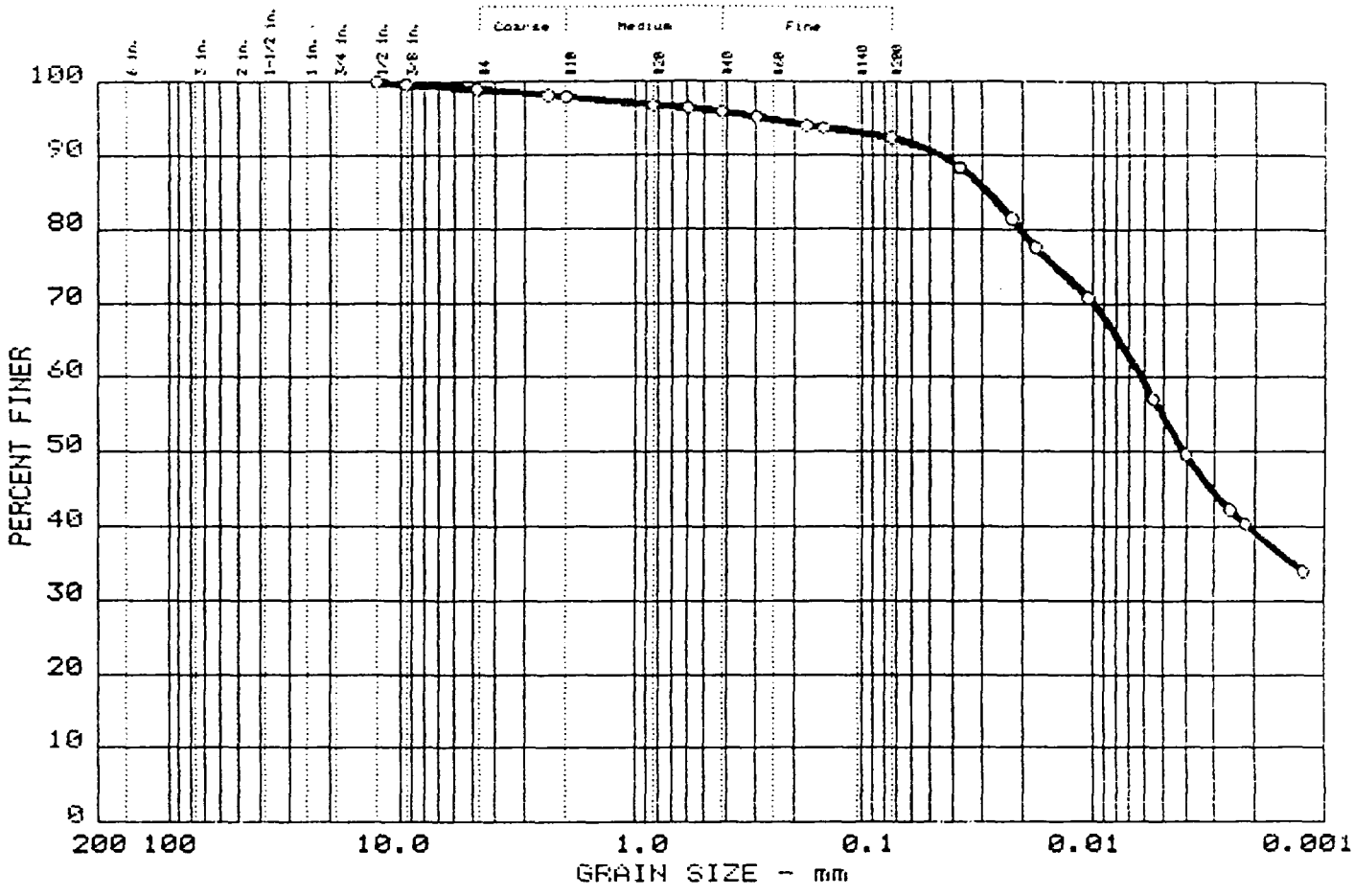
Date: 6/18/93

Remarks:
TESTED BY CLS
CHECKED BY CLS
APPROVED BY VSR

GRAIN SIZE DISTRIBUTION TEST REPORT
WARZYN, INC.

Sheet No.

GRAIN SIZE DISTRIBUTION TEST REPORT



Symbol	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
○	0.0	1.0	6.7	37.7	54.6

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	31	15			0.00					

MATERIAL DESCRIPTION	USCS
○ Gray Lean CLAY, Little Sand, Trace Gravel	CL

Project No.: 10010201-38224
Project: H.O.D. LANDFILL RI/FS Antioch, Illinois
○ Sample: HD-SCTP10-45"-91

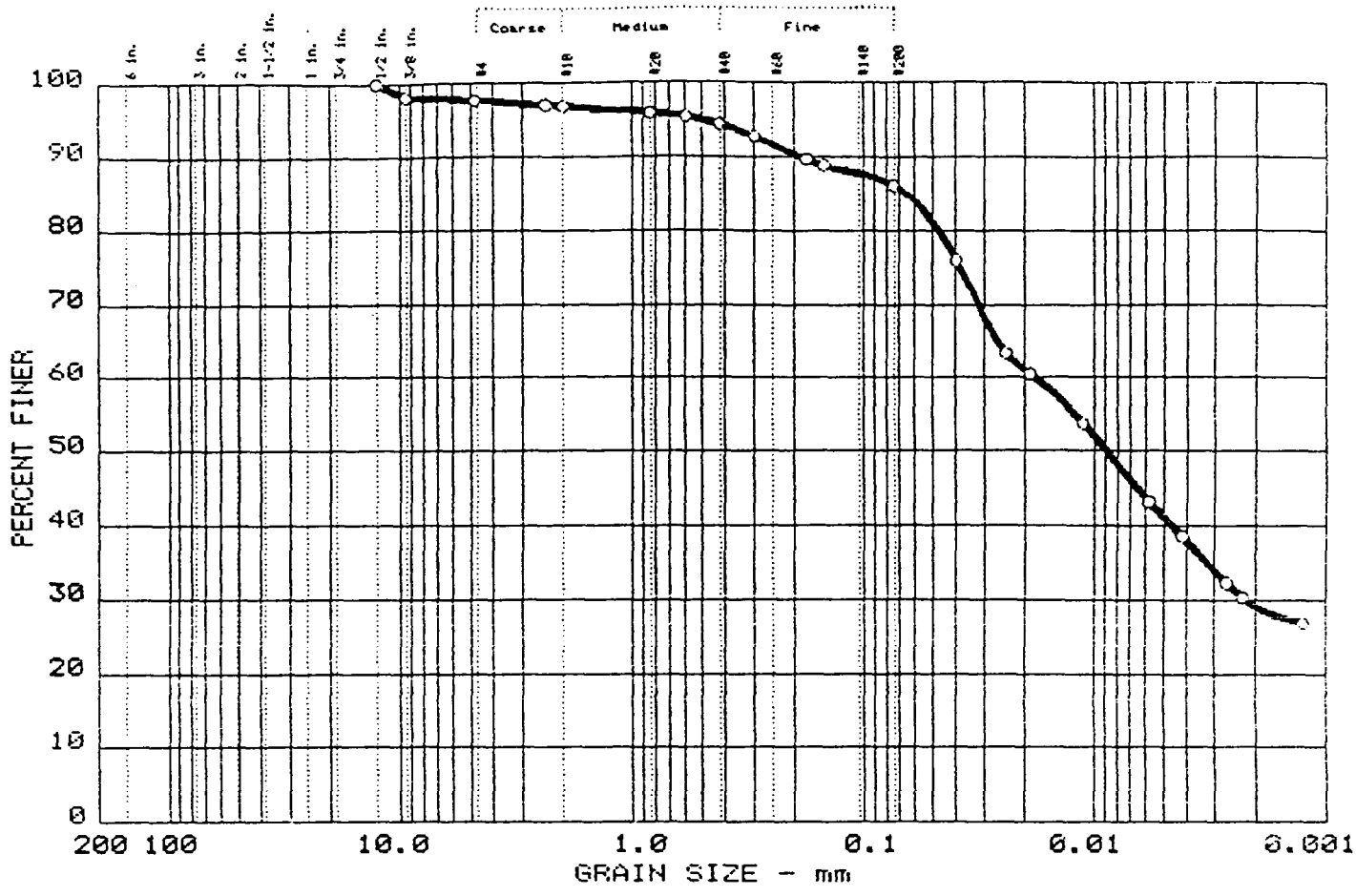
Date: 6/18/93

Remarks:
TESTED BY CLS
CHECKED BY CLS
APPROVED BY JSR

GRAIN SIZE DISTRIBUTION TEST REPORT
WARZYN, INC.

Sheet No.

GRAIN SIZE DISTRIBUTION TEST REPORT



Symbol	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
○	0.0	2.3	11.6	45.1	41.0

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	46	25			0.01	0.002				

MATERIAL DESCRIPTION	USCS
○ Brown Lean CLAY, Little Sand, Trace Gravel	CL

Project No.: 10010201-38224
Project: H.O.D. LANDFILL RI/FS Antioch, Illinois
○ Sample: HD-SCTP7-20"

Date: 6/18/93

Remarks:
TESTED BY CLS
CHECKED BY CLS
APPROVED BY VSR

GRAIN SIZE DISTRIBUTION TEST REPORT
WARZYN, INC.

Sheet No.

APPENDIX D-2

BOUTWELL TEST DATA

HOD LANDFILL
ANTIOCH, ILLINOIS
BOUTWELL NO. 1

Date	Time hr:min	Rt cm	Refilled to cm	Change cm	Temp °C	Viscosity Ratio Rt	Z cm	Ra cm	b1 cm	d cm	D cm	G1	H1 cm	H2' cm	Elapsed Time sec	Apparent Vertical Conductivity cm/sec
6/15/93	9:10 AM	85.1			20	1	58.4	6.6	20.3	1.8	11.40	0.069785717	170.42	98.32	1800	2.13E-05
	9:40 AM	13	89.7	72.1	20.5	1.01	58.4	6.6	20.3	1.8	11.40	0.069785717	175.02	113.62	1500	2.03E-05
	10:05 AM	28.3	90	61.4	21	1.02	58.4	6.6	20.3	1.8	11.40	0.069785717	175.32	106.02	1800	1.99E-05
	10:35 AM	20.7	90	69.3	21.5	1.03	58.4	6.6	20.3	1.8	11.40	0.069785717	175.32	106.82	1800	1.98E-05
	11:05 AM	21.5	90	68.5	22	1.05	58.4	6.6	20.3	1.8	11.40	0.069785717	175.32	108.62	1800	1.95E-05
	11:35 AM	23.3	90.4	66.7	22	1.05	58.4	6.6	20.3	1.8	11.40	0.069785717	175.72	109.02	1800	1.94E-05
	12:05 PM	23.7	90.2	66.7	22	1.05	58.4	6.6	20.3	1.8	11.40	0.069785717				
	1:37 PM	89.3			24	1.1	58.4	6.6	20.3	1.8	11.40	0.069785717	174.62	113.72	1800	1.83E-05
	2:07 PM	28.4	90	60.9	24.5	1.11	58.4	6.6	20.3	1.8	11.40	0.069785717	175.32	116.62	1800	1.75E-05
	2:37 PM	31.3	90	58.7	25	1.12	58.4	6.6	20.3	1.8	11.40	0.069785717	175.32	119.02	1800	1.68E-05
	3:07 PM	33.7	90.3	56.3	25.5	1.13	58.4	6.6	20.3	1.8	11.40	0.069785717	175.62	119.52	1800	1.69E-05
	3:37 PM	34.2	90	56.1	26	1.15	58.4	6.6	20.3	1.8	11.40	0.069785717	175.32	121.12	1800	1.65E-05
	4:07 PM	35.8	90	54.2	26	1.15	58.4	6.6	20.3	1.8	11.40	0.069785717	175.32	122.52	1800	1.60E-05
	4:37 PM	37.2	90	52.8	26	1.15	58.4	6.6	20.3	1.8	11.40	0.069785717	175.32	120.62	1920	1.56E-05
	5:09 PM	35.3	90.1	54.7	25.5	1.13	58.4	6.6	20.3	1.8	11.40	0.069785717	175.42	125.32	1740	1.52E-05
	5:38 PM	40	90.2	50.1	25	1.12	58.4	6.6	20.3	1.8	11.40	0.069785717	175.52	124.52	1800	1.49E-05
	6:08 PM	39.2	90.2	51	24.5	1.11	58.4	6.6	20.3	1.8	11.40	0.069785717	175.52	126.62	1800	1.41E-05
	6:38 PM	41.3	90.2	48.9	24	1.1	58.4	6.6	20.3	1.8	11.40	0.069785717	175.52	125.82	1800	1.42E-05
	7:08 PM	40.5	90.1	49.7	23	1.07	58.4	6.6	20.3	1.8	11.40	0.069785717	175.42	126.82	1800	1.35E-05
	7:38 PM	41.5		48.6	21.5	1.03	58.4	6.6	20.3	1.8	11.40	0.069785717				
6/16/93	7:51 AM	90			15.5	0.89	58.4	6.6	20.3	1.8	11.40	0.069785717	175.32	132.62	1800	9.63E-06
	8:21 AM	47.3	90.2	42.7	17	0.93	58.4	6.6	20.3	1.8	11.40	0.069785717	175.52	134.22	1800	9.67E-06
	8:51 AM	48.9	90.3	41.3	18.5	0.96	58.4	6.6	20.3	1.8	11.40	0.069785717	175.62	134.02	1800	1.01E-05
	9:21 AM	48.7	90	41.6	19	0.97	58.4	6.6	20.3	1.8	11.40	0.069785717	175.32	135.22	1800	9.77E-06
	9:51 AM	49.9	90.2	40.1	19.5	0.99	58.4	6.6	20.3	1.8	11.40	0.069785717	175.52	136.02	1800	9.79E-06
	10:21 AM	50.7	90.2	39.5	20.5	1.01	58.4	6.6	20.3	1.8	11.40	0.069785717	175.52	135.42	1800	1.02E-05
	10:51 AM	50.1	90.3	40.1	21	1.02	58.4	6.6	20.3	1.8	11.40	0.069785717	175.62	136.22	1800	1.00E-05
	11:21 AM	50.9	90.1	39.4	22.5	1.06	58.4	6.6	20.3	1.8	11.40	0.069785717	175.42	135.02	1860	1.04E-05
	11:52 AM	49.7	90.3	40.4	24	1.1	58.4	6.6	20.3	1.8	11.40	0.069785717	175.62	136.42	1800	1.08E-05
	12:22 PM	51.1	90.4	39.2	25	1.12	58.4	6.6	20.3	1.8	11.40	0.069785717	175.72	136.92	1800	1.08E-05
	12:52 PM	51.6	90.2	38.8	25.5	1.13	58.4	6.6	20.3	1.8	11.40	0.069785717	175.52	137.32	1800	1.08E-05
	1:22 PM	52		38.2	26	1.15	58.4	6.6	20.3	1.8	11.40	0.069785717				

HOD LANDFILL
ANTIOCH, ILLINOIS
BOUTWELL NO. 2

Date	Time hr:min	Rt cm	Change cm	Temp °C	Viscosity Ratio Rt	Z cm	Ra cm	b1 cm	d cm	D cm	G1	H1 cm	H2' cm	Elapsed Time sec	Apparent Vertical Conductivity cm/sec
6/15/93	8:00 AM	67.1		18	0.95	30.8	31.1	33	1.8	11.40	0.074160171	162	161.4	3540	7.38E-08
	8:59 AM	66.5	0.60	20	1.00	30.8	31.1	33	1.8	11.40	0.074160171	161.4	160.9	3840	5.99E-08
	10:03 AM	66	0.50	21	1.02	30.8	31.1	33	1.8	11.40	0.074160171	160.9	160.3	3600	7.85E-08
	11:03 AM	65.4	0.60	22	1.05	30.8	31.1	33	1.8	11.40	0.074160171	160.3	160	3600	4.05E-08
	12:03 PM	65.1	0.30	22	1.05	30.8	31.1	33	1.8	11.40	0.074160171	160	159.3	5460	6.25E-08
	1:34 PM	64.4	0.70	24	1.10	30.8	31.1	33	1.8	11.40	0.074160171	159.3	158.9	3600	5.70E-08
	2:34 PM	64	0.40	25	1.12	30.8	31.1	33	1.8	11.40	0.074160171	158.9	158.5	3600	5.82E-08
	3:34 PM	63.6	0.40	26	1.15	30.8	31.1	33	1.8	11.40	0.074160171	158.5	158.4	3600	1.50E-08
	4:34 PM	63.5	0.10	26	1.15	30.8	31.1	33	1.8	11.40	0.074160171	158.4	158.1	3600	4.49E-08
	5:34 PM	63.2	0.30	25	1.12	30.8	31.1	33	1.8	11.40	0.074160171	158.1	157.8	3600	4.38E-08
	6:34 PM	62.9	0.30	24	1.10	30.8	31.1	33	1.8	11.40	0.074160171	157.8	157.5	3600	4.31E-08
	7:34 PM	62.6	0.30	21.5	1.03	30.8	31.1	33	1.8	11.40	0.074160171	157.5	153.9	87240	2.02E-08
6/16/93	7:48 AM	59	3.60	15.5	0.89	30.8	31.1	33	1.8	11.40	0.074160171	153.9	153.6	3600	3.58E-08
	8:48 AM	58.7	0.30	18.5	0.96	30.8	31.1	33	1.8	11.40	0.074160171	153.6	153.2	3600	5.16E-08
	9:48 AM	58.3	0.40	19.5	0.98	30.8	31.1	33	1.8	11.40	0.074160171	153.2	152.9	3600	3.96E-08
	10:48 AM	58	0.30	21	1.02	30.8	31.1	33	1.8	11.40	0.074160171				

HOD LANDFILL
ANTIOCH, ILLINOIS
BOUTWELL NO. 3

Date	Time hr:min	Rt cm	Change cm	Temp °C	Viscosity Ratio Rt	Z cm	Ra cm	b1 cm	d cm	D cm	G1	H1 cm	H2' cm	Elapsed Time sec	Apparent Vertical Conductivity cm/sec
6/15/93	8:14 AM	87.5		18	0.95	41	21	30.5	1.8	11.40	0.073585567	180	179.3	3780	7.21E-08
	9:17 AM	86.8	0.7	20	1.00	41	21	30.5	1.8	11.40	0.073585567	179.3	178.9	3180	5.17E-08
	10:10 AM	86.4	0.4	21	1.02	41	21	30.5	1.8	11.40	0.073585567	178.9	178.4	3600	5.84E-08
	11:10 AM	85.9	0.5	22	1.05	41	21	30.5	1.8	11.40	0.073585567	178.4	178.1	3600	3.61E-08
	12:10 PM	85.6	0.3	22	1.05	41	21	30.5	1.8	11.40	0.073585567	178.1	177.6	5400	4.02E-08
	1:40 PM	85.1	0.5	24	1.10	41	21	30.5	1.8	11.40	0.073585567	177.6	177.2	3600	5.07E-08
	2:40 PM	84.7	0.4	25	1.12	41	21	30.5	1.8	11.40	0.073585567	177.2	176.9	3600	3.88E-08
	3:40 PM	84.4	0.3	26	1.15	41	21	30.5	1.8	11.40	0.073585567	176.9	176.6	3600	3.99E-08
	4:40 PM	84.1	0.3	26	1.15	41	21	30.5	1.8	11.40	0.073585567	176.6	176.3	3660	3.93E-08
	5:41 PM	83.8	0.3	25	1.12	41	21	30.5	1.8	11.40	0.073585567	176.3	175.9	3600	5.20E-08
	6:41 PM	83.4	0.4	24	1.10	41	21	30.5	1.8	11.40	0.073585567	175.9	175.4	3600	6.40E-08
	7:41 PM	82.9	0.5	21.5	1.03	41	21	30.5	1.8	11.40	0.073585567	175.4	171.1	87180	2.16E-08
6/16/93	7:54 AM	78.6	4.3	15.5	0.89	41	21	30.5	1.8	11.40	0.073585567	171.1	170.6	3600	5.32E-08
	8:54 AM	78.1	0.5	18.5	0.96	41	21	30.5	1.8	11.40	0.073585567	170.6	170.4	3600	2.30E-08
	9:54 AM	77.9	0.2	19.5	0.98	41	21	30.5	1.8	11.40	0.073585567	170.4	170	3600	4.71E-08
	10:54 AM	77.5	0.4	21	1.02	41	21	30.5	1.8	11.40	0.073585567				

HOD LANDFILL
ANTIOCH, ILLINOIS
BOUTWELL NO. 4

Date	Time hr:min	Rt cm	Change cm	Temp °C	Viscosity Ratio Rt	Z cm	Ra cm	b1 cm	d cm	D cm	G1	H1 cm	H2' cm	Elapsed Time sec	Apparent Vertical Conductivity cm/sec
6/15/93	8:20 AM	88		18	0.95	40	30.5	30.5	1.8	11.40	0.073585567	189	188.2	3600	8.24E-08
	9:20 AM	87.2	0.8	20	1.00	40	30.5	30.5	1.8	11.40	0.073585567	188.2	187.5	3120	8.79E-08
	10:12 AM	86.5	0.7	21	1.02	40	30.5	30.5	1.8	11.40	0.073585567	187.5	186.8	3600	7.80E-08
	11:12 AM	85.8	0.7	22	1.05	40	30.5	30.5	1.8	11.40	0.073585567	186.8	186.1	3600	8.06E-08
	12:12 PM	85.1	0.7	22	1.05	40	30.5	30.5	1.8	11.40	0.073585567	186.1	185	5400	8.48E-08
	1:42 PM	84	1.1	24	1.10	40	30.5	30.5	1.8	11.40	0.073585567	185	184.5	3600	6.09E-08
	2:42 PM	83.5	0.5	25	1.12	40	30.5	30.5	1.8	11.40	0.073585567	184.5	183.8	3600	8.70E-08
	3:42 PM	82.8	0.7	26	1.15	40	30.5	30.5	1.8	11.40	0.073585567	183.8	183.1	3600	8.97E-08
	4:42 PM	82.1	0.7	26	1.15	40	30.5	30.5	1.8	11.40	0.073585567	183.1	182.6	3660	6.32E-08
	5:43 PM	81.6	0.5	25	1.12	40	30.5	30.5	1.8	11.40	0.073585567	182.6	182.1	3600	6.28E-08
	6:43 PM	81.1	0.5	24	1.10	40	30.5	30.5	1.8	11.40	0.073585567	182.1	181.5	3600	7.42E-08
	7:43 PM	80.5	0.6	21.5	1.03	40	30.5	30.5	1.8	11.40	0.073585567	181.5	176.6	87180	2.38E-08
6/16/93	7:56 AM	75.6	4.9	15.5	0.89	40	30.5	30.5	1.8	11.40	0.073585567	176.6	175.3	3600	1.34E-07
	8:56 AM	74.3	1.3	18.5	0.96	40	30.5	30.5	1.8	11.40	0.073585567	175.3	174.6	3600	7.85E-08
	9:56 AM	73.6	0.7	19.5	0.98	40	30.5	30.5	1.8	11.40	0.073585567				

HOD LANDFILL
ANTIOCH, ILLINOIS
BOUTWELL NO. 5

Date	Time hr:min	Rt cm	Change cm	Temp °C	Viscosity Ratio Rt	Z cm	Ra cm	b1 cm	d cm	D cm	G1	H1 cm	H2' cm	Elapsed Time sec	Apparent Vertical Conductivity cm/sec
6/15/93	8:24 AM	87.8		18	0.95	27.5	42.5	22.9	1.8	11.40	0.071068351	180.7	171.7	3600	9.58E-07
	9:24 AM	78.8	9	20	1.00	27.5	42.5	22.9	1.8	11.40	0.071068351	171.7	164.7	3000	9.86E-07
	10:14 AM	71.8	7	21	1.02	27.5	42.5	22.9	1.8	11.40	0.071068351	164.7	156.9	3600	9.77E-07
	11:14 AM	64	7.8	22	1.05	27.5	42.5	22.9	1.8	11.40	0.071068351	156.9	150.2	3600	9.05E-07
	12:14 PM	57.3	6.7	22	1.05	27.5	42.5	22.9	1.8	11.40	0.071068351	150.2	140.4	5460	9.22E-07
	1:45 PM	47.5	9.8	24	1.10	27.5	42.5	22.9	1.8	11.40	0.071068351	140.4	134.7	3600	9.00E-07
	2:45 PM	41.8	5.7	25	1.12	27.5	42.5	22.9	1.8	11.40	0.071068351	134.7	129.3	3600	9.05E-07
	3:45 PM	36.4	5.4	26	1.15	27.5	42.5	22.9	1.8	11.40	0.071068351	129.3	124.4	3600	8.77E-07
	4:45 PM	31.5	4.9	26	1.15	27.5	42.5	22.9	1.8	11.40	0.071068351	124.4	120.4	3600	7.42E-07
	5:45 PM	27.5	4	25	1.12	27.5	42.5	22.9	1.8	11.40	0.071068351				
	5:49 PM	87.5		25	1.12	27.5	42.5	22.9	1.8	11.40	0.071068351	180.4	172.9	3360	1.01E-06
	6:45 PM	80	7.5	24	1.10	27.5	42.5	22.9	1.8	11.40	0.071068351	172.9	165.6	3600	9.37E-07
	7:45 PM	72.7	7.3	21.5	1.03	27.5	42.5	22.9	1.8	11.40	0.071068351				
6/16/93	8:00 AM	87.4		15.5	0.89	27.5	42.5	22.9	1.8	11.40	0.071068351	180.3	173.6	3600	6.65E-07
	9:00 AM	80.7	6.7	18.5	0.96	27.5	42.5	22.9	1.8	11.40	0.071068351	173.6	167.5	3600	6.78E-07
	10:00 AM	74.6	6.1	19.5	0.98	27.5	42.5	22.9	1.8	11.40	0.071068351				

HOD LANDFILL
ANTIOCH, ILLINOIS
BOUTWELL NO. 6

Date	Time hr:min	Rt cm	Change cm	Temp °C	Viscosity Ratio Rt	Z cm	Ra cm	b1 cm	d cm	D cm	G1	H1 cm	H2' cm	Elapsed Time sec	Apparent Vertical Conductivity cm/sec
6/9/93	1:18 PM	85.5		26.5	1.16	41.5	14	124.5	1.8	11.40	0.07931222	265.5	265.2	1800	5.78E-08
	1:48 PM	85.2	0.30	26.5	1.16	41.5	14	124.5	1.8	11.40	0.07931222	265.2	264.5	3600	6.75E-08
	2:48 PM	84.5	0.70	26.5	1.16	41.5	14	124.5	1.8	11.40	0.07931222	264.5	263.9	3600	5.80E-08
	3:48 PM	83.9	0.60	26.5	1.16	41.5	14	124.5	1.8	11.40	0.07931222	263.9	263.3	3600	5.82E-08
	4:48 PM	83.3	0.60	26.5	1.16	41.5	14	124.5	1.8	11.40	0.07931222	263.3	262.7	3600	5.83E-08
	5:48 PM	82.7	0.60	26.5	1.16	41.5	14	124.5	1.8	11.40	0.07931222	262.7	262.1	3600	5.84E-08
	6:48 PM	82.1	0.60	26.5	1.16	41.5	14	124.5	1.8	11.40	0.07931222	262.1	254.9	92400	2.77E-08
6/10/93	8:28 AM	74.9	7.20	22.5	1.06	41.5	14	124.5	1.8	11.40	0.07931222	254.9	254.3	3600	5.50E-08
	9:28 AM	74.3	0.60	25.5	1.13	41.5	14	124.5	1.8	11.40	0.07931222	254.3	254	3600	2.94E-08
	10:28 AM	74	0.30	26.5	1.16	41.5	14	124.5	1.8	11.40	0.07931222	254	253.6	3600	4.03E-08
	11:28 AM	73.6	0.40	28	1.20	41.5	14	124.5	1.8	11.40	0.07931222	253.6	253.3	3600	3.13E-08
	12:28 PM	73.3	0.30	29.5	1.24	41.5	14	124.5	1.8	11.40	0.07931222	253.3	253.2	3600	1.08E-08
	1:28 PM	73.2	0.10	30.5	1.26	41.5	14	124.5	1.8	11.40	0.07931222				

HOD LANDFILL
ANTIOCH, ILLINOIS
BOUTWELL NO. 7

Date	Time hr:min	Rt cm	Change cm	Temp °C	Viscosity Ratio Rt	Z cm	Ra cm	b1 cm	d cm	D cm	G1	H1 cm	H2' cm	Elapsed Time sec	Apparent Vertical Conductivity cm/sec
6/9/93	11:35 AM	83.8		26.5	1.16	40	17	73.7	1.8	11.40	0.078031456	214.5	213.3	3600	1.41E-07
	12:35 PM	82.6	1.20	26.5	1.16	40	17	73.7	1.8	11.40	0.078031456	213.3	212.4	3600	1.06E-07
	1:35 PM	81.7	0.90	26.5	1.16	40	17	73.7	1.8	11.40	0.078031456	212.4	211.4	3600	1.19E-07
	2:35 PM	80.7	1.00	26.5	1.16	40	17	73.7	1.8	11.40	0.078031456	211.4	211	3600	4.76E-08
	3:35 PM	80.3	0.40	26.5	1.16	40	17	73.7	1.8	11.40	0.078031456	211	210.2	3600	9.55E-08
	4:35 PM	79.5	0.80	26.5	1.16	40	17	73.7	1.8	11.40	0.078031456	210.2	209.4	3600	9.59E-08
	5:35 PM	78.7	0.80	26.5	1.16	40	17	73.7	1.8	11.40	0.078031456	209.4	208.4	3600	1.20E-07
	6:35 PM	77.7	1.00	26.5	1.16	40	17	73.7	1.8	11.40	0.078031456	208.4	207.5	3600	1.09E-07
	7:35 PM	76.8	0.90	26.5	1.16	40	17	73.7	1.8	11.40	0.078031456				

HOD LANDFILL
ANTIOCH, ILLINOIS
BOUTWELL NO. 8

Date	Time hr:min	Rt cm	Refilled to cm	Change cm	Temp °C	Viscosity Ratio Rt	Z cm	Ra cm	b1 cm	d cm	D cm	G1	H1 cm	H2' cm	Elapsed Time sec	Apparent Vertical Conductivity cm/sec
6/10/93	12:03 PM	88.4			29	1.23	40	21.7	88.9	2.2	11.40	0.117367218	239	219.7	1020	1.19E-05
	12:20 PM	69.1		19.3	29.5	1.24	40	21.7	88.9	2.2	11.40	0.117367218	219.7	181.6	3600	7.70E-06
	1:20 PM	31	89.5	38.1	30.5	1.27	40	21.7	88.9	2.2	11.40	0.117367218	240.1	191.6	3600	9.34E-06
	2:20 PM	41	89.6	48.5	32	1.31	40	21.7	88.9	2.2	11.40	0.117367218	240.2	190.6	3600	9.88E-06
	3:20 PM	40	89.5	49.6	31.5	1.29	40	21.7	88.9	2.2	11.40	0.117367218	240.1	193.1	3600	9.16E-06
	4:20 PM	42.5	82	47	31	1.28	40	21.7	88.9	2.2	11.40	0.117367218	232.6	189.9	3600	8.46E-06
	5:20 PM	39.3	89.6	42.7	30	1.25	40	21.7	88.9	2.2	11.40	0.117367218	240.2	193.1	3600	8.89E-06
	6:20 PM	42.5	89.7	47.1	29	1.23	40	21.7	88.9	2.2	11.40	0.117367218	240.3	193.9	3600	8.60E-06
	7:20 PM	43.3	89.6	46.4	27	1.17	40	21.7	88.9	2.2	11.40	0.117367218				

HOD LANDFILL
ANTIOCH, ILLINOIS
BOUTWELL NO. 9

Date	Time hr:min	Rt cm	Refilled to cm	Change cm	Temp °C	Viscosity Ratio Rt	Z cm	Ra cm	b1 cm	d cm	D cm	G1	H1 cm	H2' cm	Elapsed Time sec	Apparent Vertical Conductivity cm/sec
6/10/93	8:15 AM	85			22	1.05	41	61	101.6	2.2	11.40	0.117853123	288.6	219.1	1800	1.89E-05
	8:45 AM	15.5	87	69.5	22.5	1.05	41	61	101.6	2.2	11.40	0.117853123	290.6	227.1	1800	1.70E-05
	9:15 AM	23.5	88	63.5	23.5	1.09	41	61	101.6	2.2	11.40	0.117853123	291.6	232.1	1800	1.63E-05
	9:45 AM	28.5	88.4	59.5	25.5	1.13	41	61	101.6	2.2	11.40	0.117853123	292	234.8	1800	1.61E-05
	10:15 AM	31.2	88.4	57.2	26	1.15	41	61	101.6	2.2	11.40	0.117853123	292	236.1	1800	1.60E-05
	10:45 AM	32.5	88.4	55.9	26.5	1.16	41	61	101.6	2.2	11.40	0.117853123	292	236.9	1800	1.59E-05
	11:15 AM	33.3	88.4	55.1	27	1.17	41	61	101.6	2.2	11.40	0.117853123	292	238.1	1800	1.56E-05
	11:45 AM	34.5	88.4	53.9	28	1.20	41	61	101.6	2.2	11.40	0.117853123	292	239.3	1800	1.56E-05
	12:15 PM	35.7	88.4	52.7	29	1.23	41	61	101.6	2.2	11.40	0.117853123	292	239.2	1800	1.61E-05
	12:45 PM	35.6	87	52.8	29.5	1.24	41	61	101.6	2.2	11.40	0.117853123	290.6	238.9	1800	1.59E-05
	1:15 PM	35.3		51.7	30	1.25	41	61	101.6	2.2	11.40	0.117853123				

CCH/jrs/BER/DJN
[J:10010201/Bout.xlw/HOD9.xls]

HOD LANDFILL
ANTIOCH, ILLINOIS
BOUTWELL NO. 10

Date	Time hr:min	Rt cm	Change cm	Temp °C	Viscosity Ratio Rt	Z cm	Ra cm	b1 cm	d cm	D cm	G1	H1 cm	H2' cm	Elapsed Time sec	Apparent Vertical Conductivity cm/sec
6/9/93	1:00 PM	86.3		26.5	1.16	42.5	-5	83.8	1.8	11.40	0.07840977	207.6	207.4	1800	4.87E-08
	1:30 PM	86.1	0.20	26.5	1.16	42.5	-5	83.8	1.8	11.40	0.07840977	207.4	207	3600	4.88E-08
	2:30 PM	85.7	0.40	26.5	1.16	42.5	-5	83.8	1.8	11.40	0.07840977	207	206.6	3600	4.89E-08
	3:30 PM	85.3	0.40	26.5	1.16	42.5	-5	83.8	1.8	11.40	0.07840977	206.6	206.2	3600	4.90E-08
	4:30 PM	84.9	0.40	26.5	1.16	42.5	-5	83.8	1.8	11.40	0.07840977	206.2	205.8	3600	4.91E-08
	5:30 PM	84.5	0.40	26.5	1.16	42.5	-5	83.8	1.8	11.40	0.07840977	205.8	205.2	3600	7.38E-08
	6:30 PM	83.9	0.60	26.5	1.16	42.5	-5	83.8	1.8	11.40	0.07840977	205.2	200.1	92400	2.48E-08
6/10/93	8:10 AM	78.8	5.10	22.5	1.06	42.5	-5	83.8	1.8	11.40	0.07840977	200.1	199.7	3600	4.62E-08
	9:10 AM	78.4	0.40	25.5	1.13	42.5	-5	83.8	1.8	11.40	0.07840977	199.7	199.4	3600	3.70E-08
	10:10 AM	78.1	0.30	26.5	1.16	42.5	-5	83.8	1.8	11.40	0.07840977	199.4	199	3600	5.07E-08
	11:10 AM	77.7	0.40	28	1.20	42.5	-5	83.8	1.8	11.40	0.07840977	199	198.7	3600	3.94E-08
	12:10 PM	77.4	0.30	29.5	1.24	42.5	-5	83.8	1.8	11.40	0.07840977				

E

APPENDIX E

LEACHATE PIEZOMETER LANDFILL GAS WELL BORING LOGS AND WELL CONSTRUCTION DETAILS

APPENDIX E

LEACHATE PIEZOMETER AND LANDFILL GAS WELL BORING LOGS/WELL CONSTRUCTION DETAILS

Soil Borehole Logs
LP1
LP2
LP3
LP4
LP5
LP6
LP7
LP8
LP9
LP10
LP11
LP12
LP13
LP14

Leachate Piezometer Detail
LP1
LP2
LP3
LP4
LP5
LP6
LP7
LP8
LP9
LP10
LP11
LP12
LP13
LP14

SOIL BOREHOLE LOG

SITE NAME AND LOCATION H.O.D. Landfill - Antioch, Illinois	DRILLING METHOD: 10 1/4" ID HSA	BORING NO. LP1
		SHEET 1 OF 1
	SAMPLING METHOD: 2" ID SPLIT SPOON	DRILLING START / FINISH
BORING LOCATION: SE 1/4 of SE 1/4 of Section 8 , T 46 N, R 10 E/W	WATER LEVEL	TIME / TIME
	TIME	
NORTHING 2116410.7 EASTING 1050909.7	DATE	DATE / DATE
DATUM ELEVATION 775.6	CASING DEPTH	4/27/93 / 4/27/93
DRILL RIG CME 75	SURFACE CONDITIONS GRASS COVERED LANDFILL CAP	
ANGLE Vertical BEARING ------		
SAMPLE HAMMER TORQUE FT-LBS		

DEPTH IN FEET (ELEVATION)	BLOWS/6 IN. ON SAMPLER	RECOVERY %	SYMBOL	SAMPLE NUMBER	SAMPLE NUMBER AND DESCRIPTION OF MATERIALS	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	TEST RESULTS: WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TESTS
					FILL: Brown Clay Cap								
771.6													
770.6					Black Clay Cap Material								
5					Refuse								
10	3 12 13 15	33		1	FILL: Refuse - Paper, Metal, Plastic, Cloth, Etc.	SS							–
▼ 15	5 7 4 2	100		2	Wet Black Muck and Garbage at Approximately 14' 15% LEL Pulling Center Bit Refuse - Metal Plastic, etc.	SS							–
20	9 9 9 10	4		3	Refuse Mostly Wood and Black Wet Material	SS							–
752.6					Cuttings Changed Color From Black to Brown at Approximately 23 feet								
25	–	50		4	1" Fine to Coarse Sand Layer at 25', Brown Silty CLAY (CL), Silty Lenses Present 1/8 - 1/4" Trace Fine to Coarse Sand	SS							–
748.6	3 4 6 5	46		5		SS							–
746.6					Gray Clayey SILT (ML) Trace Fine to Coarse Sand								
30					End of Boring at 29 Feet Leachate Piezometer Set at 20.31 Ft PID = None Detected								
35													

LOGGED BY SJC DRILLING CONTR E & F

DATE 9/17/93 CHK'D BY DAP CHAS. MARKGRAF

Template ID: WM1 ID: WM1

SOIL BOREHOLE LOG

SITE NAME AND LOCATION H.O.D. Landfill - Antioch, Illinois	DRILLING METHOD: 10 1/4" ID HSA	BORING NO. LP2
	SAMPLING METHOD: 3" OD SPLIT SPOON	SHEET 1 OF 2
		DRILLING START / FINISH
BORING LOCATION: SE 1/4 of SE 1/4 of Section 8 , T 46 N, R 10 E/W	WATER LEVEL / TIME	TIME / TIME
NORTHING 2116428.7 EASTING 1051349.0	TIME / DATE	DATE / DATE
DATUM ELEVATION 785.8	CASING DEPTH	4/29/93 / 4/30/93
DRILL RIG CME 75	SURFACE CONDITIONS GRASS COVERED LANDFILL CAP	
ANGLE Vertical BEARING ------		
SAMPLE HAMMER TORQUE FT-LBS		

DEPTH IN FEET (ELEVATION)	BLOWS/6 IN. ON SAMPLER	RECOVERY %	SYMBOL		SAMPLE NUMBER AND DESCRIPTION OF MATERIALS	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	TEST RESULTS: WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TESTS
					Grass Surface Brown CLAY (CL) Trace to Some Gravel, Landfill Cap Material								
781.8													
5					Black Clay and Refuse Blind Drill to 20 Feet								
10													
15													
20	4 5 6 6	50		1	Refuse	SS							–
25	60/4 in.	20		2	Refuse	SS							–
30	100/14"	25		3	Refuse	SS							–
35	12 11 13 14	50		4	Refuse	SS							–
745.8													

LOGGED BY PMS DRILLING CONTR E & F

DATE 9/17/93 CHK'D BY DAP BRANDON POWERS

Template ID: WM1 ID: WM1

SOIL BOREHOLE LOG

SITE NAME AND LOCATION H.O.D. Landfill - Antioch, Illinois

SHEET 2 OF 2

BORING NO. LP2

DEPTH IN FEET (ELEVATION)	BLOWS/6 IN. ON SAMPLER	RECOVERY %	SYMBOL		SAMPLE NUMBER AND DESCRIPTION OF MATERIALS	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	TEST RESULTS: WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TESTS
	15 11 13 14	50		5	Gray Silty CLAY (CL), Trace Gravel	SS							–
	7 10 13 15	100		6		SS							–
741.8					End of Boring at 44 Feet Leachate Piezometer Set at 35 Feet PID = None Detected								
45													
50													
55													
60													
65													
70													
75													
80													
85													
90													
95													

SOIL BOREHOLE LOG

SITE NAME AND LOCATION H.O.D. Landfill - Antioch, Illinois	DRILLING METHOD: 10 1/4" ID HSA	BORING NO. LP3
	SAMPLING METHOD: 2" OD SPLIT SPOON 3" OD	SHEET 1 OF 1
	SPLIT SPOON (30 - 32 FT)	DRILLING
BORING LOCATION: SE 1/4 of SE 1/4 of Section 8 , T 46 N, R 10 E/W	WATER LEVEL / TIME / DATE / CASING DEPTH	START TIME / FINISH TIME
NORTHING 2116428.7 EASTING 1050318.9		DATE 4/28/93 / DATE 4/28/93
DATUM ELEVATION 778.1		
DRILL RIG CME 75	SURFACE CONDITIONS GRASS COVERED LANDFILL CAP	
ANGLE Vertical BEARING ------		
SAMPLE HAMMER TORQUE FT-LBS		

DEPTH IN FEET (ELEVATION)	BLOWS/6 IN. ON SAMPLER	RECOVERY %	SYMBOL	SAMPLE NUMBER	SAMPLE NUMBER AND DESCRIPTION OF MATERIALS	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	TEST RESULTS: WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TS
					FILL: Blind Drill to 15 Feet Brown Cap Clay to Approximately 5 Feet then Black Clay and Little Refuse to Approximately 8 Feet then more Refuse and Little Clay to 10 Feet								
5 773.1					FILL: Black Clay and Refuse								
10					Refuse - Metal, Wood, Plastic, Paper, etc. and Black Clay								
15													
20 ▽	–	50		1	Black Wet Refuse - Paper and Wood 30 - 50% LEL from Auger Head and After Collected Sample	SS							–
25	–	4		2	Brown Clay and Black Refuse - Wood	SS							–
749.6													
30 747.1	5 10 19 18	66		3	Gray Clayey SILT (ML)	SS							–
					Fine to Coarse SAND and Fine GRAVEL (SP/GP), Clay Lens at Approximately 31.3' 15-50% LEL From Auger Head								
35 743.2	9 10 9 9	50		4		SS							–
742.1					Fine to Coarse SAND (SP) Grading to Fine to Medium Sand 5 - 15% LEL in Augers								
40					End of Boring at 37 Feet Leachate Piezometer Set at 25.5 Feet PID = None Detected								

LOGGED BY SJC DRILLING CONTR E & F

DATE 9/18/93 CHK'D BY DAP CHAS. MARKGRAF

Template ID: WM1 ID: WM1

SOIL BOREHOLE LOG

SITE NAME AND LOCATION H.O.D. Landfill - Antioch, Illinois	DRILLING METHOD: 10 1/4" ID HSA		BORING NO. LP4
	SAMPLING METHOD: 3" SPLIT SPOON		SHEET 1 OF 2
			DRILLING START / FINISH
BORING LOCATION: SE 1/4 of SE 1/4 of Section 8 , T 46 N, R 10 E/W	WATER LEVEL		TIME / TIME
	TIME		12:30 / 14:00
NORTHING 2116110.6 EASTING 1051338.6	DATE		DATE / DATE
DATUM ELEVATION 788.9	CASING DEPTH		5/3/93 / 5/4/93
DRILL RIG CME 75	SURFACE CONDITIONS GRASS COVERED LANDFILL CAP		
ANGLE Vertical BEARING ------			
SAMPLE HAMMER TORQUE FT-LBS			

DEPTH IN FEET (ELEVATION)	BLOWS/6 IN. ON SAMPLER	RECOVERY %	SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIALS	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	TEST RESULTS: WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TESTS
				Grass Surface Brown/Gray Silty Clay, Cap Material								
784.9				Black Clay and Refuse								
5												
10												
15												
20												
25	10 13 21 22	50		1 Refuse	SS							–
	11 12 19 17			2 Refuse	SS							–
30	5 7 6 8	40		3	SS							–
	4 8 11 13	50		4 Refuse	SS							–
35												
	7 8 12 13	50		5 Refuse	SS							–
748.9												

LOGGED BY PMS DRILLING CONTR E & F

DATE 9/17/93 CHK'D BY DAP BRANDON POWERS

Template ID: WM1 ID: WM1

SOIL BOREHOLE LOG

SITE NAME AND LOCATION H.O.D. Landfill - Antioch, Illinois

SHEET 2 OF 2

BORING NO. LP4

DEPTH IN FEET (ELEVATION)	BLOWS/6 IN. ON SAMPLER	RECOVERY %	SYMBOL		SAMPLE NUMBER AND DESCRIPTION OF MATERIALS	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	TEST RESULTS: WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TESTS
					Gray Silty CLAY (CL)								
	5 8 11 14	100		6		SS							–
45	6 7 12 13	100		7		SS							–
742.9					End of Boring at 46 Feet Leachate Piezometer Set at 39 Feet								
50													
55													
60													
65													
70													
75													
80													
85													
90													
95													

SOIL BOREHOLE LOG

SITE NAME AND LOCATION H.O.D. Landfill - Antioch, Illinois	DRILLING METHOD: 10.25" ID HSA	BORING NO. LP5
	SAMPLING METHOD: 3" SPLIT SPOON	SHEET 1 OF 2
BORING LOCATION: SE 1/4 of SE 1/4 of Section 8 , T 46 N, R 10 E/W	WATER LEVEL / TIME / DATE / CASING DEPTH	DRILLING START TIME 7:30 DATE 4/20/93; FINISH TIME 12:00 DATE 4/21/93
NORTHING 2116230.0 EASTING 1051719.6		
DATUM ELEVATION 796.6		
DRILL RIG CME 75	SURFACE CONDITIONS	
ANGLE Vertical BEARING ------		
SAMPLE HAMMER TORQUE FT-LBS		

DEPTH IN FEET (ELEVATION)	BLOWS/6 IN. ON SAMPLER	RECOVERY %	SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIALS	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	TEST RESULTS: WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TESTS
				Grass Surface Lt. Brown Clay (CL) Some Silt and Gravel								
5 792.1				Dark Gray Silty Organic Clay with Refuse								
10												
15												
20												
25												
30	5 10 12 7	50		1 Refuse	SS							–
35	100/6"	25		2	SS							–
	10 12 9 11	75		3	SS							–

LOGGED BY PMS DRILLING CONTR E & F

DATE 9/17/93 CHK'D BY DAP BRANDON POWERS

Template ID: WM1 ID: WM1

SOIL BOREHOLE LOG

SITE NAME AND LOCATION H.O.D. Landfill - Antioch, Illinois

SHEET 2 OF 2

BORING NO. LP5

DEPTH IN FEET (ELEVATION)	BLOWS/6 IN. ON SAMPLER	RECOVERY %	SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIALS	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	TEST RESULTS: WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TESTS
	110/7"	70		4	SS							–
45	100/20"	60		5	SS							–
50 745.6	17 20 21 18	80		6 Gray Clay with Gravel and Refuse	SS							–
744.6				Gray Coarse SAND and GRAVEL (SP/GP)								
742.6	8 15 5 4	100		7 Gray Silty CLAY (CL), Trace Fine to Coarse Sand	SS							–
55				End of Boring at 54 Feet Leachate Piezometer Set at 50 Feet								
60												
65												
70												
75												
80												
85												
90												
95												

SOIL BOREHOLE LOG

SITE NAME AND LOCATION H.O.D. Landfill - Antioch, Illinois	DRILLING METHOD: 10.25" ID HSA	BORING NO. LP6
	SAMPLING METHOD: 3" SPLIT SPOON	SHEET 1 OF 1
BORING LOCATION: SE 1/4 of SE 1/4 of Section 8 , T 46 N, R 10 E/W	WATER LEVEL / TIME / DATE / CASING DEPTH	DRILLING START TIME 16:00 DATE 4/14/93; FINISH TIME 12:00 DATE 4/16/93
NORTHING 2115990.2 EASTING 1051732.1		
DATUM ELEVATION 794.6		
DRILL RIG CME 75	SURFACE CONDITIONS	
ANGLE Vertical BEARING ------		
SAMPLE HAMMER TORQUE FT-LBS		

DEPTH IN FEET (ELEVATION)	BLOWS/6 IN. ON SAMPLER	RECOVERY %	SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIALS	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	TEST RESULTS: WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TESTS
				Grass Surface Light Brown Silty Clay (CL)								
790.1				Light Gray to Dark Gray Silty Organic Clay with Refuse								
5												
10												
15												
20												
	3 5 17 7	30		1	SS							–
25												
30	14 17 5 8	60		2 Refuse and Black Clay	SS							–
	21 7 3 2			3	SS							–
35	4 3 4 2			4	SS							–
	100/7"			5	SS							–
40 754.6				Refuse								
	8 13 19 12	15		6 Gray Silty CLAY (CL)	SS							–
752.6				End of Boring at 42 Feet Leachate Piezometer Set at 36.5 Feet								

LOGGED BY PMS DRILLING CONTR E & F

DATE 9/18/93 CHK'D BY DAP BRANDON POWERS

Template ID: WM1 ID: WM1

SOIL BOREHOLE LOG

SITE NAME AND LOCATION H.O.D. Landfill - Antioch, Illinois	DRILLING METHOD: 10.25" ID HSA	BORING NO. LP7
	SAMPLING METHOD: 3" SPLIT SPOON	SHEET 1 OF 2

						DRILLING START	DRILLING FINISH
WATER LEVEL						TIME	TIME
TIME						18:00	12:30
DATE						DATE	DATE
CASING DEPTH						4/27/93	4/28/93

BORING LOCATION:
SW 1/4 of SW 1/4 of Section 9 , T 46 N, R 10 E/W
NORTHING 2116197.8 EASTING 1052105.4
DATUM ELEVATION 794.7

DRILL RIG CME 75
ANGLE Vertical BEARING ------
SAMPLE HAMMER TORQUE FT-LBS

SURFACE CONDITIONS

DEPTH IN FEET (ELEVATION)	BLOWS/6 IN. ON SAMPLER	RECOVERY %	SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIALS	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	TEST RESULTS: WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TESTS
				Grass Surface Brown Silty Clay, Trace Gravel								
5 789.7				Refuse								
10												
15												
20												
25												
30	100/7"	25		1	SS							--
35	5 6 18 20	30		2	SS							--

LOGGED BY PMS
DATE 9/17/93 CHK'D BY DAP
DRILLING CONTR E & F
BRANDON POWERS

Template ID: WM1 ID: WM1

SOIL BOREHOLE LOG

SITE NAME AND LOCATION H.O.D. Landfill - Antioch, Illinois

SHEET 2 OF 2

BORING NO. LP7

DEPTH IN FEET (ELEVATION)	BLOWS/6 IN. ON SAMPLER	RECOVERY %	SYMBOL		SAMPLE NUMBER AND DESCRIPTION OF MATERIALS	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	TEST RESULTS: WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TESTS
	5 11 18 20	45		3		SS							–
45	11 10 27 25	75		4		SS							–
50	11 12 13 13	45		5		SS							–
55	7 8 21 27	50		6		SS							–
60	9 11 13 15	50		7	Refuse	SS							–
732.7					Gray Silty CLAY to Clayey SILT (CL/ML), Trace Gravel								
65	8 10 12 11	50		8		SS							–
727.7					End of Boring at 67 feet Leachate Piezometer Set at 61 Feet								
70													
75													
80													
85													
90													
95													

SOIL BOREHOLE LOG

SITE NAME AND LOCATION H.O.D. Landfill - Antioch, Illinois	DRILLING METHOD: 10.25" ID HSA	BORING NO. LP8
	SAMPLING METHOD: 3" SPLIT SPOON	SHEET 1 OF 2
BORING LOCATION: SW 1/4 of SW 1/4 of Section 9 , T 46 N, R 10 E/W	WATER LEVEL / TIME / DATE / CASING DEPTH	DRILLING START TIME 14:00 DATE 4/23/93; FINISH TIME 17:00 DATE 4/27/93
NORTHING 2116218.6 EASTING 1052519.4		
DATUM ELEVATION 793.5		
DRILL RIG CME 75	SURFACE CONDITIONS	
ANGLE Vertical BEARING ------		
SAMPLE HAMMER TORQUE FT-LBS		

DEPTH IN FEET (ELEVATION)	BLOWS/6 IN. ON SAMPLER	RECOVERY %	SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIALS	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	TEST RESULTS: WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TESTS
				Grass Surface Brown Silty Clay with Trace Gravel								
5												
786.5				Refuse with Black Clay								
10												
15												
20												
25												
30	8 8 22 17	50		1 Refuse	SS							–
35	17 19 10 21	55		2 Refuse	SS							–

LOGGED BY PMS DRILLING CONTR E & F

DATE 9/17/93 CHK'D BY DAP BRANDON POWERS

Template ID: WM1 ID: WM1

SOIL BOREHOLE LOG

SITE NAME AND LOCATION H.O.D. Landfill - Antioch, Illinois

SHEET 2 OF 2

BORING NO. LP8

DEPTH IN FEET (ELEVATION)	BLOWS/6 IN. ON SAMPLER	RECOVERY %	SYMBOL		SAMPLE NUMBER AND DESCRIPTION OF MATERIALS	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	TEST RESULTS: WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TESTS
	10 12 15 15	75		3	Refuse	SS							–
45	11 13 14 12	75		4	Refuse	SS							–
50	15 16 17 9	100		5	Refuse	SS							–
55	100/14"	55		6	Refuse	SS							–
60	5 7 7 13	80		7		SS							–
65	8 10 12 15	40		8		SS							–
					Refuse								
70 723.0	8 9 16 17	100		9	Gray Silty CLAY (CL), Trace Fine to Coarse Sand	SS							–
	7 8 11 14	100		10		SS							–
75 718.5					End of Boring at 75 Feet Leachate Piezometer Set at 70 Feet								
80													
85													
90													
95													

SOIL BOREHOLE LOG

SITE NAME AND LOCATION H.O.D. Landfill - Antioch, Illinois	DRILLING METHOD: 10.25" ID HSA	BORING NO. LP9
	SAMPLING METHOD: 3" SPLIT SPOON	SHEET 1 OF 2

						DRILLING START	DRILLING FINISH
WATER LEVEL						TIME	TIME
TIME						14:00	12:00
DATE						DATE	DATE
CASING DEPTH						4/21/93	4/23/93

BORING LOCATION:
SW 1/4 of SW 1/4 of Section 9 , T 46 N, R 10 E/W
NORTHING 2116220.4 EASTING 1052769.9
DATUM ELEVATION 785.8

DRILL RIG CME 75
ANGLE Vertical BEARING ------
SAMPLE HAMMER TORQUE FT-LBS

SURFACE CONDITIONS

DEPTH IN FEET (ELEVATION)	BLOWS/6 IN. ON SAMPLER	RECOVERY %	SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIALS	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	TEST RESULTS: WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TESTS
				Grass Surface Light Brown Silty Clay with Trace Fine to Coarse Sand								
5												
777.8				Black Clay and Refuse								
10												
15												
20												
25												
30	11/10/ 60/1"	50		1 Refuse	SS							–
35	5 7 11 21	55		2 Refuse	SS							–
	5 7 8 22	50		3 Refuse	SS							–

LOGGED BY PMS DRILLING CONTR E & F
DATE 9/17/93 CHK'D BY DAP BRANDON POWERS

Template ID: WM1 ID: WM1

SOIL BOREHOLE LOG

SITE NAME AND LOCATION H.O.D. Landfill - Antioch, Illinois

SHEET 2 OF 2

BORING NO. LP9

DEPTH IN FEET (ELEVATION)	BLOWS/6 IN. ON SAMPLER	RECOVERY %	SYMBOL		SAMPLE NUMBER AND DESCRIPTION OF MATERIALS	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	TEST RESULTS: WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TESTS
	5 6 7 10	75		4	Refuse	SS							–
	100/4"	15		5	Refuse	SS							–
45	8 28 9 10	55		6	Refuse	SS							–
	8 10 16 18	50		7	Refuse	SS							–
50	4 6 6 11	30		8	Refuse	SS							–
	4 8 10 12	65		9	Refuse	SS							–
55	100/1"	100		10	Refuse	SS							–
	10 15 7 6	25		11	Refuse	SS							–
60	100/8"	33		12	Refuse	SS							–
65	5 7 8 8	50		13	Refuse	SS							–
717.3					Gray CLAY (CL), Trace Silt and Fine to Coarse Sand								
70	5 18 15 7	100		14		SS							–
713.8					End of Boring at 72 Feet Leachate Piezometer Set at 66.5 Feet								
75													
80													
85													
90													
95													

SOIL BOREHOLE LOG

SITE NAME AND LOCATION H.O.D. Landfill - Antioch, Illinois	DRILLING METHOD: 10.25" ID HSA	BORING NO. LP12
	SAMPLING METHOD: 2" SPLIT SPOON	SHEET 1 OF 1

						DRILLING START	DRILLING FINISH
WATER LEVEL						TIME	TIME
TIME							
DATE						DATE	DATE
CASING DEPTH						4/7/93	4/8/93

BORING LOCATION:
SE 1/4 of SE 1/4 of Section 8 , T 46 N, R 10 E/W
NORTHING 2115515.5 EASTING 1051138.4
DATUM ELEVATION 782.6

DRILL RIG CME 75
ANGLE Vertical BEARING ------
SAMPLE HAMMER TORQUE FT-LBS

SURFACE CONDITIONS

DEPTH IN FEET (ELEVATION)	BLOWS/6 IN. ON SAMPLER	RECOVERY %	SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIALS	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	TEST RESULTS: WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TESTS
				Grass Surface Black Silty Clay Topsoil								
				Brown Silty Clay Cap, Trace Sand and Gravel								
778.1				Black Silty/Sandy Fill								
5				Refuse								
10												
15												
20												
25	757.1	3 7 8 8	10	10 Gray Silty Fine to Medium SAND (SM)	SS							
755.6				End of Boring at 27 Feet Leachate Piezometer Set at 22.5 Feet								
30												
35												

LOGGED BY PMS
DATE 9/17/93 CHK'D BY DAP
DRILLING CONTR E & F
BRANDON POWERS

Template ID: WM1 ID: WM1

SOIL BOREHOLE LOG

SITE NAME AND LOCATION H.O.D. Landfill - Antioch, Illinois	DRILLING METHOD: 10 1/4" ID HSA	BORING NO. LP10
		SHEET 1 OF 1
	SAMPLING METHOD: 2 " OD SPLIT SPOON 3" OD	
	SPLIT SPOON (30-32 FT)	DRILLING
		START / FINISH
BORING LOCATION: SE 1/4 of SE 1/4 of Section 8 , T 46 N, R 10 E/W	WATER LEVEL / TIME	TIME / TIME
NORTHING 2115810.4 EASTING 1050919.8	DATE	DATE / DATE
DATUM ELEVATION 781.1	CASING DEPTH	4/27/93 / 4/27/93
DRILL RIG	SURFACE CONDITIONS GRASS COVERED LANDFILL CAP	
ANGLE Vertical BEARING ------		
SAMPLE HAMMER TORQUE FT-LBS		

DEPTH IN FEET (ELEVATION)	BLOWS/6 IN. ON SAMPLER	RECOVERY %	SYMBOL	SAMPLE NUMBER	SAMPLE NUMBER AND DESCRIPTION OF MATERIALS	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	TEST RESULTS: WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TESTS
					FILL: Brown CLAY Cap Material								
5 776.1					FILL: Black Clay and Refuse								
10													
15													
20	–	4		1	Refuse	SS							–
					Clay Cuttings at Approximately 23 - 24'								
25	3 3 4 5	4		2		SS							–
754.1					Refuse - Pushed 2" Spoon then 3" Spoon to Try to Get Better Recovery, No Recovery on 3" Spoon								
30	6 6 8 8	58		3	Gray Silty CLAY (CL) Trace Fine to Coarse Sand	SS							–
749.1					PID = None Detected								
35					End of Boring at 32 Feet Leachate Well Set at 23 Feet PID = None Detected								

LOGGED BY SJC DRILLING CONTR E & F

DATE 9/17/93 CHK'D BY DAP DAVID MASKE

Template ID: WM1 ID: WM1

SOIL BOREHOLE LOG

SITE NAME AND LOCATION H.O.D. Landfill - Antioch, Illinois	DRILLING METHOD: 10.25" ID HSA	BORING NO. LP11
	SAMPLING METHOD: 2" SPLIT SPOON	SHEET 1 OF 1
		DRILLING START TIME / FINISH TIME
BORING LOCATION: SE 1/4 of SE 1/4 of Section 8 , T 46 N, R 10 E/W	WATER LEVEL / TIME	
NORTHING 2115807.1 EASTING 1051321.8	DATE	DATE 4/8/93 / DATE 4/12/93
DATUM ELEVATION 787.8	CASING DEPTH	
DRILL RIG CME 75	SURFACE CONDITIONS	
ANGLE Vertical BEARING ------		
SAMPLE HAMMER TORQUE FT-LBS		

DEPTH IN FEET (ELEVATION)	BLOWS/6 IN. ON SAMPLER	RECOVERY %	SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIALS	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	TEST RESULTS: WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TESTS
				Grassy Surface Black Silty Clay Topsoil								
5				FILL: Light Brown Silty Clay, Trace Fine to Coarse Sand and Fine Gravel								
778.8				Black Clayey Sandy Refuse								
10												
15												
20	3 15 17 19	24	1	Refuse	SS							
25	100/16"	0	2	Refuse	SS							
30	10 12 7 7	12	3	Black Clayey Soil and Refuse	SS							
754.8	7 10 4 10	18	4		SS							
35 752.8				Black Organic Clay and PEAT (OH) End of Boring at 35 Feet Leachate Piezometer Set at 29.2 Feet								

LOGGED BY PMS DRILLING CONTR E & F

DATE 9/17/93 CHK'D BY DAP BRANDON POWERS

Template ID: WM1 ID: WM1

SOIL BOREHOLE LOG

SITE NAME AND LOCATION H.O.D. Landfill - Antioch, Illinois	DRILLING METHOD: 10.25" ID HSA	BORING NO. LP13
	SAMPLING METHOD: 2" SPLIT SPOON	SHEET 1 OF 1
		DRILLING START / FINISH
BORING LOCATION: SE 1/4 of SE 1/4 of Section 8 , T 46 N, R 10 E/W	WATER LEVEL / TIME	TIME / TIME
NORTHING 2115448.4 EASTING 1050899.8	DATE / CASING DEPTH	DATE / DATE
DATUM ELEVATION 779.0		4/13/93 / 4/13/93
DRILL RIG CME 75	SURFACE CONDITIONS	
ANGLE Vertical BEARING ------		
SAMPLE HAMMER TORQUE FT-LBS		

DEPTH IN FEET (ELEVATION)	BLOWS/6 IN. ON SAMPLER	RECOVERY %	SYMBOL		SAMPLE NUMBER AND DESCRIPTION OF MATERIALS	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	TEST RESULTS: WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TESTS
					Grass Surface FILL: Black to Dark Brown Silty Clay Topsoil to 8"								
					Brown Fine to Coarse Clayey Sand to Sandy Clay								
5 774.0					Black Clay Mixed with Refuse								
10													
15													
762.0					Approximate Base of Refuse								
20	2 5 5 7	18		1	Gray Fine to Coarse Silty SAND (SM), Trace to Some Clay	SS							
	2 5 4 7	18		2		SS							
755.0					End of Boring at 24 Feet Leachate Piezometer Set at 17 Feet								
25													
30													
35													

LOGGED BY PMS DRILLING CONTR E & F

DATE 9/17/93 CHK'D BY DAP BRANDON POWERS

Template ID: WM1 ID: WM1

SOIL BOREHOLE LOG

SITE NAME AND LOCATION H.O.D. Landfill - Antioch, Illinois	DRILLING METHOD: 10.25" ID HSA	BORING NO. LP14
	SAMPLING METHOD: 2" SPLIT SPOON	SHEET 1 OF 1
		DRILLING START TIME / FINISH TIME
BORING LOCATION: SE 1/4 of SE 1/4 of Section 8 , T 46 N, R 10 E/W	WATER LEVEL / TIME	
NORTHING 2115474.5 EASTING 1051389.5	DATE	DATE 4/13/93 / DATE 4/13/93
DATUM ELEVATION 781.7	CASING DEPTH	
DRILL RIG CME 75	SURFACE CONDITIONS	
ANGLE Vertical BEARING ------		
SAMPLE HAMMER TORQUE FT-LBS		

DEPTH IN FEET (ELEVATION)	BLOWS/6 IN. ON SAMPLER	RECOVERY %	SYMBOL	SAMPLE NUMBER	SAMPLE NUMBER AND DESCRIPTION OF MATERIALS	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	TEST RESULTS: WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TESTS
					Grass Surface Black Silty Clayey Topsoil Brown Silty/Sandy Clay								
777.2					Refuse								
5													
10													
15													
	5 12 11 13	6		1	Refuse	SS							
20	4 18 7 10	9		2		SS							
758.2	2 3 2 2	12		3	Base of Refuse	SS							
25	2 4 9 6	9		4	Light Gray Silty Fine SAND (SM) Native Soil	SS							
754.7					End of Boring at 27 Feet Leachate Piezometer Set at 22.5 Feet								
30													
35													

LOGGED BY PMS DRILLING CONTR PMS

DATE 9/17/93 CHK'D BY DAP BRANDON POWERS

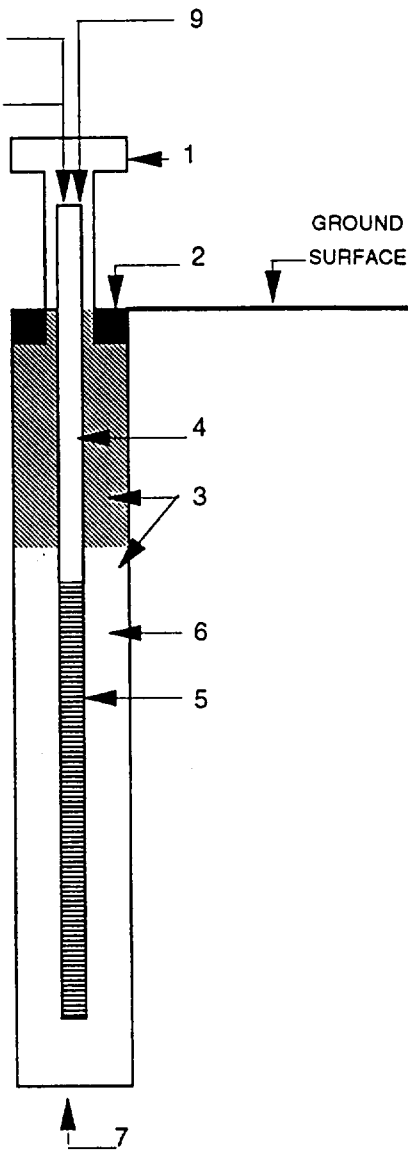
Template ID: WM1 ID: WM1

WARZYN

LEACHATE PIEZOMETER DETAIL
LEACHATE PIEZOMETER NO. LP1

Project	HOD LANDFILL
Location	ANTIOCH, ILLINOIS
Job No.	10010201
Date Constructed	4/28/93
Contractor	E & F
Coordinates	2116410.7N, 1050909.7 E

ELEVATION	778.46 ft
STICK-UP	2.86 ft
GROUND SURFACE ELEVATION	775.6 ft
DEPTH BELOW GROUND SURFACE	
TOP OF FINE SAND	6.5 ft
ELEVATION	769.1 ft
TOP OF PEA GRAVEL	7 ft
ELEVATION	768.6 ft
TOP OF SCREEN	9.87 ft
ELEVATION	765.73 ft
BOTTOM OF SCREEN	20.31 ft
ELEVATION	755.29 ft
END OF BORING	29 ft
ELEVATION	746.6 ft



1. LOCKING STEEL PROTECTIVE CASING
   DIAMETER 8 IN
   LENGTH 7 FT
2. SURFACE SEAL
   BENTONITE HYDRATED CHIPS
   CONCRETE
3. HYDRATED BENTONITE CHIPS, AND FINE SILICA SAND
4. PVC PIPE
   DIAMETER 6 IN ID
   SCHEDULE 80 PVC
5. SLOTTED PVC SCREEN
   DIAMETER 6 IN ID
   SCHEDULE 80 PVC
   SLOT SIZE 0.020 IN
   LENGTH 10.44 FT
6. PEA GRAVEL WASHED
7. BORING BACKFILL TO SCREEN BOTTOM BENTONITE CHIPS
8. BOREHOLE DIAMETER 14 IN
9. PROBE TOP VENTED SLIP CAP

SJC/jrs/DAP

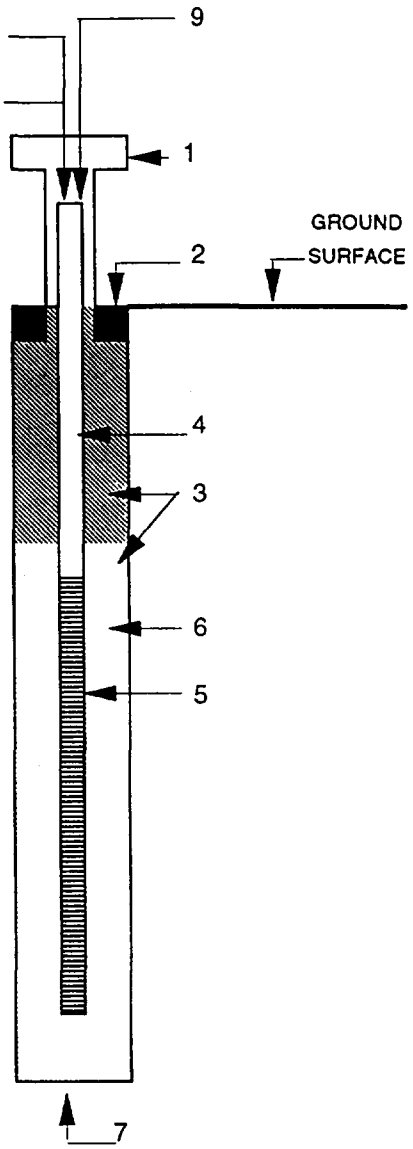
J:/10010201/LP1.XLS

WARZYN

LEACHATE PIEZOMETER DETAIL
LEACHATE PIEZOMETER NO. LP2

Project	HOD LANDFILL
Location	ANTIOCH, ILLINOIS
Job No.	10010201
Date Constructed	4/30/93
Contractor	E & F
Coordinates	2116428.7N, 1051349E

ELEVATION	787.8 ft
STICK-UP	2.3 ft
GROUND SURFACE ELEVATION	785.5 ft
DEPTH BELOW GROUND SURFACE	
TOP OF FINE SAND	7.4 ft
ELEVATION	778.1 ft
TOP OF PEA GRAVEL	8.5 ft
ELEVATION	777 ft
TOP OF SCREEN	9.7 ft
ELEVATION	775.8 ft
BOTTOM OF SCREEN	35 ft
ELEVATION	750.5 ft
END OF BORING	42 ft
ELEVATION	743.5 ft



1. LOCKING STEEL PROTECTIVE CASING
   DIAMETER 8 IN
   LENGTH 7 FT
2. SURFACE SEAL
   BENTONITE HYDRATED GRANULAR/CHIPS
   CONCRETE
3. HYDRATED BENTONITE GRANULAR/CHIPS, FINE SILICA SAND
4. PVC PIPE
   DIAMETER 6 IN ID
   SCHEDULE 80 PVC
5. SLOTTED PVC SCREEN
   DIAMETER 6 IN ID
   SCHEDULE 80 PVC
   SLOT SIZE 0.020 IN
   LENGTH 25.3 FT
6. PEA GRAVEL WASHED
7. BORING BACKFILL TO SCREEN BOTTOM BENTONITE CHIPS/PEA GRAVEL
8. BOREHOLE
   DIAMETER 14 IN
9. PROBE TOP VENTED SLIP CAP

SJC/jrs/DAP

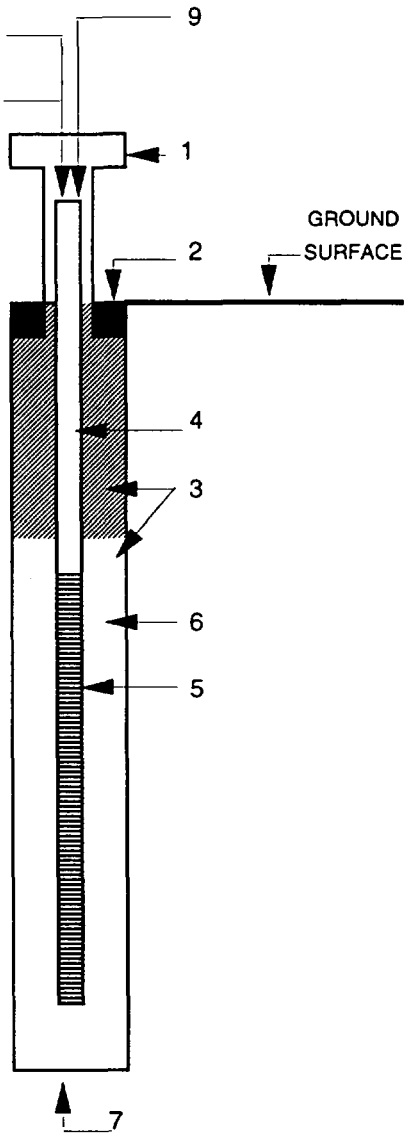
J:/10010201/LP2.XLS

WARZYN

LEACHATE PIEZOMETER DETAIL
LEACHATE PIEZOMETER NO. LP3

Project	HOD LANDFILL
Location	ANTIOCH, ILLINOIS
Job No.	10010201
Date Constructed	4/29/93
Contractor	E & F
Coordinates	2116428.7N, 1050918.9E

ELEVATION	780.89 ft
STICK-UP	2.79 ft
GROUND SURFACE ELEVATION	778.1 ft
DEPTH BELOW GROUND SURFACE	
TOP OF FINE SAND	8 ft
ELEVATION	770.1 ft
TOP OF PEA GRAVEL	9 ft
ELEVATION	769.1 ft
TOP OF SCREEN	11 ft
ELEVATION	767.1 ft
BOTTOM OF SCREEN	25.5 ft
ELEVATION	752.6 ft
END OF BORING	37 ft
ELEVATION	741.1 ft



1. LOCKING STEEL PROTECTIVE CASING
   DIAMETER 8 IN
   LENGTH 7 FT
2. SURFACE SEAL
   BENTONITE HYDRATED CHIPS
   CONCRETE
3. HYDRATED BENTONITE CHIPS, FINE SILICA SAND
4. PVC PIPE
   DIAMETER 6 IN ID
   SCHEDULE 80 PVC
5. SLOTTED PVC SCREEN
   DIAMETER 6 IN ID
   SCHEDULE 80 PVC
   SLOT SIZE 0.020 IN
   LENGTH 14.5 FT
6. PEA GRAVEL WASHED
7. BORING BACKFILL TO SCREEN BOTTOM BENTONITE CHIPS/PEA GRAVEL
8. BOREHOLE DIAMETER 14 IN
9. PROBE TOP VENTED SLIP CAP

SJC/jrs/DAP

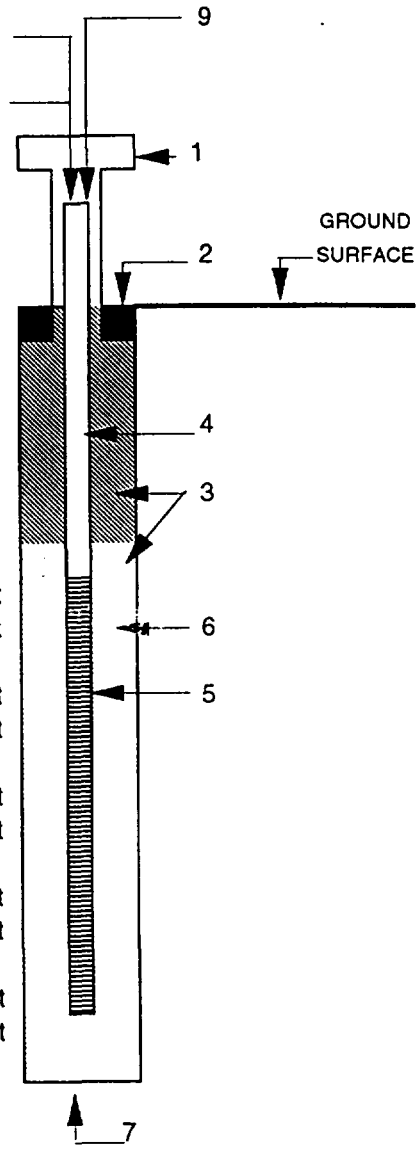
J:10010201/LP3.XLS

LEACHATE PIEZOMETER DETAIL
LEACHATE PIEZOMETER NO. LP4

WARZYN

Project	HOD LANDFILL
Location	ANTIOCH, ILLINOIS
Job No.	10010201
Date Constructed	5/4/93
Contractor	E & F
Coordinates	2116110.6N, 1051338.6E

ELEVATION	790.84 ft
STICK-UP	1.94 ft
GROUND SURFACE ELEVATION	788.9 ft
DEPTH BELOW GROUND SURFACE	
TOP OF FINE SAND	7.3 ft
ELEVATION	781.6 ft
TOP OF PEA GRAVEL	8.6 ft
ELEVATION	780.3 ft
TOP OF SCREEN	9.9 ft
ELEVATION	779 ft
BOTTOM OF SCREEN	39 ft
ELEVATION	749.9 ft
END OF BORING	44 ft
ELEVATION	744.9 ft



1. LOCKING STEEL PROTECTIVE CASING
   DIAMETER 8 IN
   LENGTH 7 FT
2. SURFACE SEAL
   BENTONITE HYD. CHIPS/GRANULAR
   CONCRETE
3. HYDRATED BENTONITE
   CHIPS/GRANULAR, FINE SILICA SAND
4. PVC PIPE
   DIAMETER 6 IN ID
   SCHEDULE 80 PVC
5. SLOTTED PVC SCREEN
   DIAMETER 6 IN ID
   SCHEDULE 80 PVC
   SLOT SIZE 0.020 IN
   LENGTH 29.1 FT
6. PEA GRAVEL WASHED
7. BORING BACKFILL TO SCREEN BOTTOM
   BENTONITE CHIPS, PEA GRAVEL
8. BOREHOLE
   DIAMETER 14 IN
9. PROBE TOP VENTED SLIP CAP

SJC/jrs/DAP

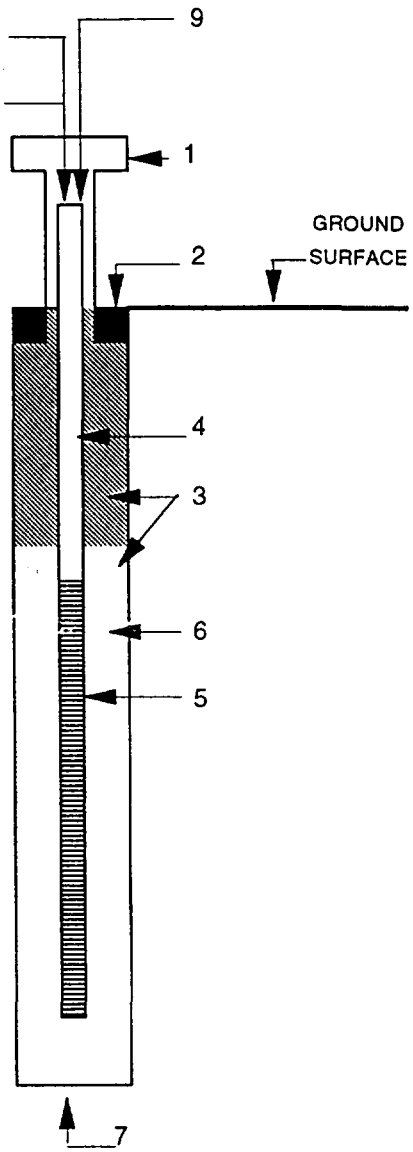
J:/10010201/LP4.XLS

WARZYN

LEACHATE PIEZOMETER DETAIL
LEACHATE PIEZOMETER NO. LP5

Project	HOD LANDFILL
Location	ANTIOCH, ILLINOIS
Job No.	10010201
Date Constructed	4/21/93
Contractor	E & F
Coordinates	2116230N, 1051719.6E

ELEVATION	800.13 ft
STICK-UP	3.53 ft
GROUND SURFACE ELEVATION	796.6 ft
DEPTH BELOW GROUND SURFACE	
TOP OF FINE SAND	8 ft
ELEVATION	788.6 ft
TOP OF PEA GRAVEL	9 ft
ELEVATION	787.6 ft
TOP OF SCREEN	10.5 ft
ELEVATION	786.1 ft
BOTTOM OF SCREEN	50 ft
ELEVATION	746.6 ft
END OF BORING	52 ft
ELEVATION	744.6 ft



1. LOCKING STEEL PROTECTIVE CASING
   DIAMETER 8 IN
   LENGTH 7 FT
2. SURFACE SEAL
   BENTONITE HYD. CHIPS/GRANULAR
   CONCRETE
3. HYDRATED BENTONITE CHIPS/GRANULAR
4. PVC PIPE
   DIAMETER 6 IN ID
   SCHEDULE 80 PVC
5. SLOTTED PVC SCREEN
   DIAMETER 6 IN ID
   SCHEDULE 80 PVC
   SLOT SIZE 0.020 IN
   LENGTH 39.5 FT
6. PEA GRAVEL WASHED
7. BORING BACKFILL TO SCREEN BOTTOM BENTONITE CHIPS, PEA GRAVEL
8. BOREHOLE DIAMETER 14 IN
9. PROBE TOP VENTED SLIP CAP

SJC/jrs/DAP

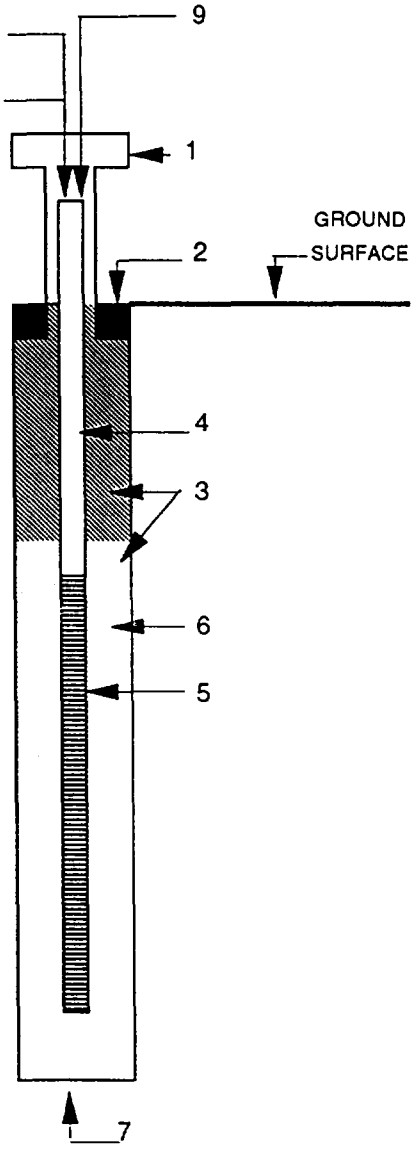
J:/10010201/LP5.XLS

WARZYN

LEACHATE PIEZOMETER DETAIL
LEACHATE PIEZOMETER NO. LP6

Project	HOD LANDFILL
Location	ANTIOCH, ILLINOIS
Job No.	10010201
Date Constructed	4/16/93
Contractor	E & F
Coordinates	2115990.2N, 1051732.1E

ELEVATION	797.32 ft
STICK-UP	2.72 ft
GROUND SURFACE ELEVATION	794.6 ft
DEPTH BELOW GROUND SURFACE	
TOP OF FINE SAND	7 ft
ELEVATION	787.6 ft
TOP OF PEA GRAVEL	8 ft
ELEVATION	786.6 ft
TOP OF SCREEN	9.7 ft
ELEVATION	784.9 ft
BOTTOM OF SCREEN	36.5 ft
ELEVATION	758.1 ft
END OF BORING	42 ft
ELEVATION	752.6 ft



1. LOCKING STEEL PROTECTIVE CASING
   DIAMETER 8 IN
   LENGTH 7 FT
2. SURFACE SEAL
   BENTONITE HYD. CHIPS/GRANULAR
   CONCRETE
3. HYDRATED BENTONITE
   CHIPS/GRANULAR, FINE SILICA SAND
4. PVC PIPE
   DIAMETER 6 IN ID
   SCHEDULE 80 PVC
5. SLOTTED PVC SCREEN
   DIAMETER 6 IN ID
   SCHEDULE 80 PVC
   SLOT SIZE 0.020 IN
   LENGTH 26.8 FT
6. PEA GRAVEL WASHED
7. BORING BACKFILL TO SCREEN BOTTOM
   WASHED PEA GRAVEL
8. BOREHOLE
   DIAMETER 14 IN
9. PROBE TOP VENTED SLIP CAP

SJC/jrs/DAP

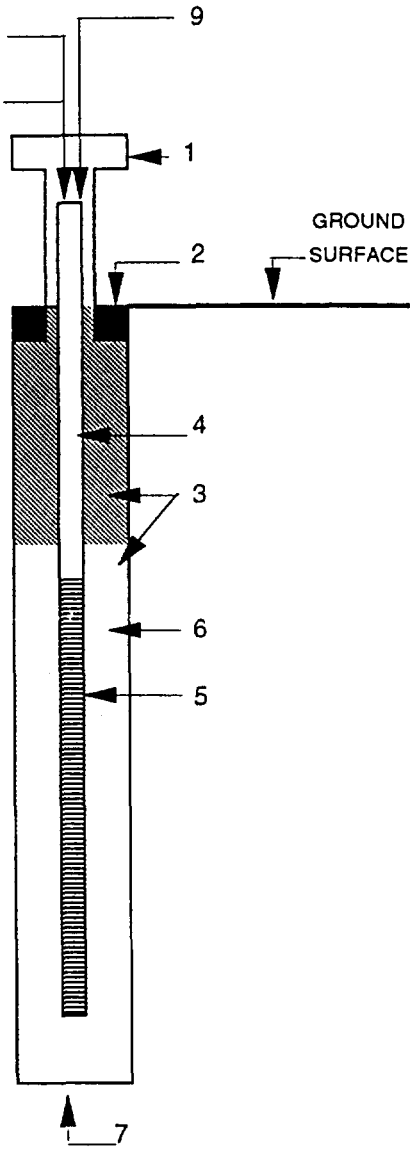
J:/10010201/LP6XLS

WARZYN

LEACHATE PIEZOMETER DETAIL
LEACHATE PIEZOMETER NO. LP7

Project	HOD LANDFILL
Location	ANTIOCH, LANDFILL
Job No.	10010201
Date Constructed	4/29/93
Contractor	E & F
Coordinates	2116197.8N, 1052105.4E

ELEVATION	797.39 ft
STICK-UP	2.69 ft
GROUND SURFACE ELEVATION	794.7 ft
DEPTH BELOW GROUND SURFACE	
TOP OF FINE SAND	7.5 ft
ELEVATION	787.2 ft
TOP OF PEA GRAVEL	8.5 ft
ELEVATION	786.2 ft
TOP OF SCREEN	9.5 ft
ELEVATION	785.2 ft
BOTTOM OF SCREEN	61 ft
ELEVATION	733.7 ft
END OF BORING	67 ft
ELEVATION	727.7 ft



1. LOCKING STEEL PROTECTIVE CASING
   DIAMETER 8 IN
   LENGTH 7 FT
2. SURFACE SEAL
   BENTONITE HYD. GRANULAR/CHIPS
   CONCRETE
3. HYDRATED BENTONITE GRANULAR/CHIPS, FINE SILICA SAND
4. PVC PIPE
   DIAMETER 6 IN ID
   SCHEDULE 80 PVC
5. SLOTTED PVC SCREEN
   DIAMETER 6 IN ID
   SCHEDULE 80 PVC
   SLOT SIZE 0.020 IN
   LENGTH 51.5 FT
6. PEA GRAVEL WASHED
7. BORING BACKFILL TO SCREEN BOTTOM BETNONITE CHIPS/PEA GRAVEL
8. BOREHOLE
   DIAMETER 14 IN
9. PROBE TOP VENTED SLIP CAP

SJC/jrs/DAP

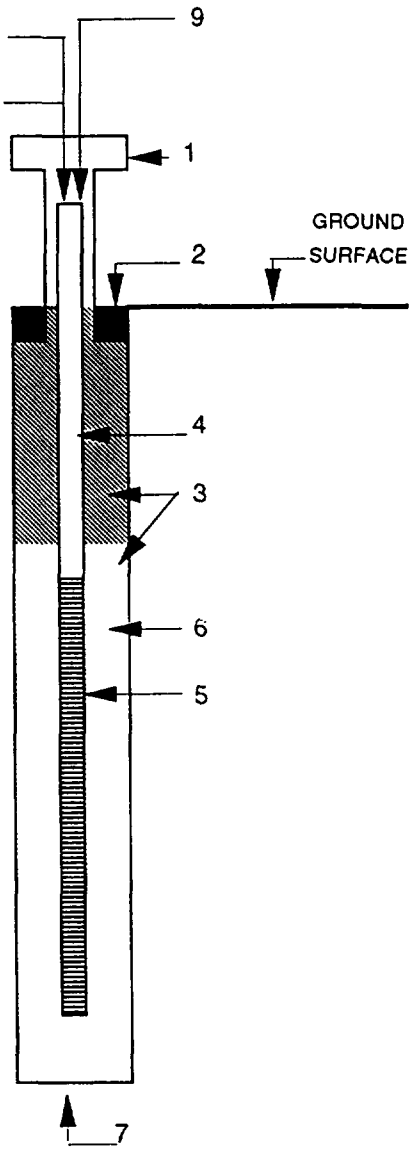
J:/10010201/LP7.XLS

WARZYN

LEACHATE PIEZOMETER DETAIL
LEACHATE PIEZOMETER NO. LP8

Project	HOD LANDFILL
Location	ANTIOCH, ILLINOIS
Job No.	10010201
Date Constructed	4/27/93
Contractor	E & F
Coordinates	2116218.6N, 1052519.4E

ELEVATION	796.35 ft
STICK-UP	2.85 ft
GROUND SURFACE ELEVATION	793.5 ft
DEPTH BELOW GROUND SURFACE	
TOP OF FINE SAND	8 ft
ELEVATION	185.5 ft
TOP OF PEA GRAVEL	9 ft
ELEVATION	784.5 ft
TOP OF SCREEN	10 ft
ELEVATION	783.5 ft
BOTTOM OF SCREEN	70 ft
ELEVATION	723.5 ft
END OF BORING	75 ft
ELEVATION	718.5 ft



1. LOCKING STEEL PROTECTIVE CASING
   DIAMETER 8 IN
   LENGTH 7 FT
2. SURFACE SEAL
   BENTONITE HYD. CHIPS/GRANULAR
   CONCRETE
3. HYDRATED BENTONITE CHIPS/GRANULAR, FINE SILICA SAND
4. PVC PIPE
   DIAMETER 6 IN ID
   SCHEDULE 80 PVC
5. SLOTTED PVC SCREEN
   DIAMETER 6 IN ID
   SCHEDULE 80 PVC
   SLOT SIZE 0.020 IN
   LENGTH 60 FT
6. PEA GRAVEL WASHED
7. BORING BACKFILL TO SCREEN BOTTOM BENTONITE CHIPS, PEA GRAVEL
8. BOREHOLE DIAMETER 14 IN
9. PROBE TOP VENTED SLIP CAP

SJC/jrs/DAP

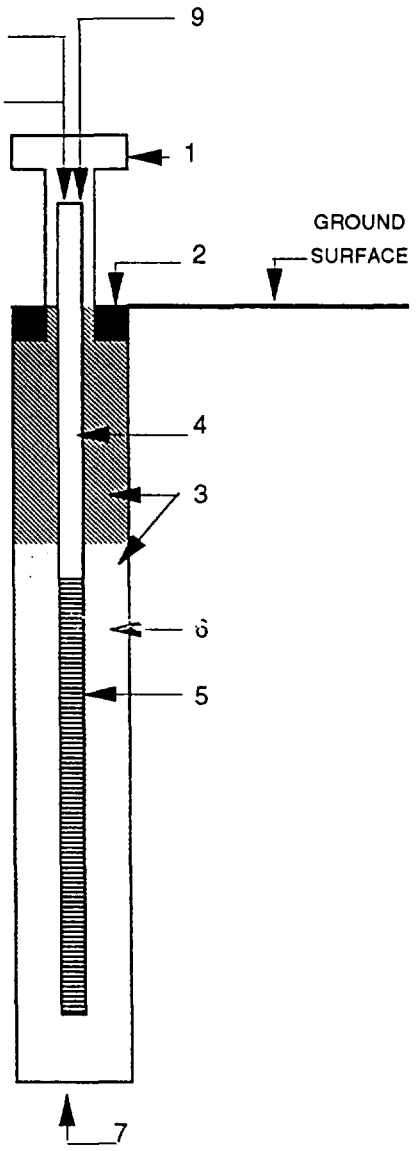
J:/10010201/LP8.XLS

WARZYN

LEACHATE PIEZOMETER DETAIL
LEACHATE PIEZOMETER NO. LP9

Project	HOD LANDFILL
Location	ANTIOCH, ILLINOIS
Job No.	10010201
Date Constructed	4/23/93
Contractor	E & F
Coordinates	2116220.4N, 1052769.9E

ELEVATION	789.16 ft
STICK-UP	3.36 ft
GROUND SURFACE ELEVATION	785.8 ft
DEPTH BELOW GROUND SURFACE	
TOP OF FINE SAND	7.5 ft
ELEVATION	778.3 ft
TOP OF PEA GRAVEL	8.5 ft
ELEVATION	777.3 ft
TOP OF SCREEN	9.2 ft
ELEVATION	776.6 ft
BOTTOM OF SCREEN	66.5 ft
ELEVATION	719.3 ft
END OF BORING	72 ft
ELEVATION	713.8 ft



1. LOCKING STEEL PROTECTIVE CASING
   DIAMETER 8 IN
   LENGTH 7 FT
2. SURFACE SEAL
   BENTONITE HYD CHIPS/GRANULAR
   CONCRETE
3. HYDRATED BENTONITE CHIPS/GRANULAR, FINE SILICA SAND
4. PVC PIPE
   DIAMETER 6 IN ID
   SCHEDULE 80 PVC
5. SLOTTED PVC SCREEN
   DIAMETER 6 IN ID
   SCHEDULE 80 PVC
   SLOT SIZE 0.020 IN
   LENGTH 57.3 FT
6. PEA GRAVEL WASHED
7. BORING BACKFILL TO SCREEN BOTTOM BENTONITE CHIPS THEN PEA GRAVEL
8. BOREHOLE
   DIAMETER 14 IN
9. PROBE TOP VENTED SLIP CAP

SJC/jrs/DAP

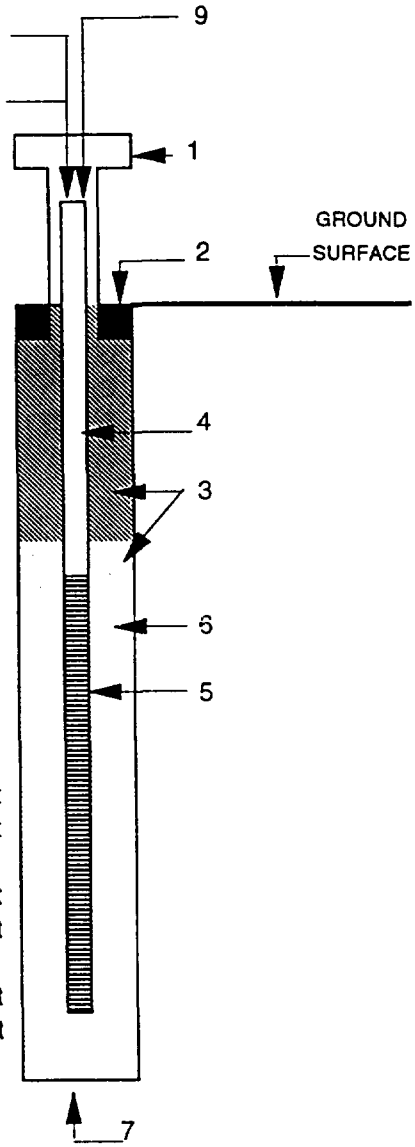
J:/10010201/LP9.XLS

WARZYN

LEACHATE PIEZOMETER DETAIL
LEACHATE PIEZOMETER NO. LP10

Project	HOD LANDFILL
Location	ANTIOCH, ILLINOIS
Job No.	10010201
Date Constructed	4/30/93
Contractor	E & F
Coordinates	2115810.4N, 1050919.8E

ELEVATION	783.92 ft
STICK-UP	2.82 ft
GROUND SURFACE ELEVATION	781.1 ft
DEPTH BELOW GROUND SURFACE	
TOP OF FINE SAND	7.1 ft
ELEVATION	774 ft
TOP OF PEA GRAVEL	8.3 ft
ELEVATION	772.8 ft
TOP OF SCREEN	9.5 ft
ELEVATION	771.6 ft
BOTTOM OF SCREEN	23 ft
ELEVATION	758.1 ft
END OF BORING	32 ft
ELEVATION	749.1 ft



1. LOCKING STEEL PROTECTIVE CASING
   DIAMETER 8 IN
   LENGTH 7 FT
2. SURFACE SEAL
   BENTONITE HYD. GRANULAR/CHIPS
   CONCRETE
3. HYDRATED BENTONITE GRANULAR/CHIPS, AND FINE SILICA SAND
4. PVC PIPE
   DIAMETER 6 IN ID
   SCHEDULE 80 PVC
5. SLOTTED PVC SCREEN
   DIAMETER 6 IN ID
   SCHEDULE 80 PVC
   SLOT SIZE 0.020 IN
   LENGTH 13.5 FT
6. PEA GRAVEL WASHED
7. BORING BACKFILL TO SCREEN BOTTOM BENTONITE CHIPS
8. BOREHOLE DIAMETER 14 IN
9. PROBE TOP VENTED SLIP CAP

SJC/jrs/DAP

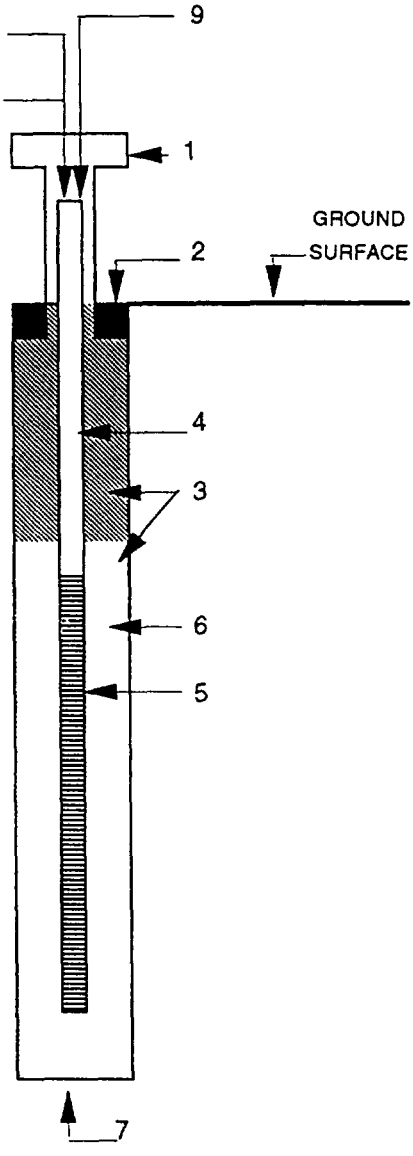
J:/10010201/LP10.XLS

WARZYN

LEACHATE PIEZOMETER DETAIL
LEACHATE PIEZOMETER NO. LP11

Project	HOD LANDFILL
Location	ANTIOCH, ILLINOIS
Job No.	10010201
Date Constructed	4/12/93
Contractor	E & F
Coordinates	2115807.1N, 1051321.8E

ELEVATION	790.61 ft
STICK-UP	2.81 ft
GROUND SURFACE ELEVATION	787.8 ft
DEPTH BELOW GROUND SURFACE	
TOP OF FINE SAND	6.5 ft
ELEVATION	781.3 ft
TOP OF PEA GRAVEL	7.5 ft
ELEVATION	780.3 ft
TOP OF SCREEN	9.3 ft
ELEVATION	778.5 ft
BOTTOM OF SCREEN	29.2 ft
ELEVATION	758.6 ft
END OF BORING	33 ft
ELEVATION	754.8 ft



1. LOCKING STEEL PROTECTIVE CASING
   DIAMETER 8 IN
   LENGTH 7 FT
2. SURFACE SEAL
   BENTONITE HYD. CHIPS/GRANULAR
   CONCRETE
3. HYDRATED BENTONITE CHIPS/GRANULAR & FINE SILICA SAND
4. PVC PIPE
   DIAMETER 6 IN ID
   SCHEDULE 80 PVC
5. SLOTTED PVC SCREEN
   DIAMETER 6 IN ID
   SCHEDULE 80 PVC
   SLOT SIZE 0.020 IN
   LENGTH 21.7 FT
6. PEA GRAVEL WASHED
7. BORING BACKFILL TO SCREEN BOTTOM WASHED PEA GRAVEL
8. BOREHOLE DIAMETER 14 IN
9. PROBE TOP VENTED SLIP CAP

SJC/jrs/DAP

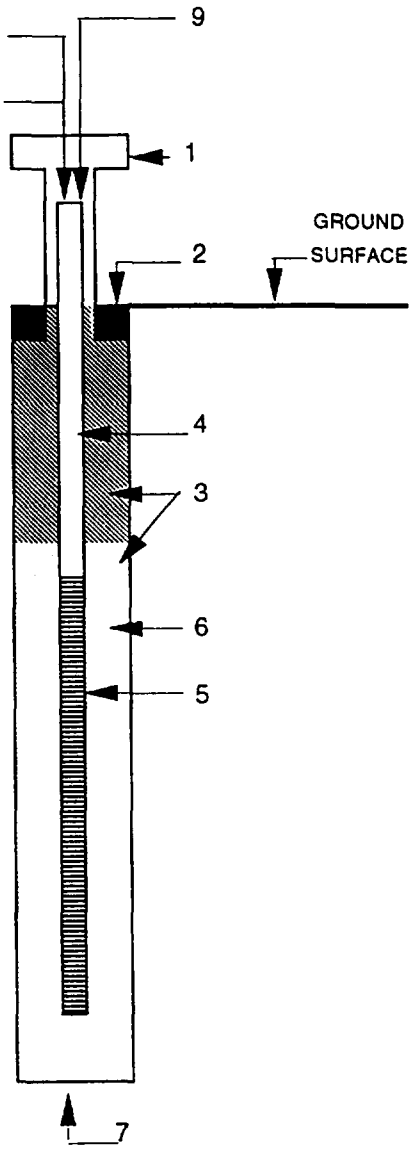
J:/10010201/LP11.XLS

WARZYN

LEACHATE PIEZOMETER DETAIL
LEACHATE PIEZOMETER NO. LP12

Project	HOD LANDFILL
Location	ANTIOCH, ILLINOIS
Job No.	10010201
Date Constructed	4/8/93
Contractor	E & F
Coordinates	2115515.5N, 1051138.4E

ELEVATION	784.85 ft
STICK-UP	2.25 ft
GROUND SURFACE ELEVATION	782.6 ft
DEPTH BELOW GROUND SURFACE	
TOP OF FINE SAND	7 ft
ELEVATION	775.6 ft
TOP OF PEA GRAVEL	8 ft
ELEVATION	774.6 ft
TOP OF SCREEN	10 ft
ELEVATION	772.6 ft
BOTTOM OF SCREEN	22.5 ft
ELEVATION	760.1 ft
END OF BORING	25.5 ft
ELEVATION	757.1 ft



1. LOCKING STEEL PROTECTIVE CASING
   DIAMETER 8 IN
   LENGTH 7 FT
2. SURFACE SEAL
   BENTONITE HYD. GRANULAR/CHIPS
   CONCRETE
3. HYDRATED BENTONITE GRANULAR/CHIPS, AND FINE SILICA SAND
4. PVC PIPE
   DIAMETER 6 IN ID
   SCHEDULE 80 PVC
5. SLOTTED PVC SCREEN
   DIAMETER 6 IN ID
   SCHEDULE 80 PVC
   SLOT SIZE 0.020 IN
   LENGTH 12.5 FT
6. PEA GRAVEL WASHED
7. BORING BACKFILL TO SCREEN BOTTOM WASHED PEA GRAVEL
8. BOREHOLE DIAMETER 14 IN
9. PROBE TOP VENTED SLIP CAP

SJC/jrrs/DAP

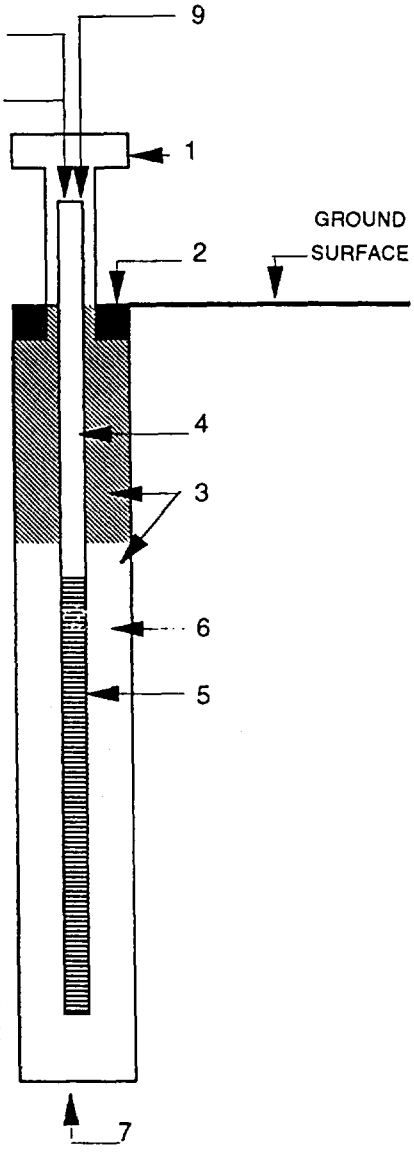
J:/10010201/LP12.XLS

WARZYN

LEACHATE PIEZOMETER DETAIL
LEACHATE PIEZOMETER NO. LP13

Project	HOD LANDFILL
Location	ANTIOCH, ILLINOIS
Job No.	10010201
Date Constructed	4/13/93
Contractor	E & F
Coordinates	2115448.4N, 1050899.8E

ELEVATION	781.68 ft
STICK-UP	2.68 ft
GROUND SURFACE ELEVATION	779 ft
DEPTH BELOW GROUND SURFACE	
TOP OF FINE SAND	8.2 ft
ELEVATION	770.8 ft
TOP OF PEA GRAVEL	9 ft
ELEVATION	770 ft
TOP OF SCREEN	9.83 ft
ELEVATION	769.17 ft
BOTTOM OF SCREEN	17 ft
ELEVATION	762 ft
END OF BORING	22 ft
ELEVATION	757 ft



1. LOCKING STEEL PROTECTIVE CASING
   DIAMETER 8 IN
   LENGTH 7 FT
2. SURFACE SEAL
   BENTONITE HYD. CHIPS/GRANULAR
   CONCRETE
3. HYDRATED BENTONITE
   GRANULAR/CHIPS, FINE SILICA SAND
4. PVC PIPE
   DIAMETER 6 IN ID
   SCHEDULE 80 PVC
5. SLOTTED PVC SCREEN
   DIAMETER 6 IN ID
   SCHEDULE 80 PVC
   SLOT SIZE 0.020 IN
   LENGTH 7.17 FT
6. PEA GRAVEL WASHED
7. BORING BACKFILL TO SCREEN BOTTOM
   WASHED PEA GRAVEL
8. BOREHOLE
   DIAMETER 14 IN
9. PROBE TOP Vented Slip Cap

SJC/jrs/DAP

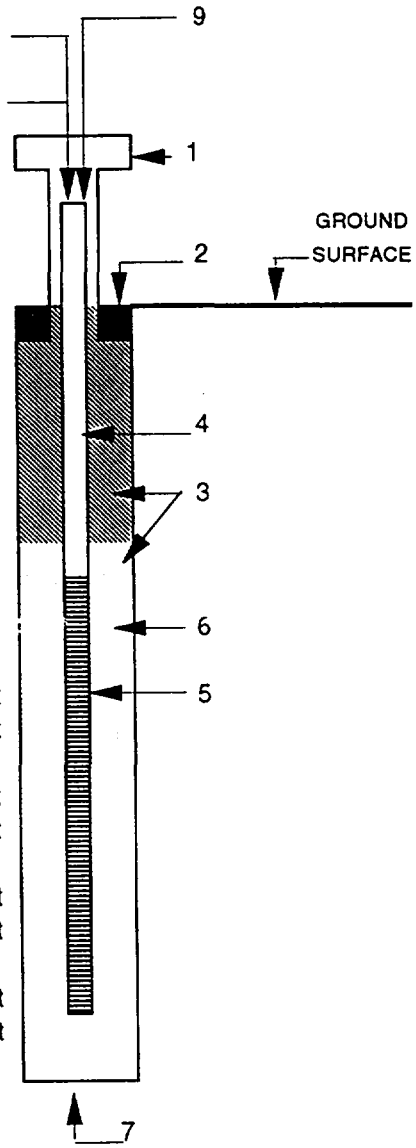
J:/10010201/LP13.XLS

WARZYN

LEACHATE PIEZOMETER DETAIL
LEACHATE PIEZOMETER NO. LP14

Project	HOD LANDFILL
Location	ANTIOCH, ILLINOIS
Job No.	10010201
Date Constructed	4/14/93
Contractor	E & F
Coordinates	2115474.5N, 1051389.5E

ELEVATION	784.27 ft
STICK-UP	2.57 ft
GROUND SURFACE ELEVATION	781.7 ft
DEPTH BELOW GROUND SURFACE	
TOP OF FINE SAND	8 ft
ELEVATION	773.7 ft
TOP OF PEA GRAVEL	8.9 ft
ELEVATION	772.8 ft
TOP OF SCREEN	10.2 ft
ELEVATION	771.5 ft
BOTTOM OF SCREEN	22.5 ft
ELEVATION	759.2 ft
END OF BORING	25 ft
ELEVATION	756.7 ft



1. LOCKING STEEL PROTECTIVE CASING
   DIAMETER 8 IN
   LENGTH 7 FT
2. SURFACE SEAL
   BENTONITE HYD. CHIPS/GRANULAR
   CONCRETE
3. HYDRATED BENTONITE
   CHIPS/GRANULAR, FINE SILICA SAND
4. PVC PIPE
   DIAMETER 6 IN ID
   SCHEDULE 80 PVC
5. SLOTTED PVC SCREEN
   DIAMETER 6 IN ID
   SCHEDULE 80 PVC
   SLOT SIZE 0.020 IN
   LENGTH 12.3 FT
6. PEA GRAVEL WASHED
7. BORING BACKFILL TO SCREEN BOTTOM
   WASHED PEA GRAVEL
8. BOREHOLE
   DIAMETER 14 IN
9. PROBE TOP VENTED SLIP CAP

SJC/jrs/DAP

J:/10010201/LP14.XLS

F

APPENDIX F

PERIMETER GAS PROBE BORING LOGS

Soil Borehole Logs
GP3
GP4
GP4A
GP5
GP5A

Gas Monitoring Probe Detail
GP3
GP4A
GP5A

SOIL BOREHOLE LOG

SITE NAME AND LOCATION H.O.D. Landfill - Antioch, Illinois	DRILLING METHOD: 4 1/4" IDHSA	BORING NO. GP3
	SAMPLING METHOD: 5 FT CME SAMPLING TUBE	SHEET 1 OF 1
		DRILLING START / FINISH
BORING LOCATION: SW 1/4 of SW 1/4 of Section 9 , T 46 N, R 10 E/W	WATER LEVEL / TIME	TIME / TIME
NORTHING 2116615.5 EASTING 1052220.9	DATE / CASING DEPTH	DATE 4/21/93 / DATE 4/21/93
DATUM ELEVATION 770.8		
DRILL RIG CME 750 ATV	SURFACE CONDITIONS GRASS COVERED SURFACE	
ANGLE Vertical BEARING -----		
SAMPLE HAMMER TORQUE FT-LBS		

DEPTH IN FEET (ELEVATION)	BLOWS/6 IN. ON SAMPLER	RECOVERY %	SYMBOL		SAMPLE NUMBER AND DESCRIPTION OF MATERIALS	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	TEST RESULTS: WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TESTS
	–	63		1	Brown TOPSOIL, Roots Present, Clayey Little to Some Sand to 1 Foot over Brown Sandy Clay to Silty Clay, Little to Some, Fine to Medium Sand to 2 Feet over 6" Moist Sand Layer	SB							1->4.5
768.3					Hard Brown and Gray Streaked Silty CLAY (CL), Little Fine to Coarse Sand, Grades to Little Fine Gravel, Limonite Patches and Gray Streaks								
5	–	100		2	Hard Brown Silty CLAY (CL) Trace to Little Fine to Coarse Sand, Trace Fine Gravel, Gray Streaks Present	SB							>4.5
10	–	97		3		SB							>4.5-3.5
					PID None Detected								
758.8					Very Stiff to Hard Gray Silty CLAY (CL), Trace to Little Fine to Coarse Sand, Trace Gravel								
15	–	100		4	PID None Detected	SB							2.75->4.5
20 750.8					End of Boring at 20 Feet Gas Probe Set at 19.85 Feet								
25													
30													
35													

LOGGED BY SJC DRILLING CONTR E&F

DATE 9/22/93 CHK'D BY DAP CHAS. MARKGRAF

SOIL BOREHOLE LOG

SITE NAME AND LOCATION H.O.D. Landfill - Antioch, Illinois	DRILLING METHOD: 4 1/4" IDHSA	BORING NO. GP4
	SAMPLING METHOD: 5 FT CME SAMPLING TUBE 2" SPLIT SPOON	SHEET 1 OF 1
		DRILLING START / FINISH
BORING LOCATION: SW 1/4 of SW 1/4 of Section 9 , T 46 N, R 10 E/W	WATER LEVEL / TIME	TIME / TIME
NORTHING / EASTING	TIME / DATE	DATE / DATE
DATUM / ELEVATION	CASING DEPTH	4/15/93 / 4/15/93
DRILL RIG CME 750 ATV	SURFACE CONDITIONS	
ANGLE Vertical BEARING ------		
SAMPLE HAMMER TORQUE FT-LBS		

DEPTH IN FEET (ELEVATION)	BLOWS/6 IN. ON SAMPLER	RECOVERY %	SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIALS	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	TEST RESULTS: WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TESTS
	–	96		1 FILL: Organic Topsoil, Roots Present Brown Silty Clay Cap Material Brown Silty Clay Grades to Little Brown Clay	SB							0.5-4
5	–	75		2 Refuse, Cloth Material at 4 Feet Plastic Material at 5 Feet	SB							–
				End of Boring at 6 Feet Boring Backfilled with Bentonite Chips								
10												
15												
20												
25												
30												
35												

LOGGED BY SJC DRILLING CONTR CM

DATE 9/22/93 CHK'D BY DAP CHAS. MARKGRAF

Template ID: WM1 ID: WM1

SOIL BOREHOLE LOG

SITE NAME AND LOCATION H.O.D. Landfill - Antioch, Illinois	DRILLING METHOD: 4 1/4" IDHSA		BORING NO. GP4A
	SAMPLING METHOD: 5 FT CME SAMPLING TUBE		SHEET 1 OF 1
			DRILLING START / FINISH
BORING LOCATION: SW 1/4 of SW 1/4 of Section 9 , T 46 N, R 10 E/W	WATER LEVEL / TIME		TIME / TIME
NORTHING 2116248.1 EASTING 1053013.8	DATE / CASING DEPTH		DATE 4/15/93 / DATE 4/15/93
DATUM ELEVATION 776.4			
DRILL RIG CME 750 ATV	SURFACE CONDITIONS GRASS COVERED		
ANGLE Vertical BEARING ------			
SAMPLE HAMMER TORQUE FT-LBS			

DEPTH IN FEET (ELEVATION)	BLOWS/6 IN. ON SAMPLER	RECOVERY %	SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIALS	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	TEST RESULTS: WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TESTS
775.4	–	67		1 10" Topsoil Over 4" Brown Sandy Clay, 1/2" Sand Lense at 14"	SB							25->4.5
773.4				Very Stiff to Hard Gray CLAY (CH)								
771.4 (5)	–	100		2 Very Stiff Brown CLAY (CH), Trace Fine to Coarse Sand, Trace Silt	SB							>4.5
				Very Stiff Brown Silty CLAY (CL), Little Fine to Coarse Sand, Trace to Little Fine Gravel, Trace Coarse Gravel								
(10)	–	97		3 3" Sandy Gravelly Clay Layer at 8 Feet, Grades to Very Stiff Brown and Gray Silty CLAY (CL) Little Fine to Coarse Sand, Trace to Little Gravel Very Stiff Gray Lean CLAY (CL), Trace to Some Silt, Little Fine to Coarse Sand, Trace to Little Fine Gravel, Trace Coarse Gravel 1" Sand Lense at 11 Feet	SB							3-4
761.9 (15)	–	95		4 3" Silt Layer at 14 Feet	SB							2.5-3.75
				Very Stiff Gray Lean CLAY (CL) Trace to Some Silt, Little Fine to Coarse Sand and Fine Gravel, Shale Fragments Present								
(20)	–	95		5 Silt Lenses Present 1" Silt Layer at 21 Feet	SB							2.5-3.75
752.8 (25)	–	67		6 1" Sand and Gravel Layer at 23.5 Feet Very Stiff Gray Sandy Gravelly CLAY (CL) 2" Sand and Gravel Layer at 25.5 Feet	SB							–
749.4				End of Boring at 27 Feet Gas Probe Set at 26 Feet								
(30)												
(35)												

LOGGED BY SJC DRILLING CONTR E&F

DATE 9/17/93 CHK'D BY DAP CHAS. MARKGRAF

Plate ID: WM1 ID: WM1

SOIL BOREHOLE LOG

SITE NAME AND LOCATION H.O.D. Landfill - Antioch, Illinois	DRILLING METHOD: 4 1/4" IDHSA	BORING NO. GP5
	SAMPLING METHOD: 5 FT CME SAMPLING TUBE	SHEET 1 OF 1
BORING LOCATION: SE 1/4 of SE 1/4 of Section 8 , T 46 N, R 10 E/W	WATER LEVEL / TIME / DATE / CASING DEPTH	DRILLING START: TIME / DATE 4/16/93; FINISH: TIME / DATE 4/16/93
NORTHING / EASTING		
DATUM / ELEVATION		
DRILL RIG CME 750 ATV	SURFACE CONDITIONS GRASS COVERED LANDFILL CAP	
ANGLE Vertical BEARING ------		
SAMPLE HAMMER TORQUE FT-LBS		

DEPTH IN FEET (ELEVATION)	BLOWS/6 IN. ON SAMPLER	RECOVERY %	SYMBOL	SAMPLE NUMBER	SAMPLE NUMBER AND DESCRIPTION OF MATERIALS	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	TEST RESULTS: WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TESTS
	–	92		1	FILL: Brown Silt and Wet Organic Clay Topsoil Over Brown and Gray Silty Clay, Little to Some Fine to Coarse Sand, Trace Coarse Gravel Sandy Lenses from 2-4 Feet	SB							->4.5
5	–	83		2	FILL: Gray Clay	SB							–
					Refuse Material at 9 Feet								
10					End of Boring at 9 Feet Boring Backfilled with Bentonite Chips								
15													
20													
25													
30													
35													

LOGGED BY SJC DRILLING CONTR E&F

DATE 9/17/93 CHK'D BY DAP CHAS. MARKGRAF

Template ID: WM1 ID: WM1

SOIL BOREHOLE LOG

SITE NAME AND LOCATION H.O.D. Landfill - Antioch, Illinois	DRILLING METHOD: 4 1/4" IDHSA	BORING NO. GP5A	
	SAMPLING METHOD: 5 FT CME SAMPLING TUBE	SHEET 1 OF 1	
		DRILLING START	DRILLING FINISH
BORING LOCATION: SE 1/4 of SE 1/4 of Section 8 , T 46 N, R 10 E/W	WATER LEVEL	TIME	TIME
NORTHING 2115682.3 EASTING 1051583.3	TIME		
DATUM ELEVATION 768.4	DATE / CASING DEPTH	DATE 4/22/93	DATE 4/22/93
DRILL RIG CME 750 ATV	SURFACE CONDITIONS GRASS COVERED SURFACE		
ANGLE Vertical BEARING ------			
SAMPLE HAMMER TORQUE FT-LBS			

DEPTH IN FEET (ELEVATION)	BLOWS/6 IN. ON SAMPLER	RECOVERY %	SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIALS	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TESTS
	–	75		1 FILL: Brown Wet Topsoil with Grass Roots with Little to Some Fine to Coarse Sand, Trace Gravel	SB							1-2
	–	90		2 FILL: Grades to Hard Silty Clay with Little Fine to Coarse Sand, Trace Gravel, Brown Sandy Clay, Brush Fibers Observed in Brown Clay FILL: Gray and Black Clay to 6 Feet	SB							.75-2
5												
762.4												
761.4				Fibrous PEAT (PT)								
	–	52		3 Soft Gray CLAY (CH), Little Fine to Coarse Sand	SB							.25-1
10												
757.9												
756.9				Stiff Brown and Gray Mottled Silty CLAY (CL)								
	–	92		4 Stiff to Very Stiff Gray Silty CLAY (CL) Grades to Gray Clayey SILT to Silty CLAY (CL/ML), Little to Some Fine to Coarse Sand, Trace Fine Gravel to 13 Feet	SB							1.5-2.5
15				Grades to Gray Silty CLAY (CL), Little Fine to Coarse Sand, Trace Fine Gravel								
753.4												
751.9				Very Stiff Yellowish Brown and Gray Mottled Silty CLAY (CL) Grading to Clayey SILT, Silty CLAY (CL/ML), Trace to Little Fine to Coarse Sand, Trace Fine to Coarse Wet Gravel 3" Gray Silty Layer at 16.5 Feet								
	–	98		5	SB							1.5-2.75
20				Stiff to Very Stiff Gray Clayey SILT, Silty CLAY (CL/ML) Grades to Gray Silty CLAY (CL)								
746.4												
				End of Boring at 22 Feet Gas Probe Installed at 16.1 Feet								
25												
30												
35												

LOGGED BY SJC DRILLING CONTR E&F

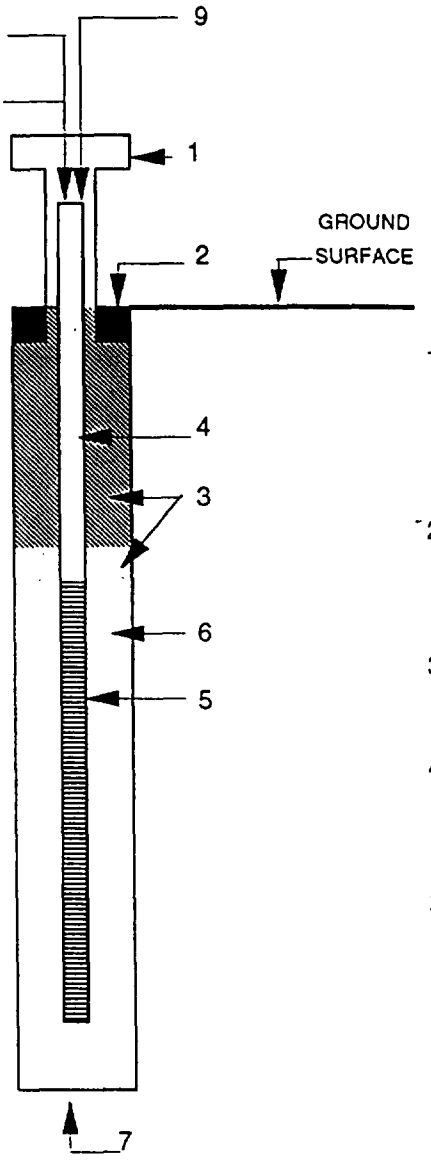
DATE 9/17/93 CHK'D BY DAP CHAS. MARKGRAF

Template ID: WM1 ID: WM1

GAS MONITORING PROBE
GAS PROBE NO. GP3

Project	HOD Landfill
Location	Antioch, Illinois
Job No.	10010201
Date Constructed	4/21/93
Contractor	E & F Drilling
Coordinates	2116615.5N, 1052220.9E

ELEVATION	773.51 ft
STICK-UP	2.71 ft
GROUND SURFACE ELEVATION	770.8 ft
DEPTH BELOW GROUND SURFACE	
TOP OF FINE SAND	N/A ft
ELEVATION	N/A ft
TOP OF PEA GRAVEL	3.6 ft
ELEVATION	767.2 ft
TOP OF SCREEN	5.03 ft
ELEVATION	765.77 ft
BOTTOM OF SCREEN	19.85 ft
ELEVATION	750.95 ft
END OF BORING	20 ft
ELEVATION	750.8 ft



1. LOCKING ALUMINUM PROTECTIVE CASING
   LENGTH 5 FT

2. SURFACE SEAL
   BENTONITE HYDRATED
   CONCRETE

3. HYDRATED BENTONITE
   GRANULAR TO SURFACE

4. PVC PIPE
   DIAMETER 2 IN ID
   SCHEDULE 40 PVC

5. SLOTTED PVC SCREEN
   DIAMETER 2 IN ID
   SCHEDULE 40 PVC
   SLOT SIZE 0.020 IN.
   LENGTH 14.65'

6. PEA GRAVEL WASHED

7. BORING BACKFILL TO SCREEN BOTTOM
   N/A

8. BOREHOLE
   DIAMETER 8.5 IN.

9. PROBE TOP VENTED PUSH CAP

SJC/jrs/DAP

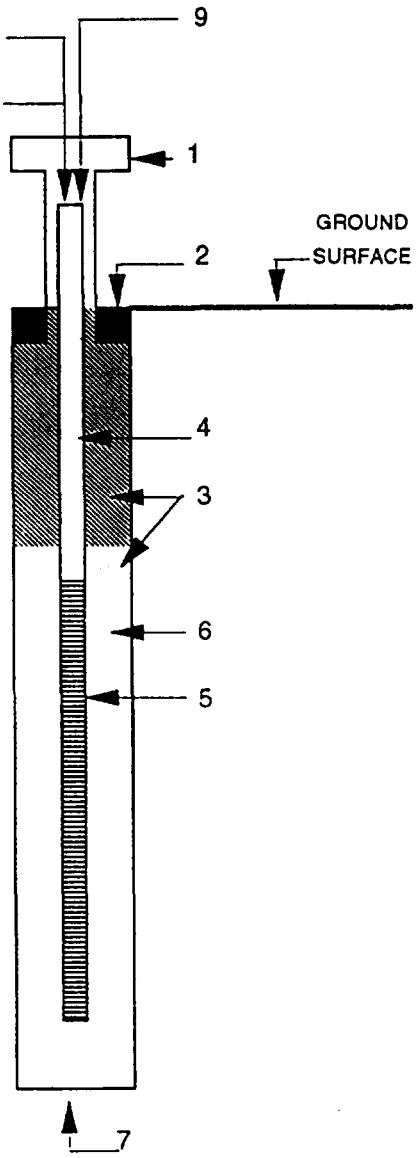
J:\10010201\GP3.XLS

VARZYN

GAS MONITORING PROBE
GAS PROBE NO. GP4A

Project	HOD LANDFILL
Location	ANTIOCH, ILLINOIS
Job No.	10010201
Date Constructed	4/15/93
Contractor	E & F
Coordinates	2116248.1N, 1053013.7E

ELEVATION	778.87	ft
STICK-UP	2.47	ft
GROUND SURFACE ELEVATION	776.4	ft
DEPTH BELOW GROUND SURFACE		
TOP OF FINE SAND	N/A	ft
ELEVATION	N/A	ft
TOP OF PEA GRAVEL	5	ft
ELEVATION	771.4	ft
TOP OF SCREEN	5.8	ft
ELEVATION	770.6	ft
BOTTOM OF SCREEN	26	ft
ELEVATION	750.4	ft
END OF BORING	27	ft
ELEVATION	749.4	ft



1. LOCKING STEEL PROTECTIVE CASING
   LENGTH 5 FT
2. SURFACE SEAL
   BENTONITE HYDRATED
   CONCRETE
3. HYDRATED BENTONITE
   CHIPS AND GRANULAR TO SURFACE
4. PVC PIPE
   DIAMETER 2 IN ID
   SCHEDULE 40 PVC
5. SLOTTED PVC SCREEN
   DIAMETER 2 IN ID
   SCHEDULE 40 PVC
   SLOT SIZE 0.020 IN
   LENGTH 20.7 FT
6. PEA GRAVEL WASHED
7. BORING BACKFILL TO SCREEN BOTTOM
   PEA GRAVEL
8. BOREHOLE
   DIAMETER 8.5 IN
9. PROBE TOP VENTED PUSH CAP

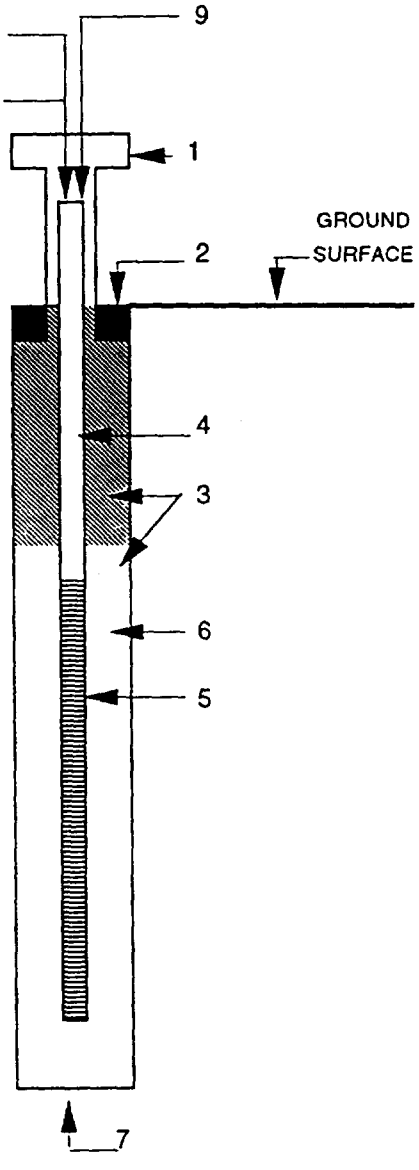
SJC/jrs/DAP

J:/10010201/GP4A.XLS

GAS MONITORING PROBE
GAS PROBE NO. GP5A

Project	HOD LANDFILL
Location	ANTIOCH, ILLINOIS
Job No.	10010201
Date Constructed	4/22/93
Contractor	E & F
Coordinates	2115682.3N, 1051583.3E

ELEVATION	770.8 ft
STICK-UP	2.4 ft
OUND RFACE ELEVATION	768.4 ft
DEPTH BELOW GROUND SURFACE	
TOP OF FINE SAND	N/A ft
ELEVATION	N/A ft
OP OF PEA GRAVEL	6 ft
ELEVATION	762.4 ft
TOP OF SCREEN	6 ft
ELEVATION	762.4 ft
TTOM OF SCREEN	16.1 ft
ELEVATION	752.3 ft
END OF BORING	22 ft
ELEVATION	746.4 ft



1. LOCKING STEEL PROTECTIVE CASING
   LENGTH 5 FT
2. SURFACE SEAL
   BENTONITE HYDRATED GRANULAR
   CONCRETE
3. HYDRATED BENTONITE GRANULAR
4. PVC PIPE
   DIAMETER 2 IN ID
   SCHEDULE 40 PVC
5. SLOTTED PVC SCREEN
   DIAMETER 2 IN ID
   SCHEDULE 40 PVC
   SLOT SIZE 0.020 IN
   LENGTH 10.09 FT
6. PEA GRAVEL WASHED
7. BORING BACKFILL TO SCREEN BOTTOM BENTONITE TO 17 FT THEN PEA GRAVEL
8. BOREHOLE DIAMETER 8.5 IN
9. PROBE TOP VENTED SLIP CAP

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J:/10010201/GP5A.XLS

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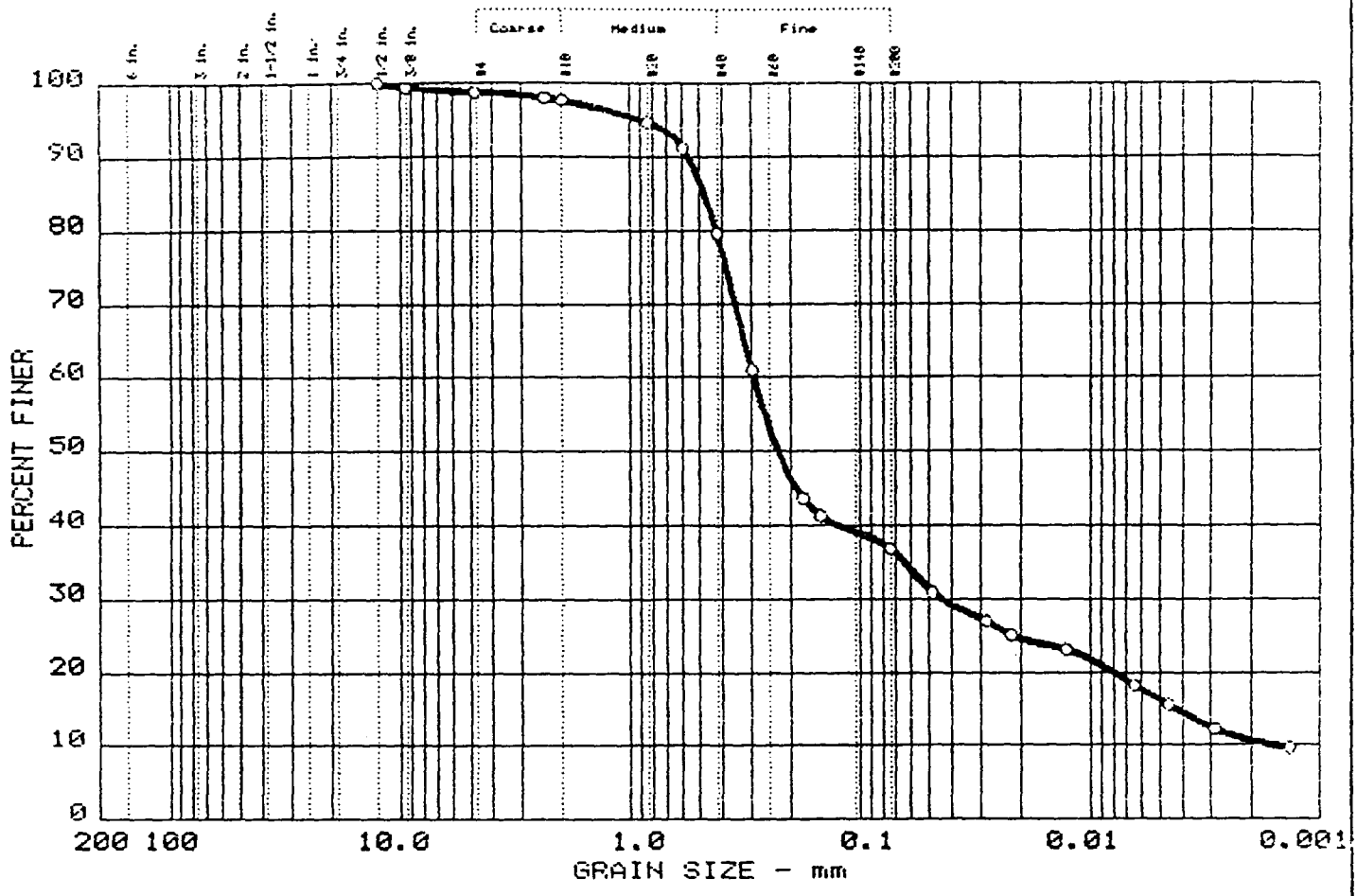

Symbol	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
○	0.0	1.2	62.0	20.6	16.2

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	25	9	0.48	0.29	0.23	0.044	0.0043	0.0014	4.62	202.1

MATERIAL DESCRIPTION	USCS
○ Brown Clayey SAND, Trace Gravel	SC

Project No.: 10010201
Project: H.O.D. LANDFILL RI/FS, Antioch, Illinois
○ Sample: HD-SU04-91

Date: 5/27/93

Remarks:
TESTED BY CLS
CHECKED BY CLS
APPROVED BY DTL

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WARZYN, INC.

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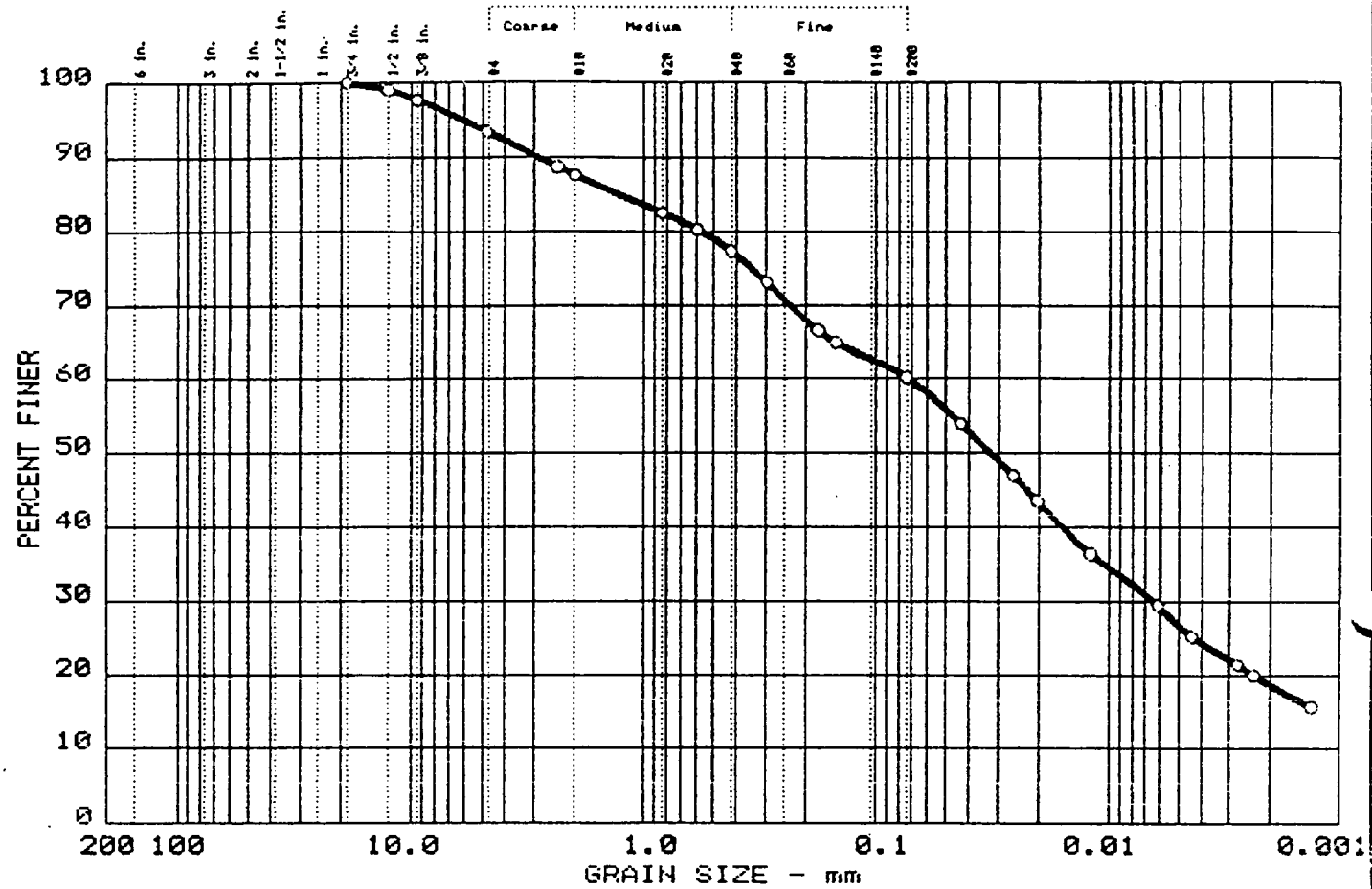

Symbol	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
○	0.0	6.6	33.1	33.5	26.8

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	29	12	1.26		0.03	0.006				

MATERIAL DESCRIPTION	USCS
○ Gray-Brown Lean CLAY, Some Sand, Little Gravel	CL

Project No.: 10010201
Project: H.O.D. LANDFILL RI/FS, Antioch, Illinois
○ Sample: HD-SU05-01

Date: 5/27/93

Remarks:
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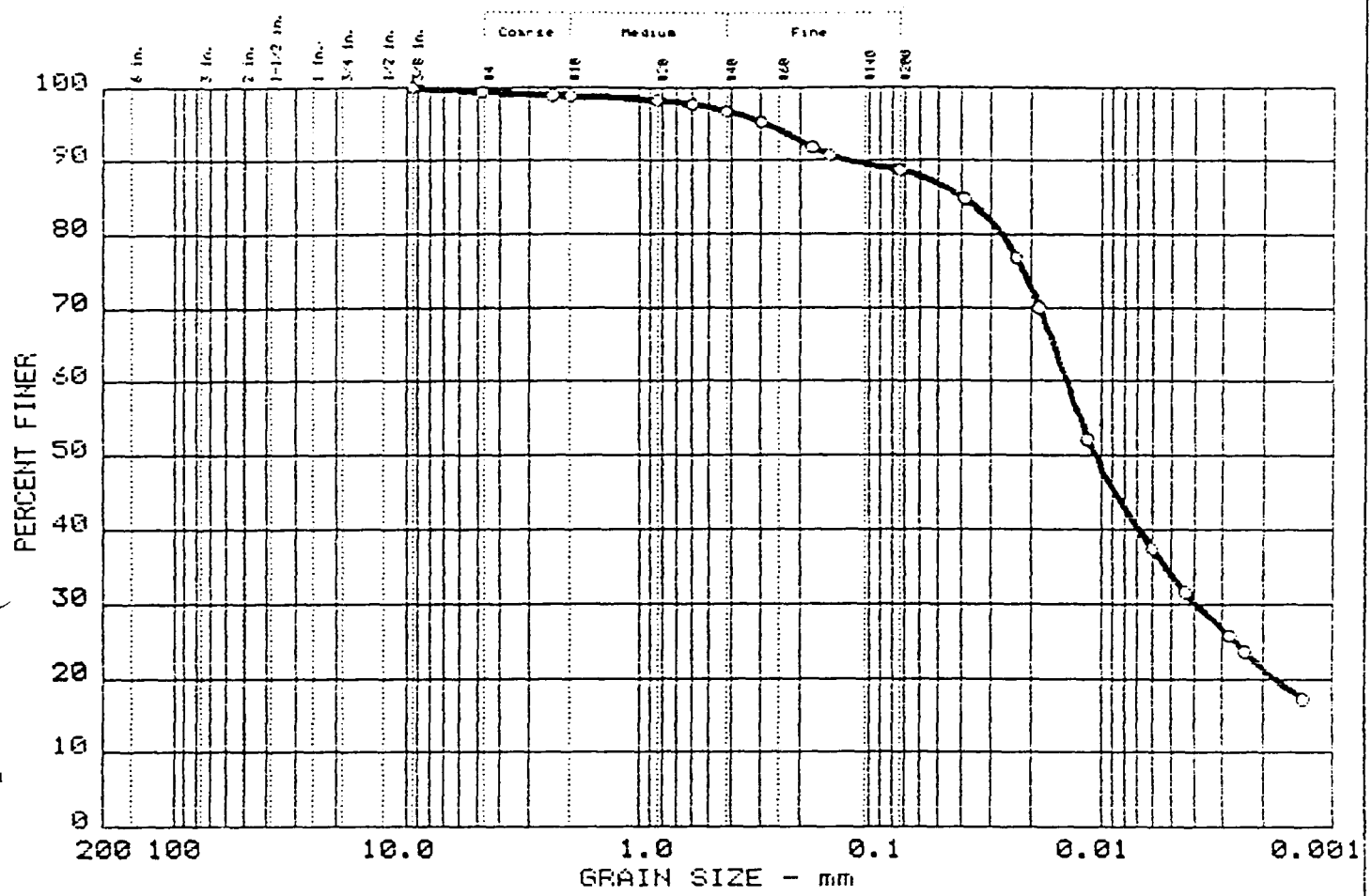

Symbol	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
○	0.0	0.6	10.8	54.8	33.8

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	30	11			0.01	0.004				

MATERIAL DESCRIPTION	USCS
○ Brown Lean CLAY, Little Sand, Trace Gravel	CL

Project No.: 10010201/38133
Project: H.O.D. LANDFILL RI/FS, Antioch, Illinois
○ Sample: HD-SSW2D-9

Date: 5/24/93

Remarks:
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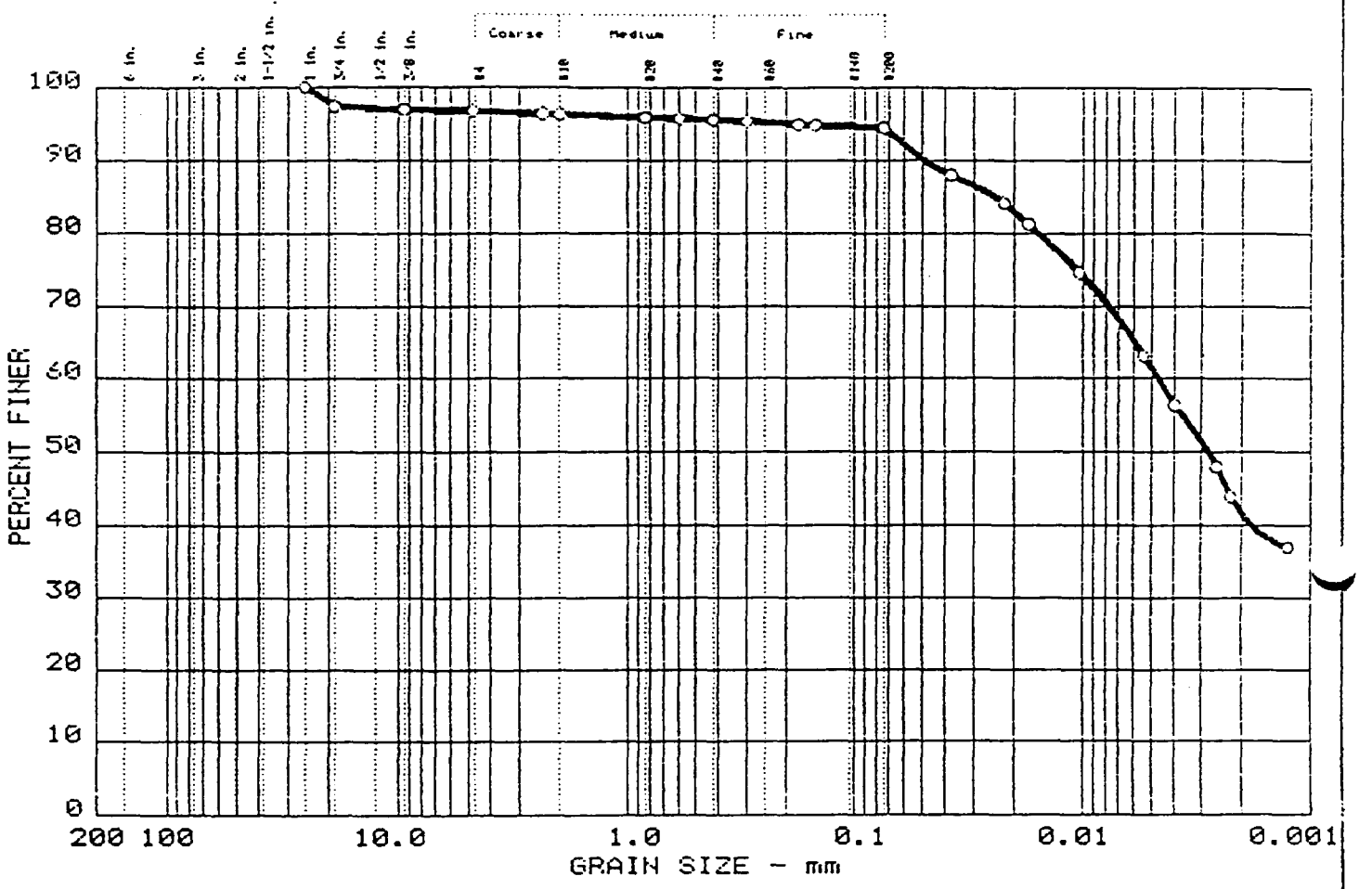

Symbol	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
O	0.0	3.3	2.3	33.3	61.1

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
O	38	19			0.00					

MATERIAL DESCRIPTION	USCS
O Brown Lean CLAY, Trace Gravel and Sand	CL

Project No.: 10010201/38133
Project: H.O.D. LANDFILL RI/FS, Antioch, Illinois
O Sample: HD-SSW2D-34

Date: 5/20/93

Remarks:
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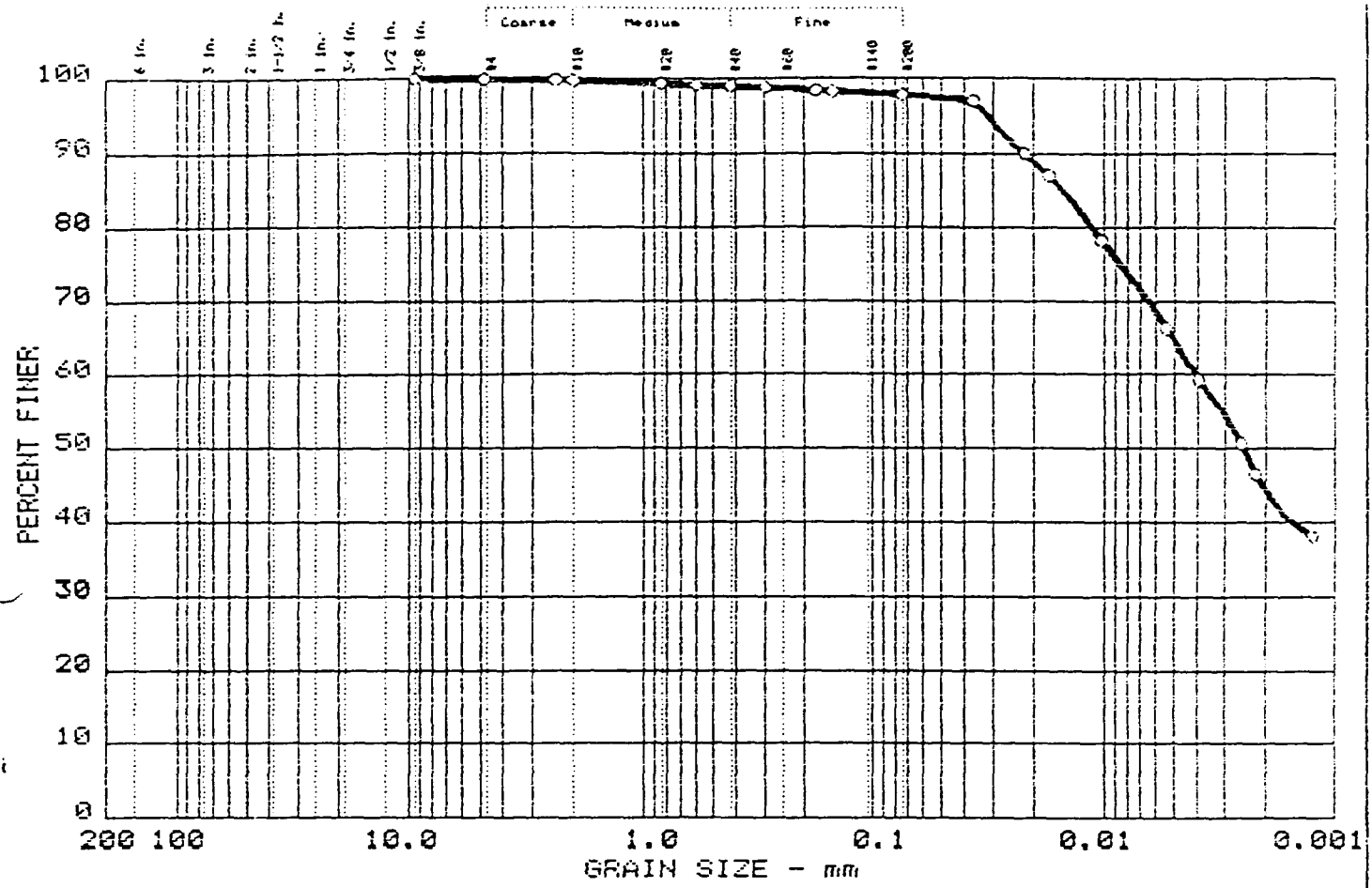

Symbol	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
○	0.0	0.1	2.0	33.4	64.5

	LL	PI	D_{95}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	38	19			0.00					

MATERIAL DESCRIPTION	USCS
○ Brown Lean CLAY, Trace Sand	CL

Project No.: 10010201/38133
Project: H.O.D. LANDFILL RI/FS, Antioch, Illinois
○ Sample: HD-SSW2D-934

Date: 5/24/93

Remarks:
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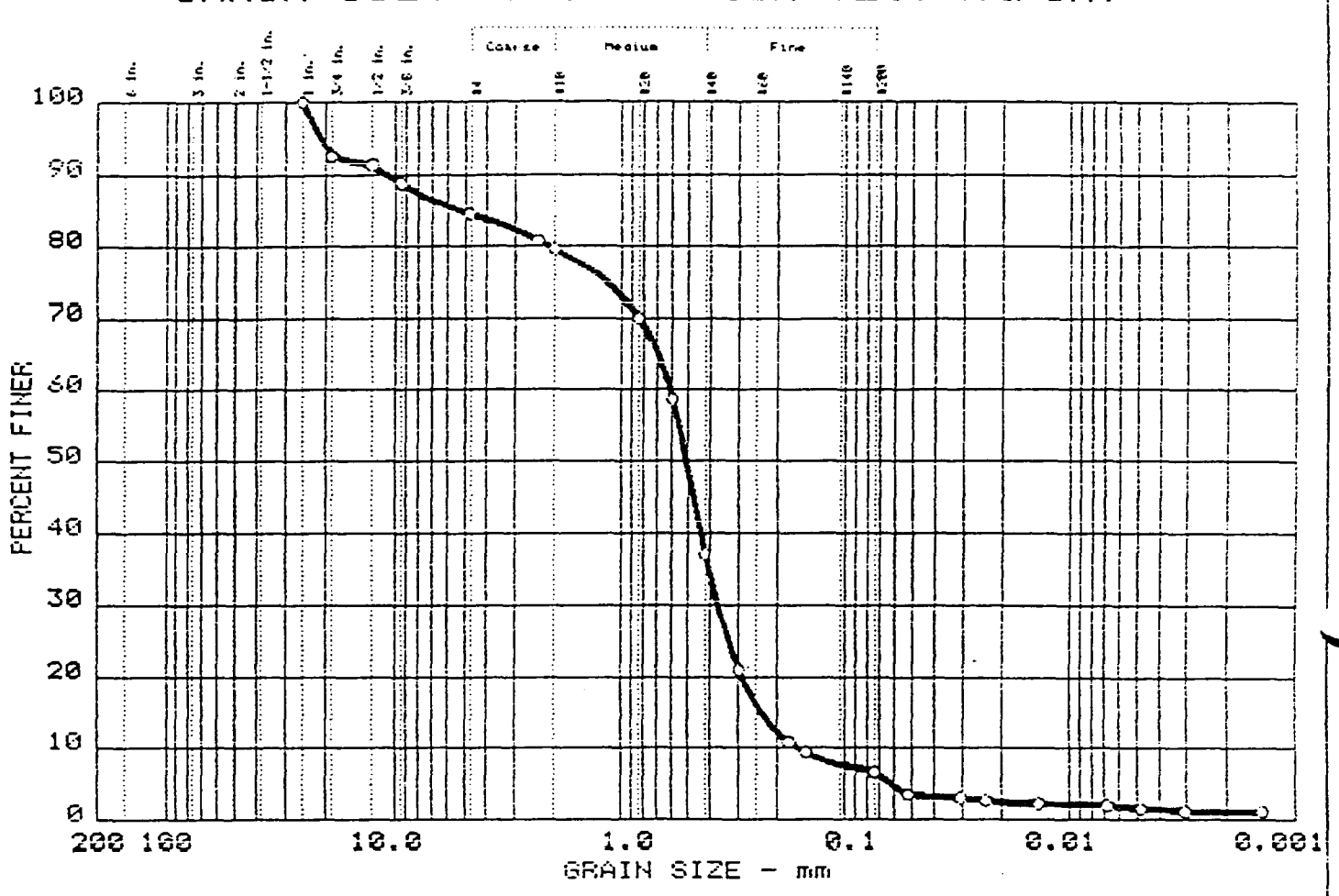

Symbol	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
○	0.0	15.3	78.0	5.1	1.6

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	--	--	5.13	0.61	0.51	0.369	0.2355	0.1574	1.43	3.8

MATERIAL DESCRIPTION	USCS
○ Brown Fine-Coarse SAND, Some Gravel, Little Silt, Trace Clay	SP-SM

Project No.: 10010201/38133
Project: H.O.D. LANDFILL RI/FS, Antioch, Illinois
○ Sample: HD-SSW2D-S8

Date: 5/24/93

Remarks:
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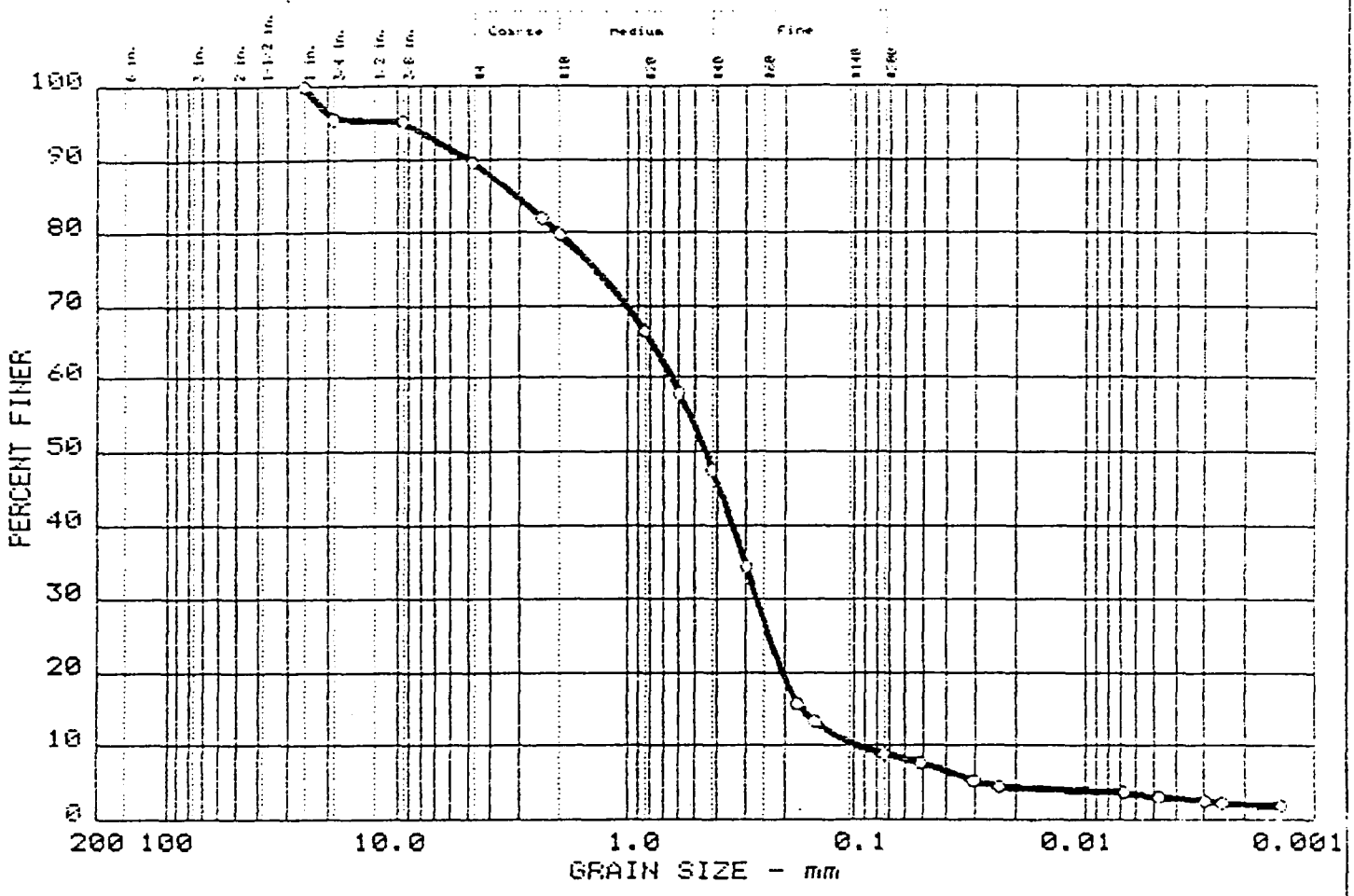

Symbol	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
○	0.0	10.4	80.7	5.7	3.2

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	--	--	3.09	0.64	0.45	0.268	0.1690	0.0940	1.20	6.8

MATERIAL DESCRIPTION	USCS
○ Gray-Brown Fine-Coarse SAND, Little Gravel & Silt, Trace Clay	SW-SM

Project No.: 10010201/38140
Project: H.O.D. LANDFILL RI/FS, Antioch, Illinois
○ Sample: Boring HD-SSW3SB-20

Date: 4/28/93

Remarks:
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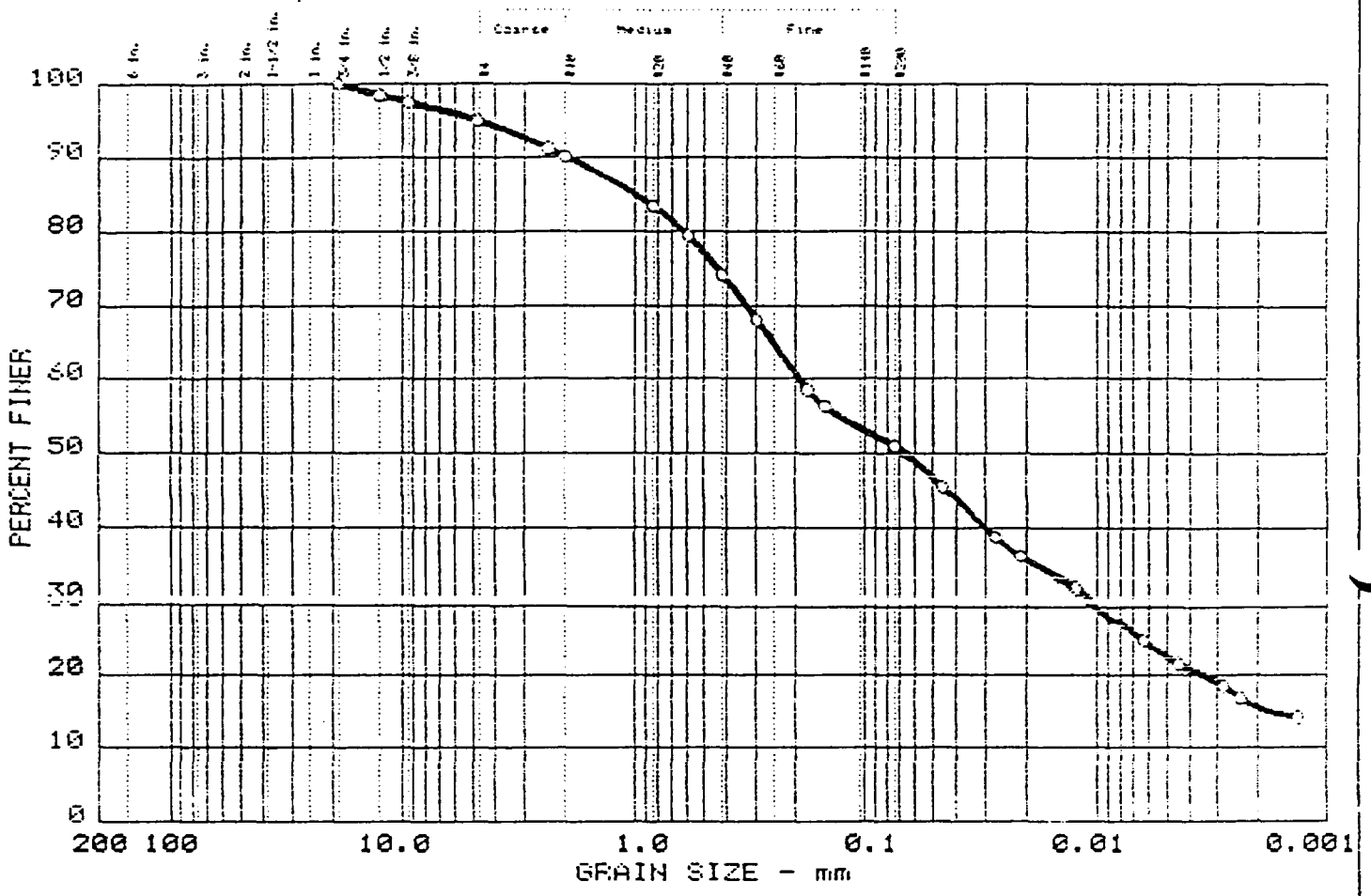

Symbol	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
○	0.0	5.0	44.0	28.8	22.2

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	18	6	1.00	0.19	0.07	0.010	0.0017			

MATERIAL DESCRIPTION	USCS
○ Gray-Brown Sandy Silty CLAY, Trace Gravel	CL-ML

Project No.: 10010201/38140
Project: H.O.D. LANDFILL RI/FS, Antioch, Illinois
○ Sample: Boring HD-SSW3D-40

Date: 4/28/93

Remarks:
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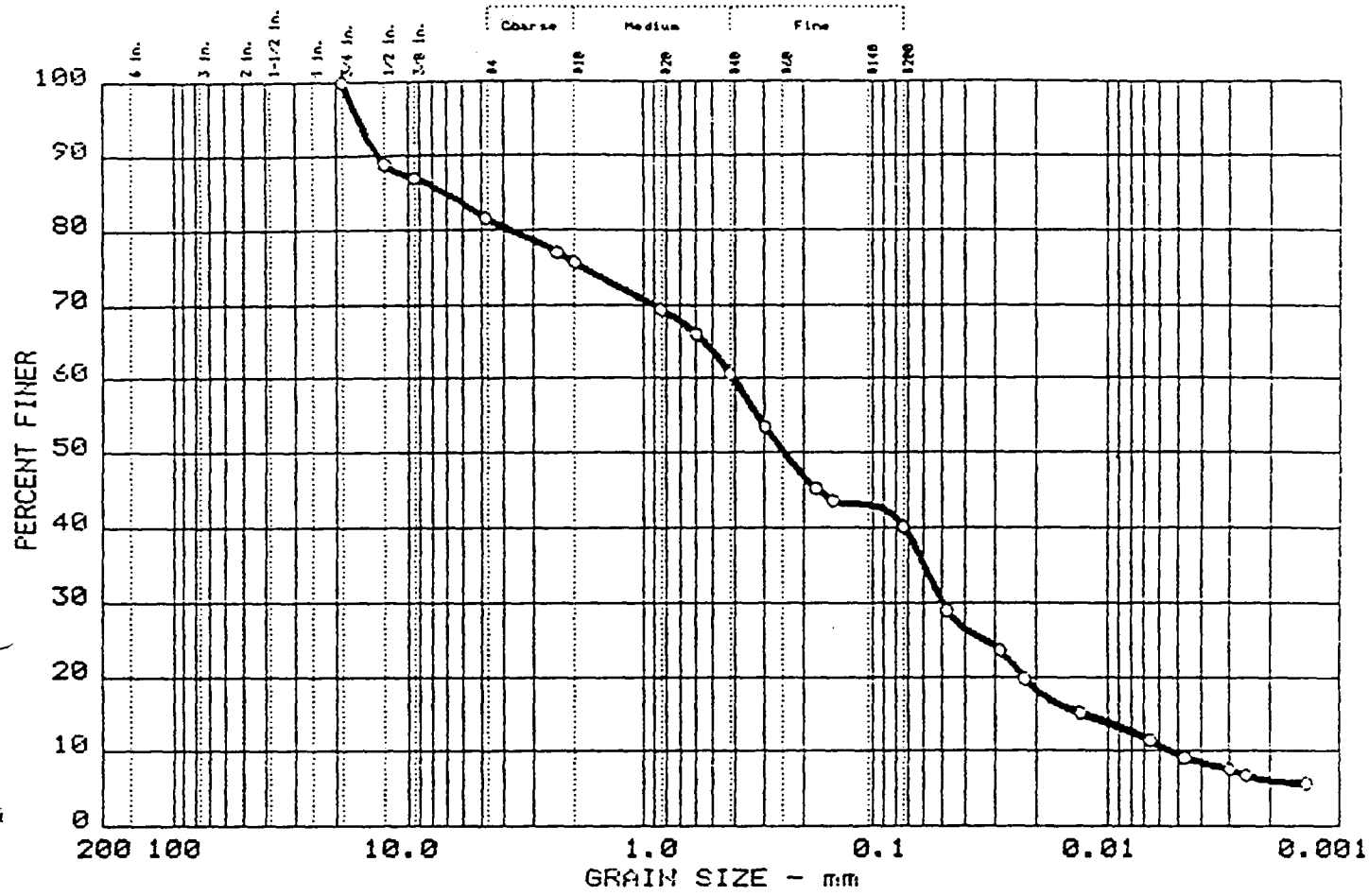

Symbol	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
O	0.0	18.5	41.4	30.6	9.5

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
O	63	NP	7.08	0.40	0.25	0.050	0.0127	0.0054	1.16	75.0

MATERIAL DESCRIPTION	USCS
O Brown Silty Fine-Coarse SAND, Some Gravel, Little Clay (Organic Content = 11.7%)	SM

Project No.: 10010201/38133
Project: H.O.D. LANDFILL RI/FS, Antioch, Illinois
O Sample: HD-SSW5S-9

Date: 5/26/93

Remarks:
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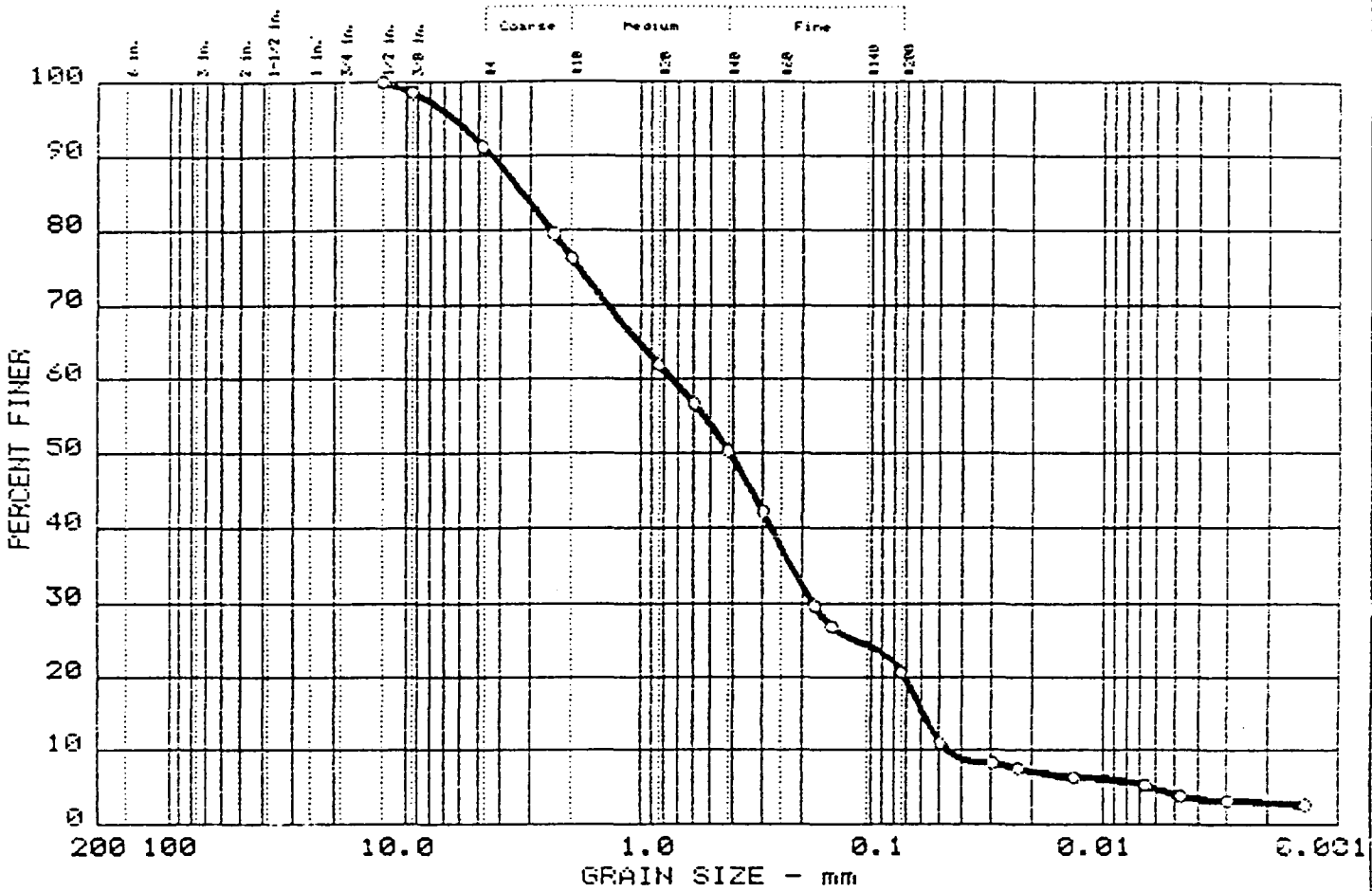

Symbol	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
○	0.0	8.8	70.6	16.5	4.1

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	--	--	3.20	0.72	0.41	0.180	0.0589	0.0462	0.97	15.7

MATERIAL DESCRIPTION	USCS
○ Brown Fine-Coarse SAND, Some Silt, Little Gravel, Trace Clay	SM

Project No.: 10010201/38133
Project: H.O.D. LANDFILL RI/FS, Antioch, Illinois
○ Sample: HD-SSW5S-14

Date: 5/24/93

Remarks:
TESTED BY TWP/CLS
CHECKED BY CLS
APPROVED BY DTL

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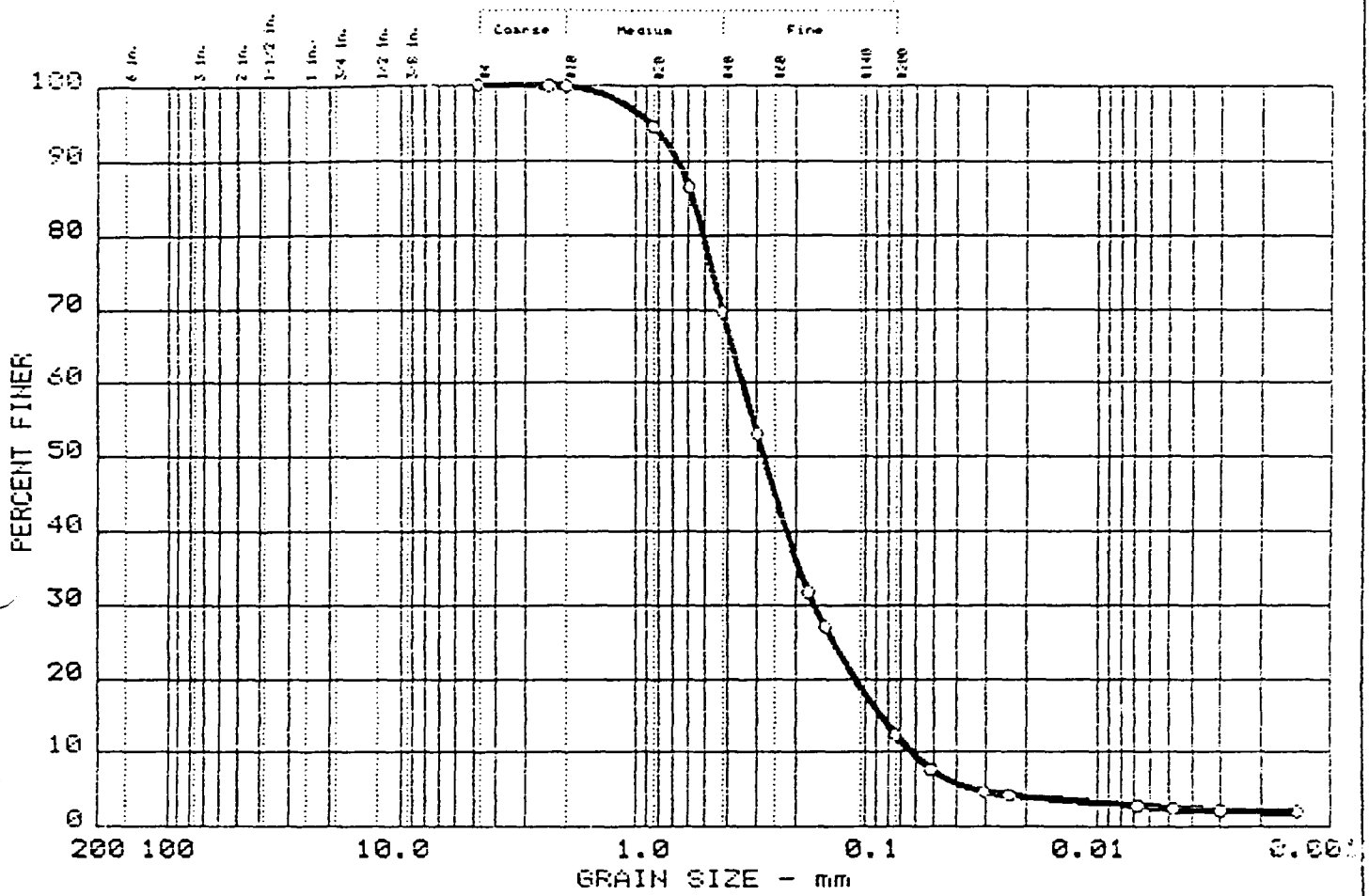


Symbol	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
O	0.0	0.0	87.6	9.9	2.5

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
O	--	--	0.57	0.34	0.28	0.167	0.0854	0.0626	1.29	5.5

MATERIAL DESCRIPTION	USCS
O Brown Fine-Medium SAND, Little Silt, Trace Clay	SM

Project No.: 10010201/38133
Project: H.O.D. LANDFILL RI/FS, Antioch, Illinois
O Sample: HD-SSW6S-14

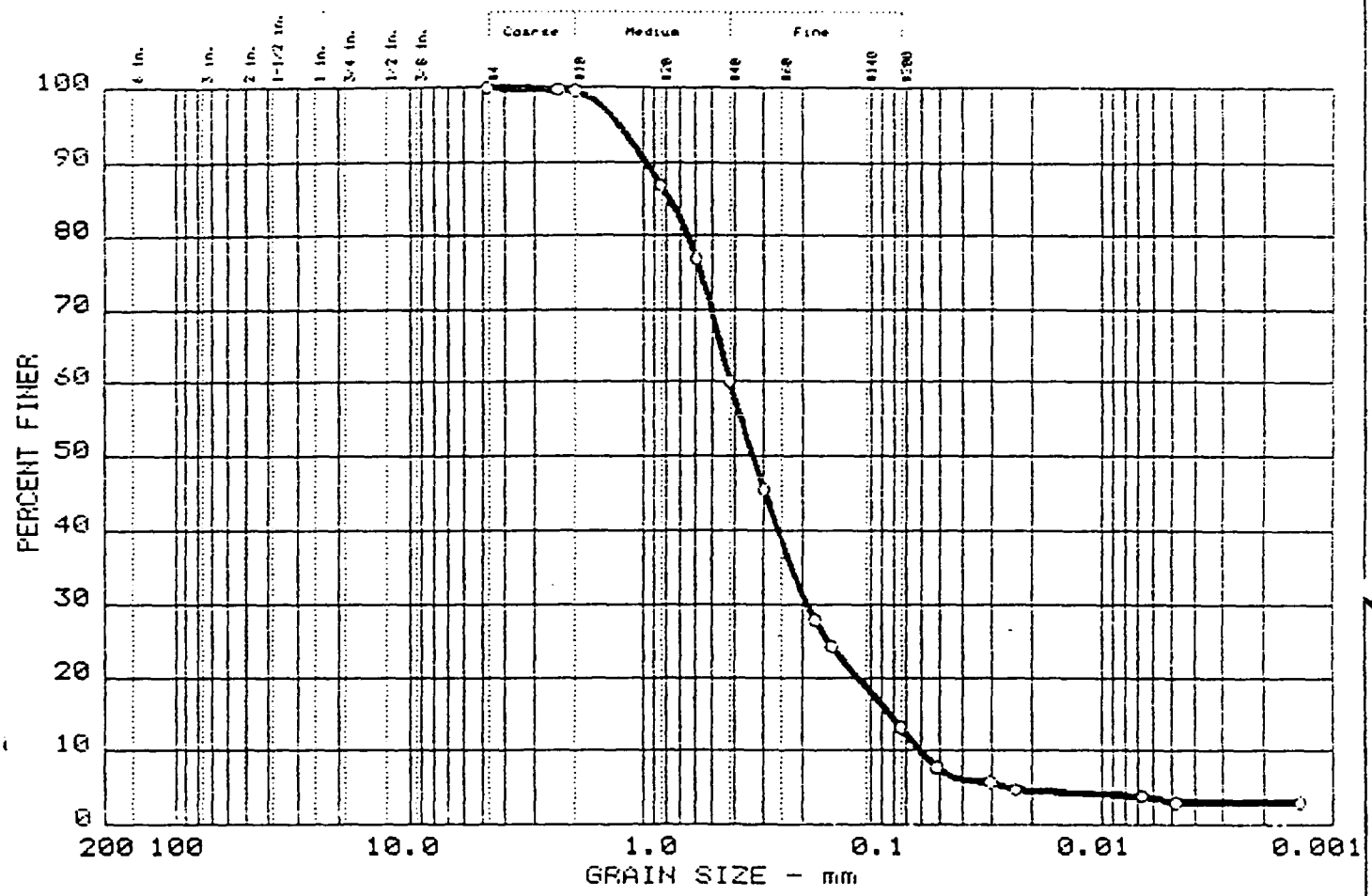
Date: 5/24/93

Remarks:
TESTED BY TWP/CLS
CHECKED BY CLS
APPROVED BY DTL

GRAIN SIZE DISTRIBUTION TEST REPORT
WARZYN, INC.

Sheet No.

GRAIN SIZE DISTRIBUTION TEST REPORT



Symbol	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
○	0.0	0.0	86.9	10.1	3.0

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	--	--	0.77	0.42	0.33	0.192	0.0827	0.0606	1.45	6.9

MATERIAL DESCRIPTION	USCS
○ Brown Fine-Medium SAND, Little Silt, Trace Clay	SM

Project No.: 10010201/38133
Project: H.O.D. LANDFILL RI/FS, Antioch, Illinois
○ Sample: HD-SSW6S-914

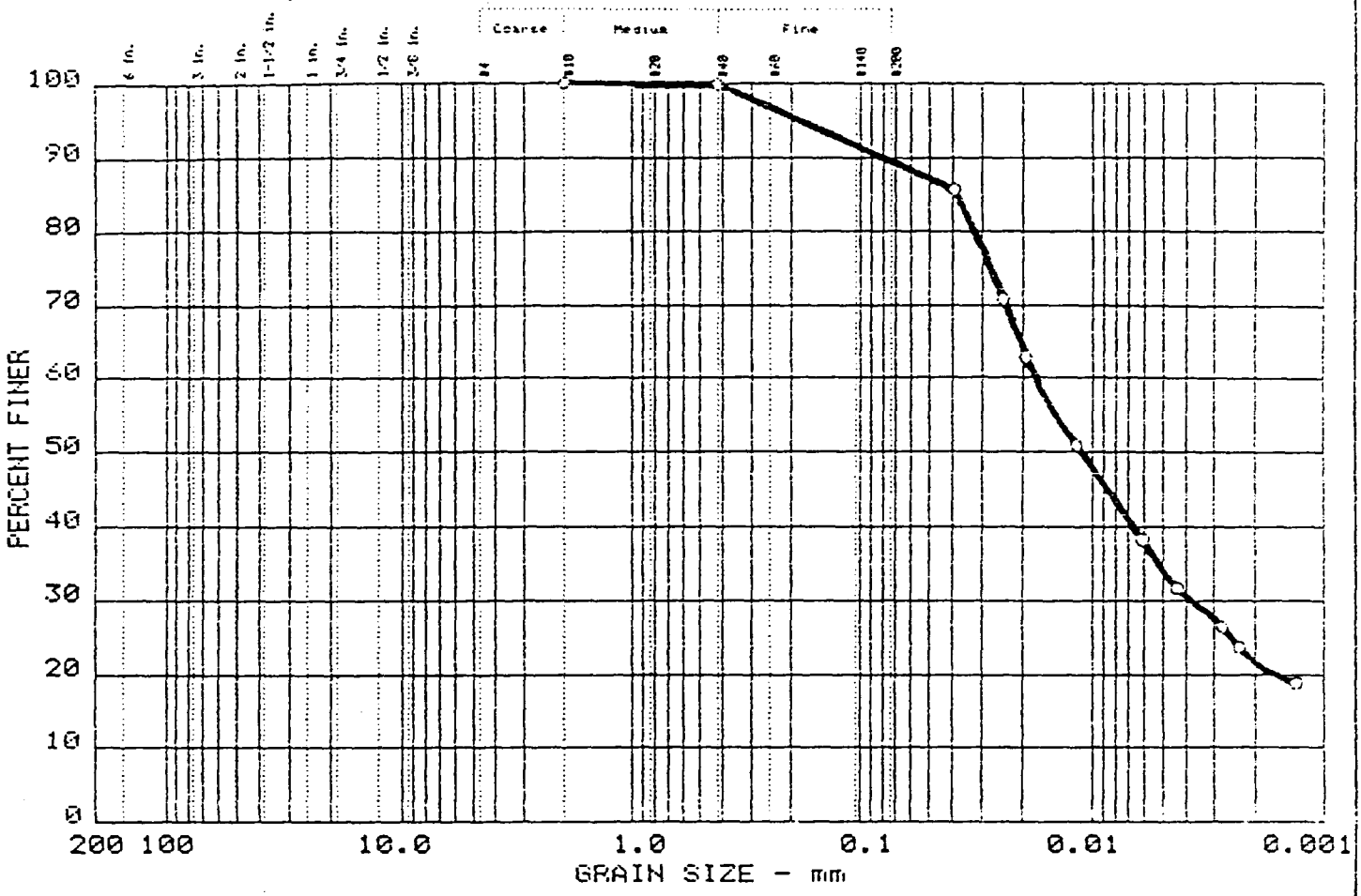
Date: 5/21/93

Remarks:
TESTED BY TWP/CLS
CHECKED BY CLS
APPROVED BY DTL

GRAIN SIZE DISTRIBUTION TEST REPORT
WARZYN, INC.

Sheet No.

GRAIN SIZE DISTRIBUTION TEST REPORT



Symbol	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
○	0.0	0.0	10.5	55.5	34.0

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	33	14			0.01	0.004				

MATERIAL DESCRIPTION	USCS
○ Gray-Brown Lean CLAY, Little Sand	CL

Project No.: 10010201/38140
Project: H.O.D. LANDFILL RI/FS, Antioch, Illinois
○ Sample: Boring HD-SSW7D-4

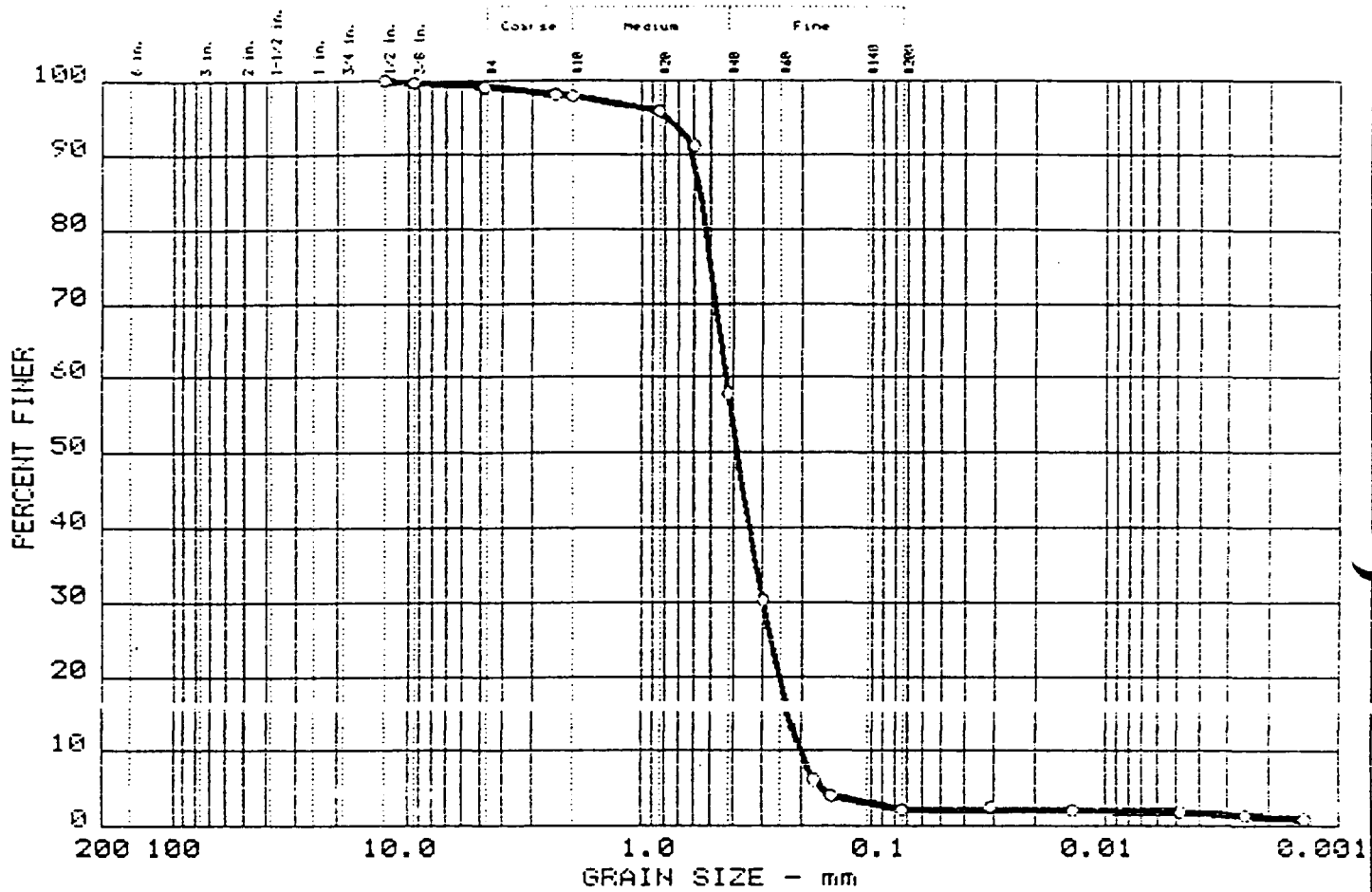
Date: 4/28/93

Remarks:
TESTED BY CLS
CHECKED BY CLS
APPROVED BY DTL

GRAIN SIZE DISTRIBUTION TEST REPORT
WARZYN, INC.

Sheet No.

GRAIN SIZE DISTRIBUTION TEST REPORT



Symbol	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
○	0.0	0.9	96.9	0.3	1.9

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	--	--	0.56	0.43	0.39	0.296	0.2270	0.2018	1.01	2.1

MATERIAL DESCRIPTION	USCS
○ Gray-Brown Fine-Medium SAND, Trace Clay, Gravel and Silt	SP

Project No.: 10010201/38140
Project: H.O.D. LANDFILL RI/FS, Antioch, Illinois
○ Sample: Boring HD-SSW7D-94

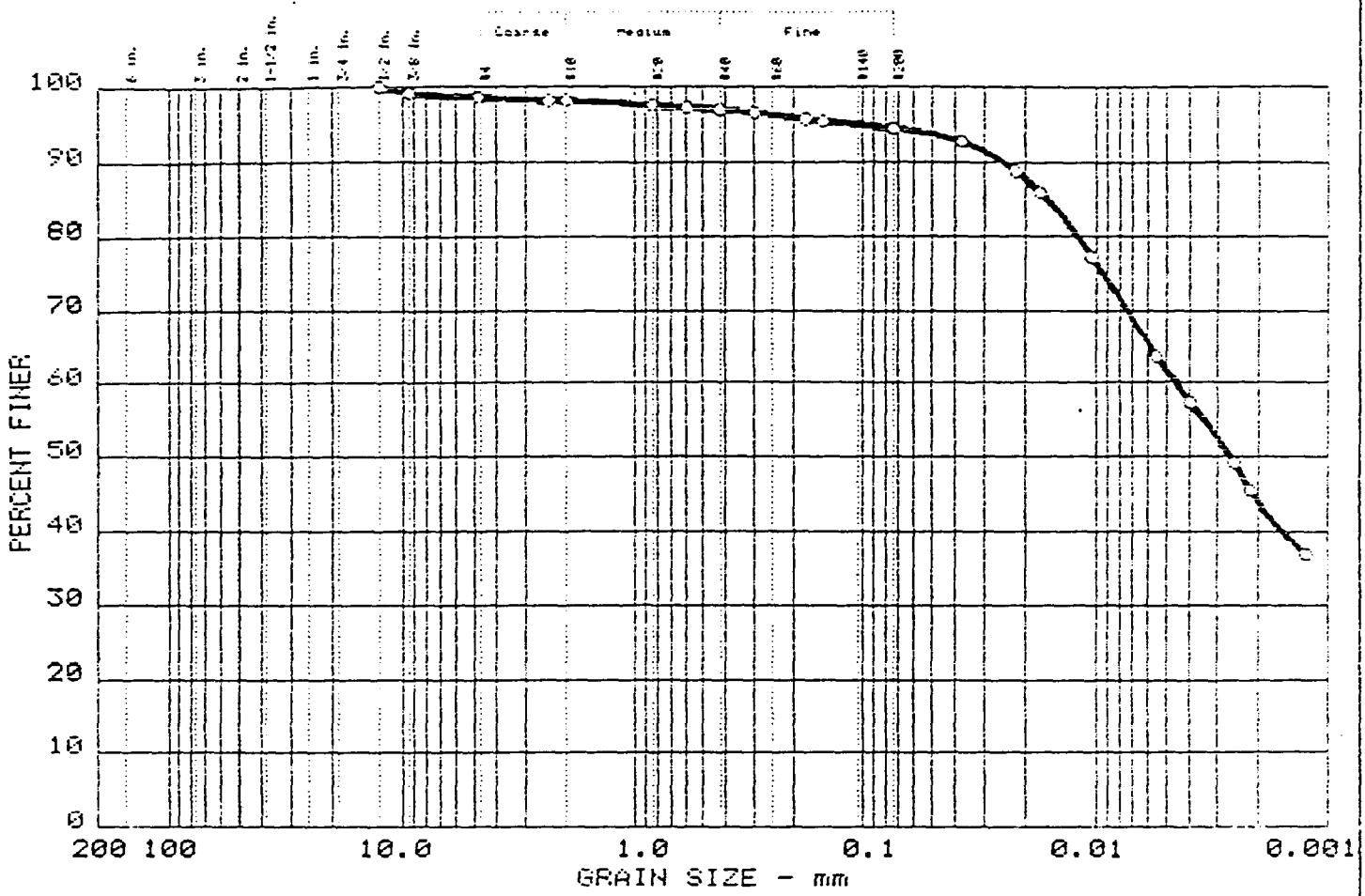
Date: 4/28/93

Remarks:
TESTED BY CLS
CHECKED BY CLS
APPROVED BY DTL

GRAIN SIZE DISTRIBUTION TEST REPORT
WARZYN, INC.

Sheet No.

GRAIN SIZE DISTRIBUTION TEST REPORT



Symbol	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
○	0.0	1.4	4.1	32.8	61.7

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	34	15			0.00					

MATERIAL DESCRIPTION	USCS
○ Gray-Brown Lean CLAY, Trace Sand and Gravel	CL

Project No.: 10010201/38140
Project: H.O.D. LANDFILL RI/FS, Antioch, Illinois
○ Sample: Boring HD-SSW7D-29

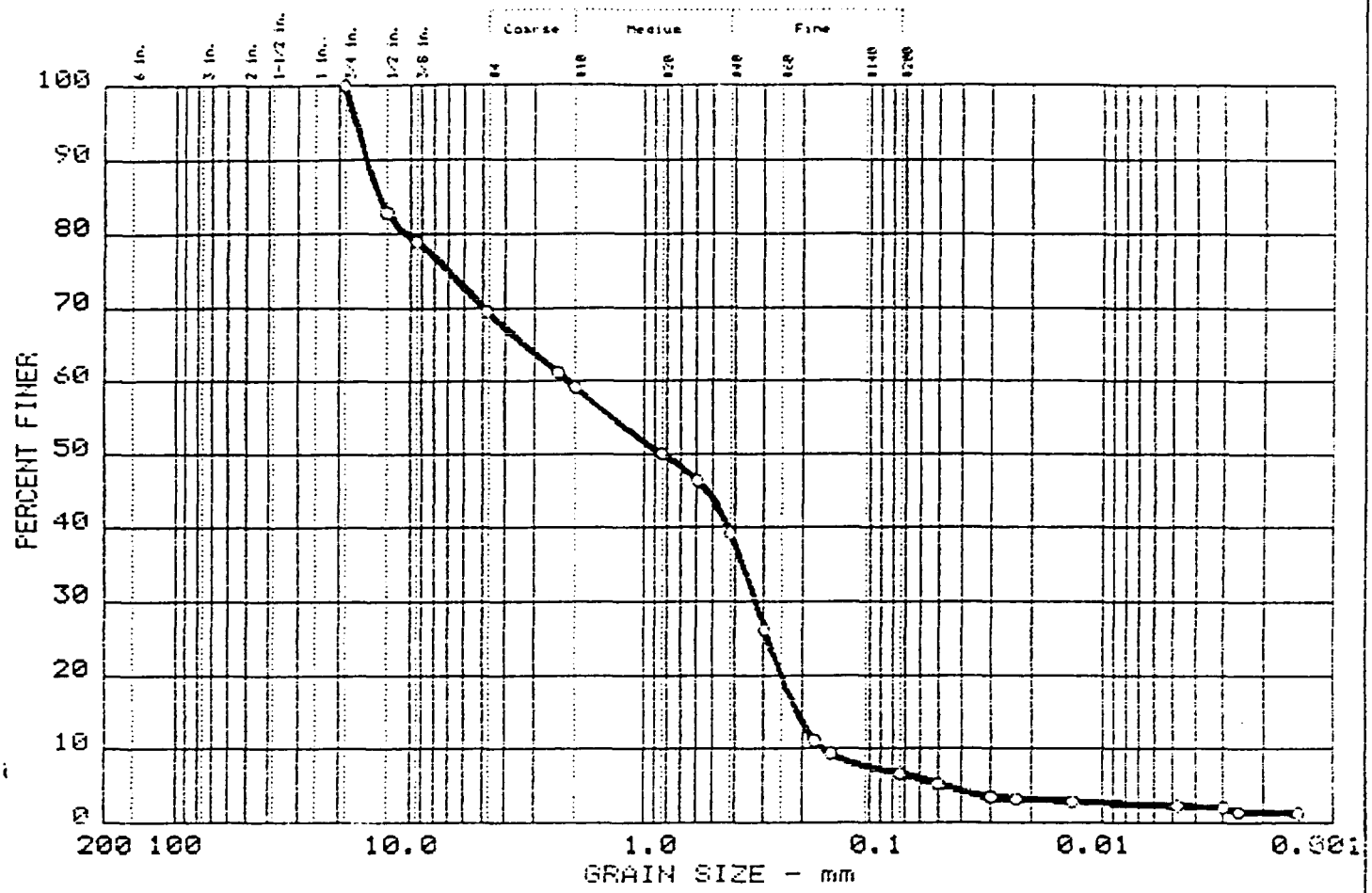
Date: 4/28/93

Remarks:
TESTED BY CLS
CHECKED BY CLS
APPROVED BY DTL

GRAIN SIZE DISTRIBUTION TEST REPORT
WARZYN, INC.

Sheet No.

GRAIN SIZE DISTRIBUTION TEST REPORT



Symbol	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
○	0.0	30.5	62.8	4.3	2.4

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	--	--	13.65	2.11	0.82	0.327	0.2131	0.1598	0.32	13.2

MATERIAL DESCRIPTION	USCS
○ Brown Fine-Coarse SAND, Some Gravel, Trace Silt and Clay	SP-SM

Project No.: 10010201/38133
Project: H.O.D. LANDFILL RI/FS, Antioch, Illinois
○ Sample: HD-SSB1-27

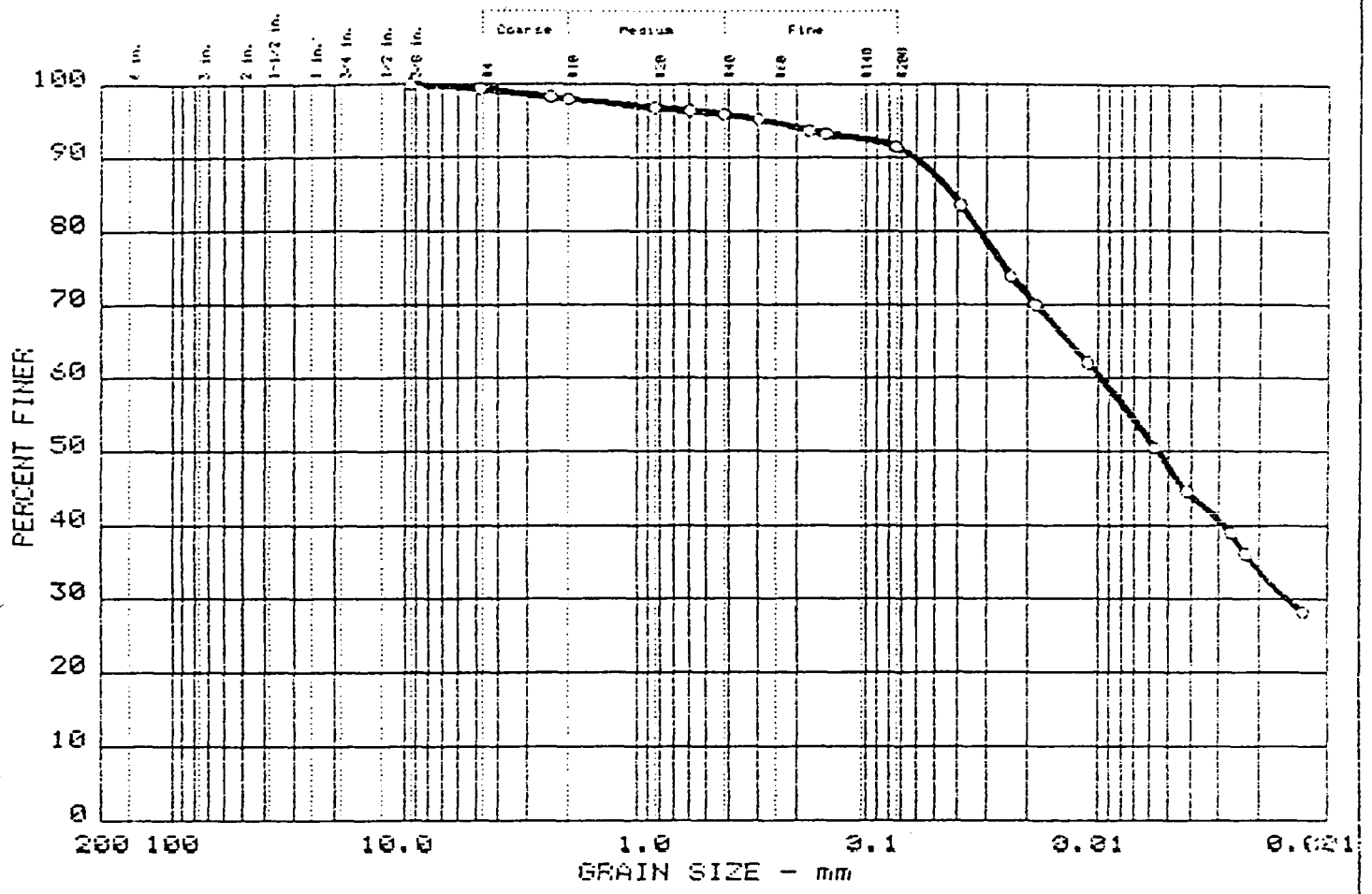
Date: 5/24/93

Remarks:
TESTED BY TWP/CLS
CHECKED BY CLS
APPROVED BY DTL

GRAIN SIZE DISTRIBUTION TEST REPORT
WARZYN, INC.

Sheet No.

GRAIN SIZE DISTRIBUTION TEST REPORT



Symbol	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
O	0.0	0.7	7.9	43.7	47.7

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
O	31	15			0.01	0.001				

MATERIAL DESCRIPTION	USCS
O Brown Lean CLAY, Little Sand, Trace Gravel	CL

Project No.: 10010201/38133
Project: H.O.D. LANDFILL RI/FS, Antioch, Illinois
O Sample: HD-SSB1-33

Date: 5/24/93

Remarks:
TESTED BY TWP/CLS
CHECKED BY CLS
APPROVED BY DTL

GRAIN SIZE DISTRIBUTION TEST REPORT
WARZYN, INC.

Sheet No.

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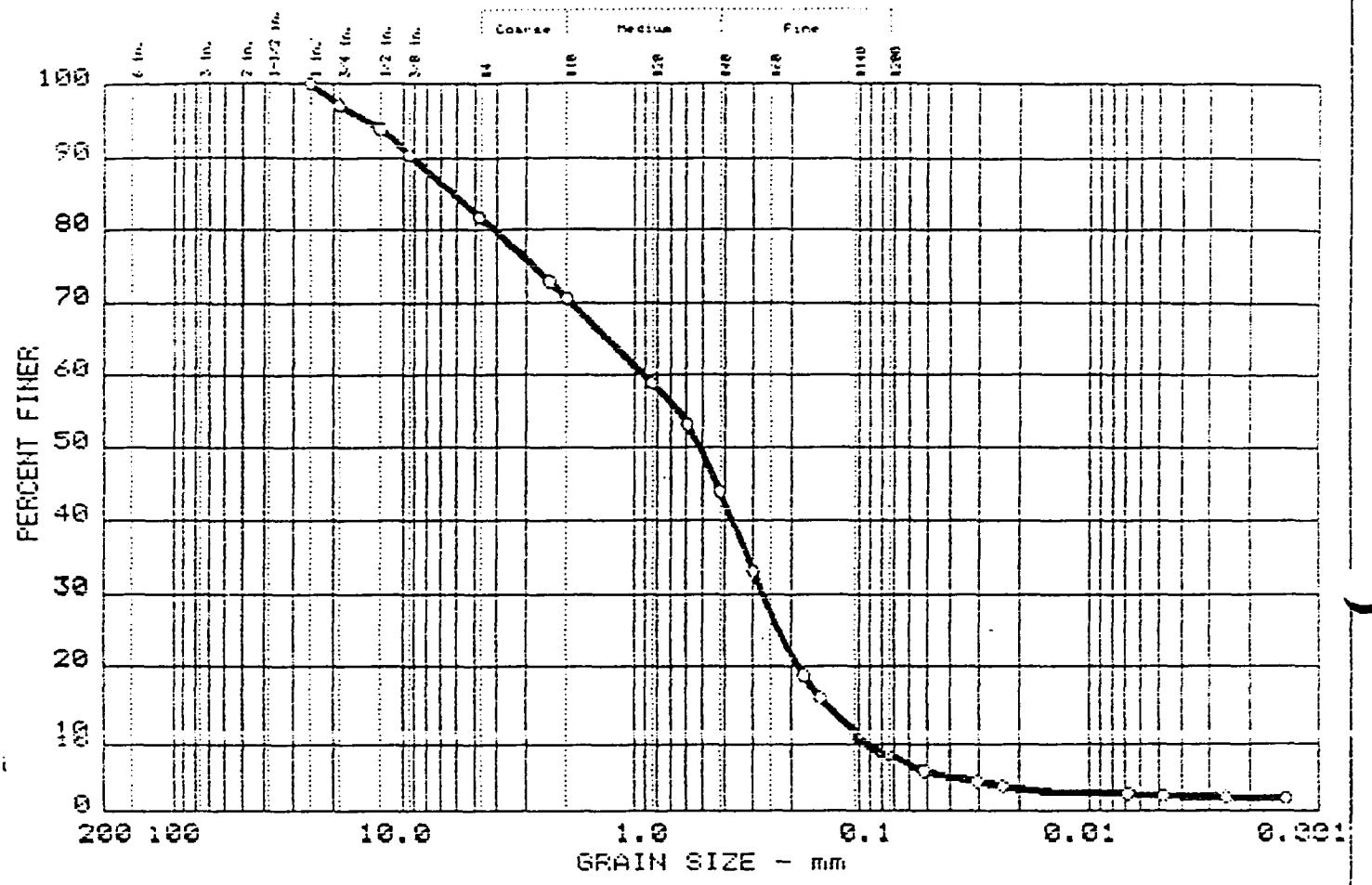


Symbol	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
○	0.0	18.3	73.9	5.7	2.1

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	--	--	6.17	0.90	0.52	0.269	0.1429	0.0944	0.85	9.5

MATERIAL DESCRIPTION	USCS
○ Brown Fine-Coarse SAND, Some Gravel, Little Silt, Trace Clay	SP-SM

Project No.: 10010201/38133
Project: H.O.D. LANDFILL RI/FS, Antioch, Illinois
○ Sample: HD-SSB2A-17

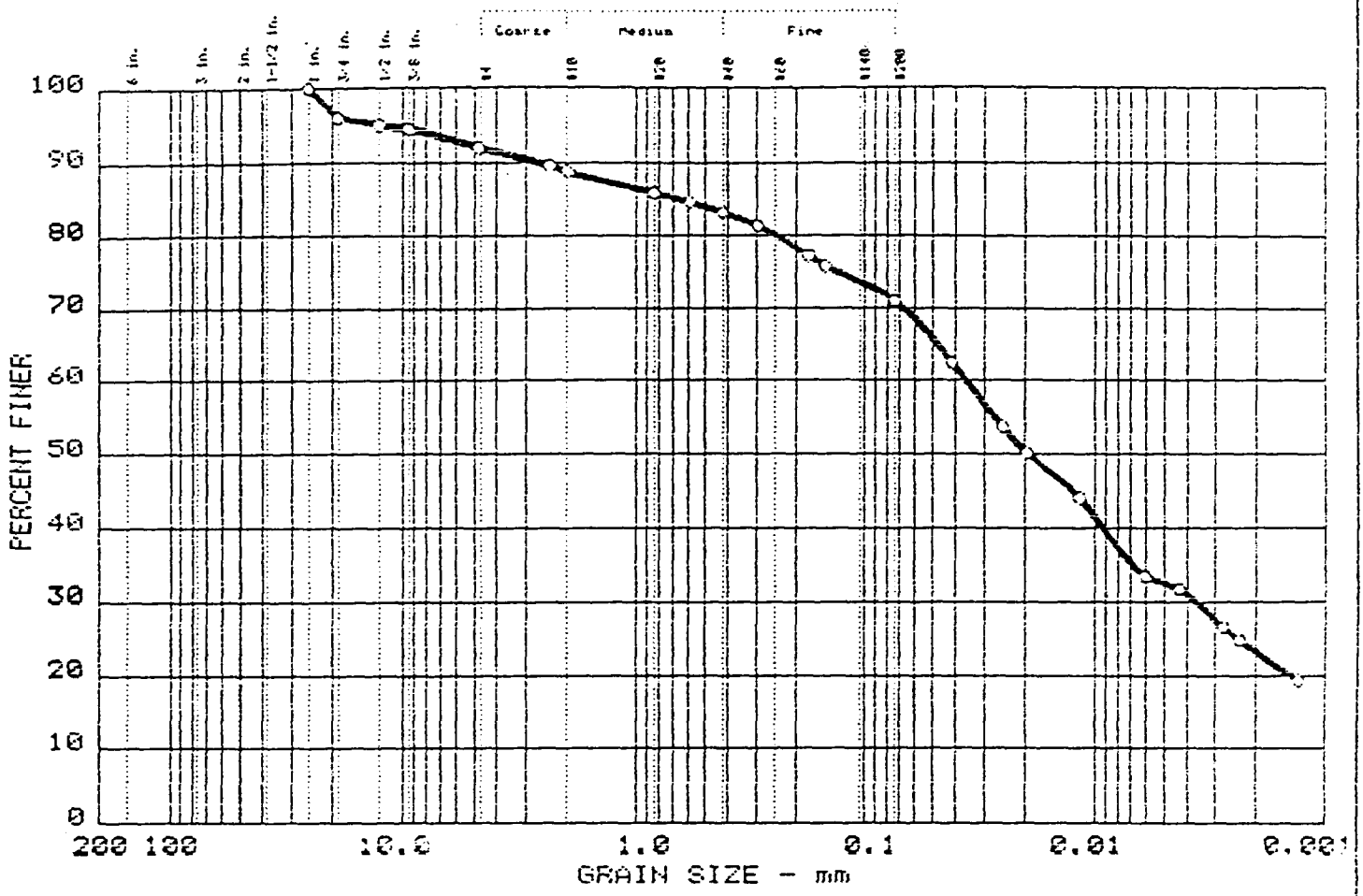
Date: 5/24/93

Remarks:
TESTED BY TWP/CLS
CHECKED BY CLS
APPROVED BY DTL

GRAIN SIZE DISTRIBUTION TEST REPORT
WARZYN, INC.

Sheet No.

GRAIN SIZE DISTRIBUTION TEST REPORT



Symbol	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
○	0.0	7.9	21.1	38.5	32.5

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	23	9	0.65		0.02	0.004				

MATERIAL DESCRIPTION	USCS
○ Brown Lean CLAY, Some Sand, Little Gravel	CL

Project No.: 10010201/38133
Project: H.O.D. LANDFILL RI/FS, Antioch, Illinois
○ Sample: HD-SSB2-36

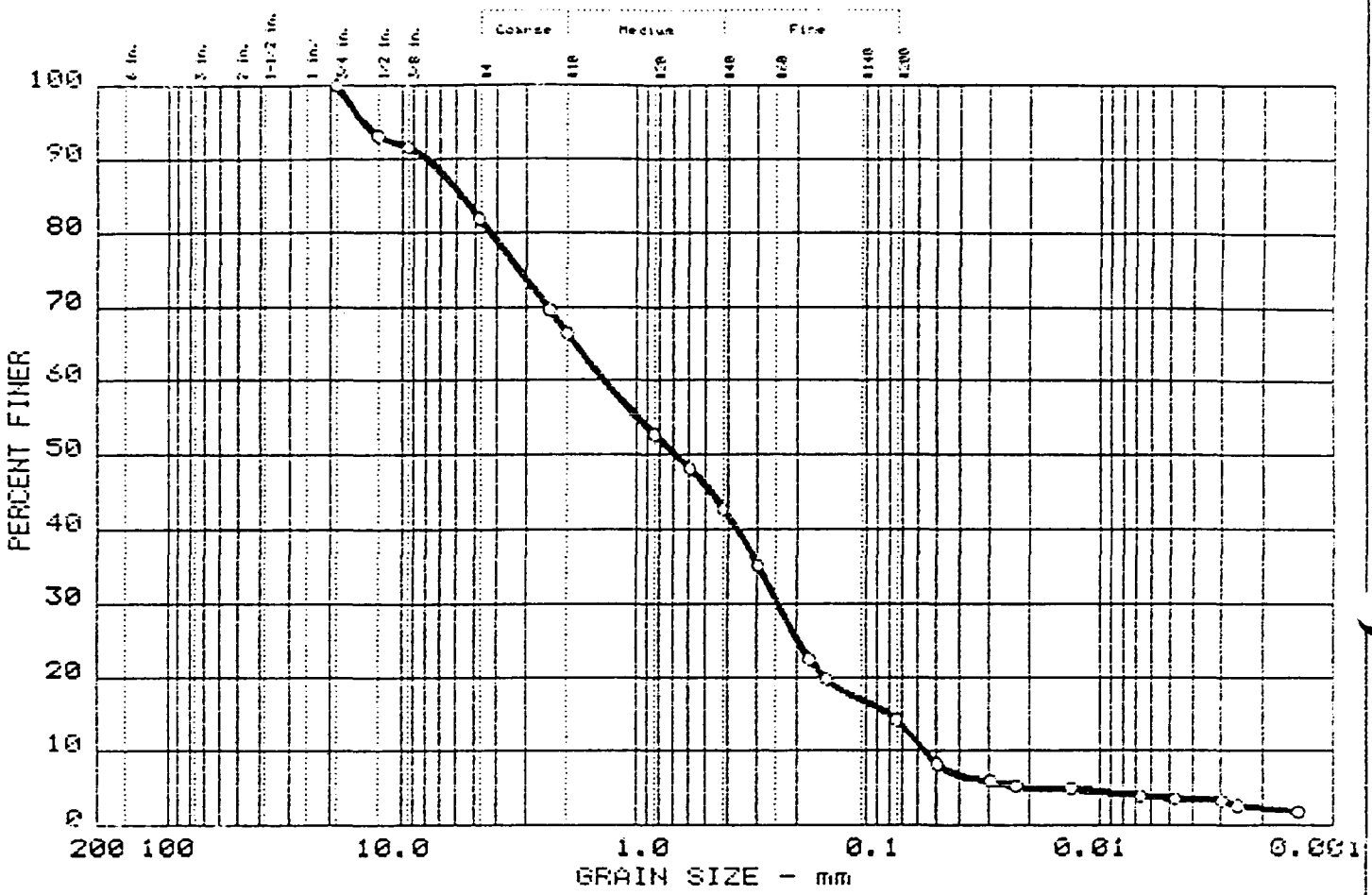
Date: 5/24/93

Remarks:
TESTED BY TWP/CLS
CHECKED BY CLS
APPROVED BY DTL

GRAIN SIZE DISTRIBUTION TEST REPORT
WARZYN, INC.

Sheet No.

GRAIN SIZE DISTRIBUTION TEST REPORT



Symbol	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
○	0.0	18.2	67.6	10.5	3.7

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	--	--	5.69	1.38	0.68	0.243	0.0794	0.0562	0.76	24.5

MATERIAL DESCRIPTION	USCS
○ Brown Fine-Coarse SAND, Some Gravel, Little Silt, Trace Clay	SM

Project No.: 10010201/38133
Project: H.O.D. LANDFILL RI/FS, Antioch, Illinois
○ Sample: HD-SSB3-24

Date: 5/24/93

Remarks:
TESTED BY TWP/CLS
CHECKED BY CLS
APPROVED BY DTL

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WARZYN, INC.

Sheet No.

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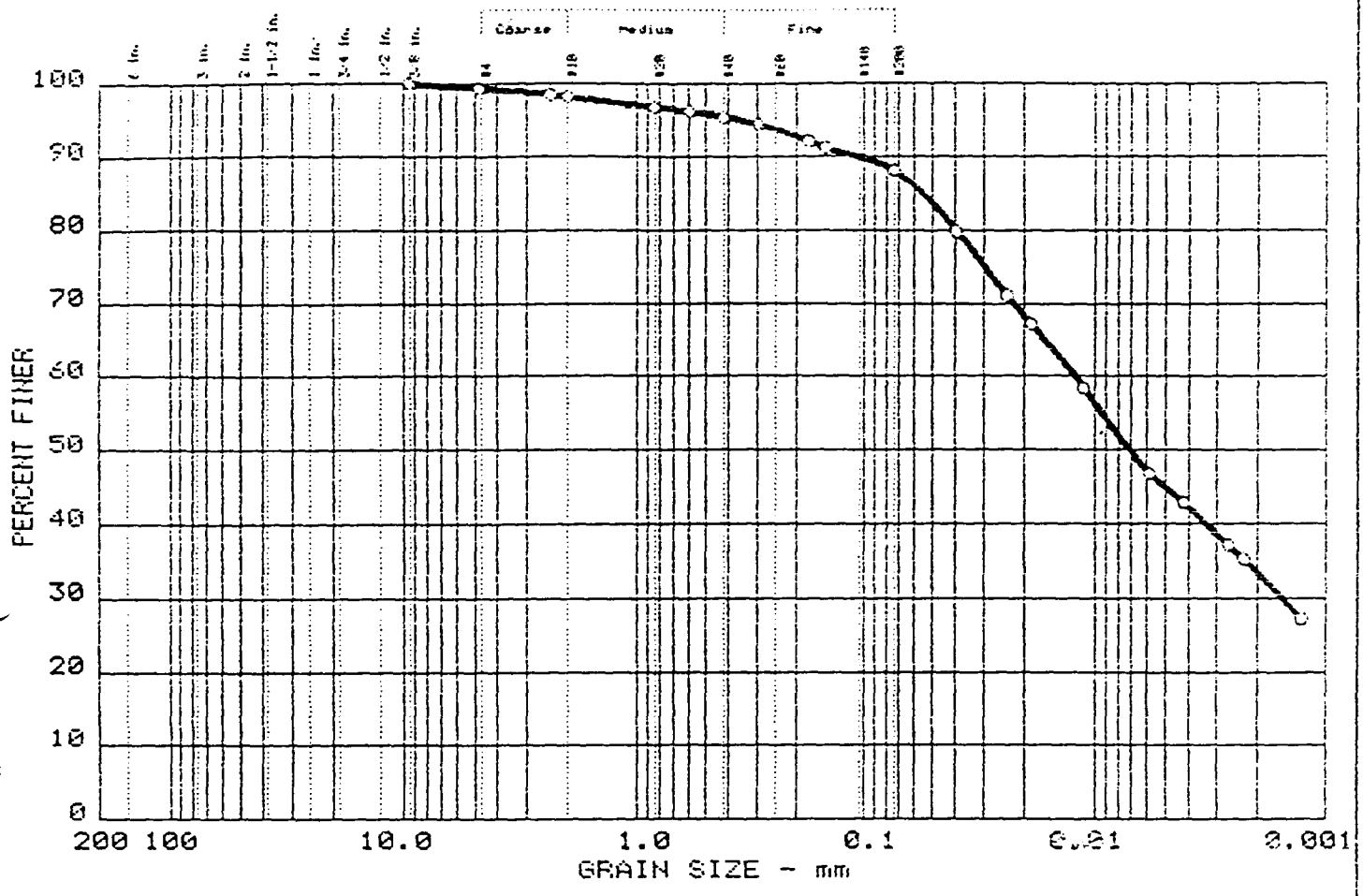

Symbol	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
○	0.0	0.7	11.2	43.3	44.8

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	27	12			0.01	0.002				

MATERIAL DESCRIPTION	USCS
○ Brown Lean CLAY, Little Sand, Trace Gravel	CL

Project No.: 10010201/38133
Project: H.O.D. LANDFILL RI/FS, Antioch, Illinois
○ Sample: HD-SSB3-48

Date: 5/24/93

Remarks:
TESTED BY TWP/CLS
CHECKED BY CLS
APPROVED BY DTL

GRAIN SIZE DISTRIBUTION TEST REPORT
WARZYN, INC.

Sheet No.

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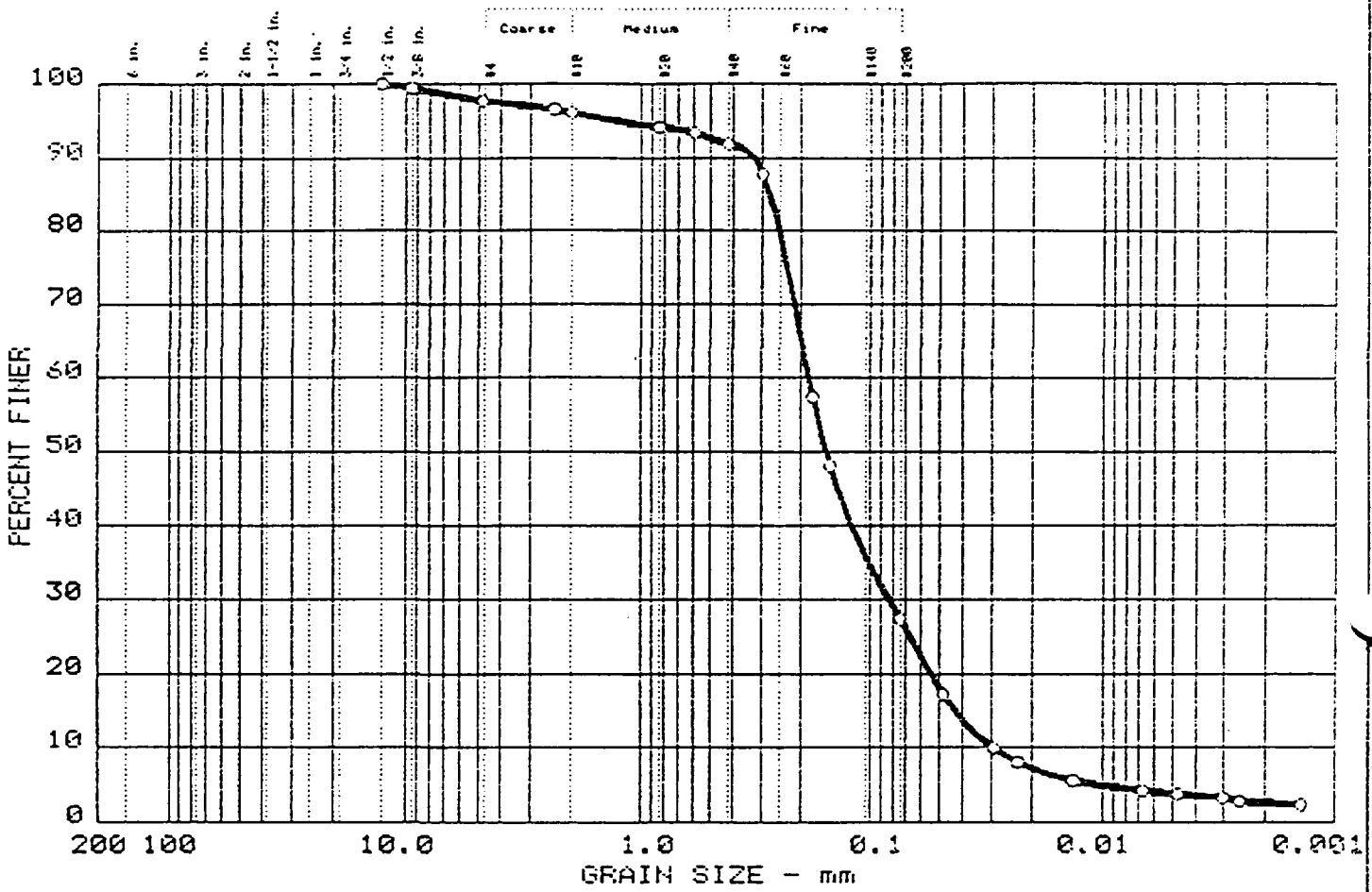

Symbol	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
○	0.0	2.3	70.4	23.5	3.8

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	--	--	0.28	0.18	0.15	0.083	0.0426	0.0291	1.29	6.3

MATERIAL DESCRIPTION	USCS
○ Brown Fine SAND, Some Silt, Trace Clay and Gravel	SM

Project No.: 10010201/38133
Project: H.O.D. LANDFILL RI/FS, Antioch, Illinois
○ Sample: HD-SSB4-39

Date: 5/24/93

Remarks:
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APPROVED BY DTL

GRAIN SIZE DISTRIBUTION TEST REPORT
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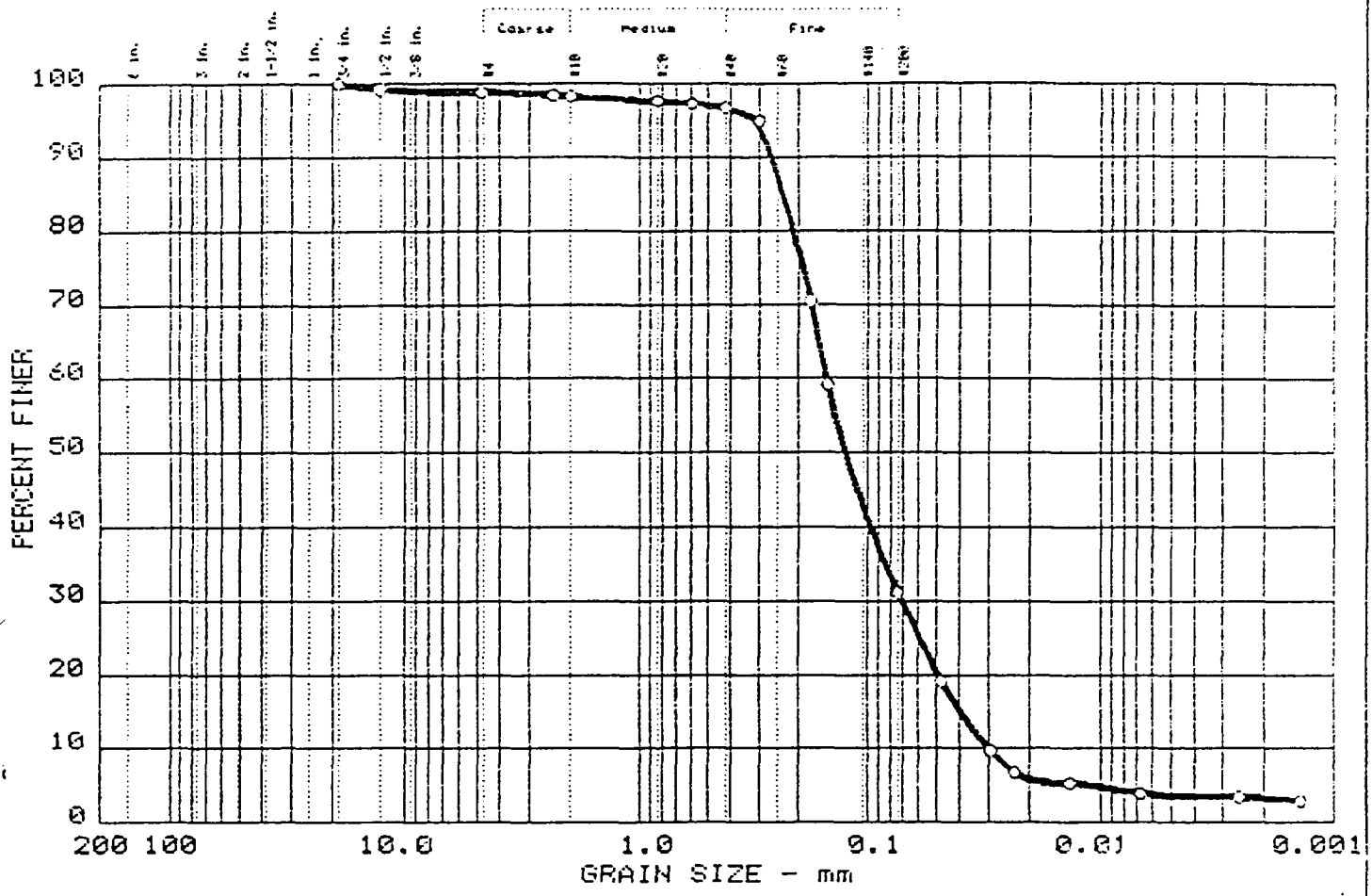

Symbol	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
○	0.0	1.1	67.7	27.6	3.6

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	--	--	0.24	0.15	0.13	0.071	0.0395	0.0296	1.13	5.1

MATERIAL DESCRIPTION	USCS
○ Brown Fine SAND, Some Silt, Trace Clay and Gravel	SM

Project No.: 10010201/38133
Project: H.O.D. LANDFILL RI/FS, Antioch, Illinois
○ Sample: HD-SSB4-939

Date: 5/24/93

Remarks:
TESTED BY TWP/CLS
CHECKED BY CLS
APPROVED BY DTL

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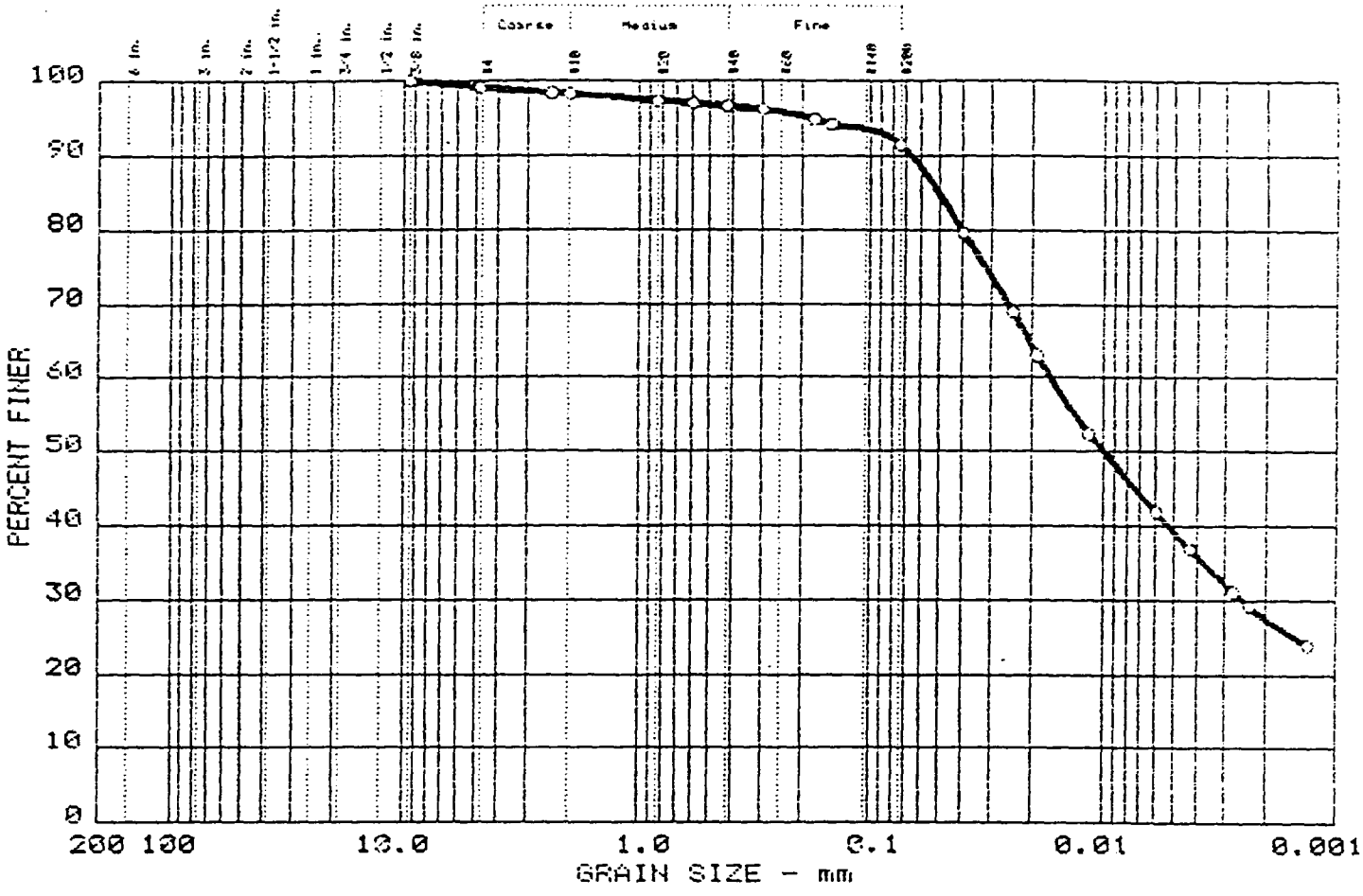

Symbol	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
○	0.0	0.9	7.7	52.3	39.1

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	25	11			0.01	0.003				

MATERIAL DESCRIPTION	USCS
○ Brown Lean CLAY, Little Sand, Trace Gravel	CL

Project No.: 10010201/38133
Project: H.O.D. LANDFILL RI/FS, Antioch, Illinois
○ Sample: HD-SSB4-49

Date: 5/24/93

Remarks:
TESTED BY TWP/CLS
CHECKED BY CLS
APPROVED BY DTL

GRAIN SIZE DISTRIBUTION TEST REPORT
WARZYN, INC.

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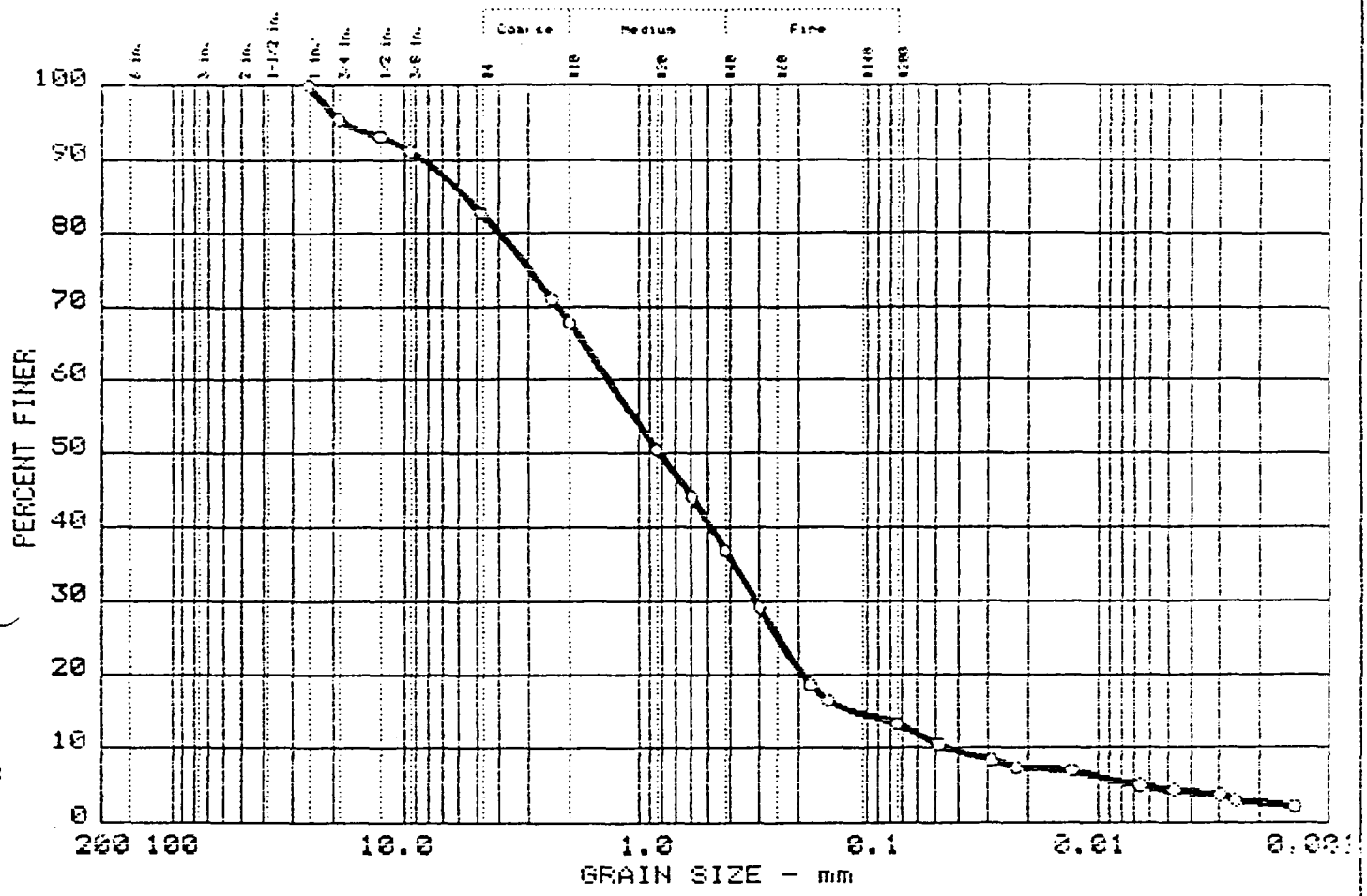

Symbol	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
○	0.0	17.3	69.5	8.8	4.4

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	--	--	5.56	1.36	0.81	0.309	0.1175	0.0432	1.62	31.6

MATERIAL DESCRIPTION	USCS
○ Brown Fine-Coarse SAND, Some Gravel, Little Silt, Trace Clay	SM

Project No.: 10010201/38133
Project: H.O.D. LANDFILL RI/FS, Antioch, Illinois
○ Sample: HD-SSB5-31

Date: 5/24/93

Remarks:
TESTED BY TWP/CLS
CHECKED BY CLS
APPROVED BY DTL

GRAIN SIZE DISTRIBUTION TEST REPORT
WARZYN, INC.

Sheet No.

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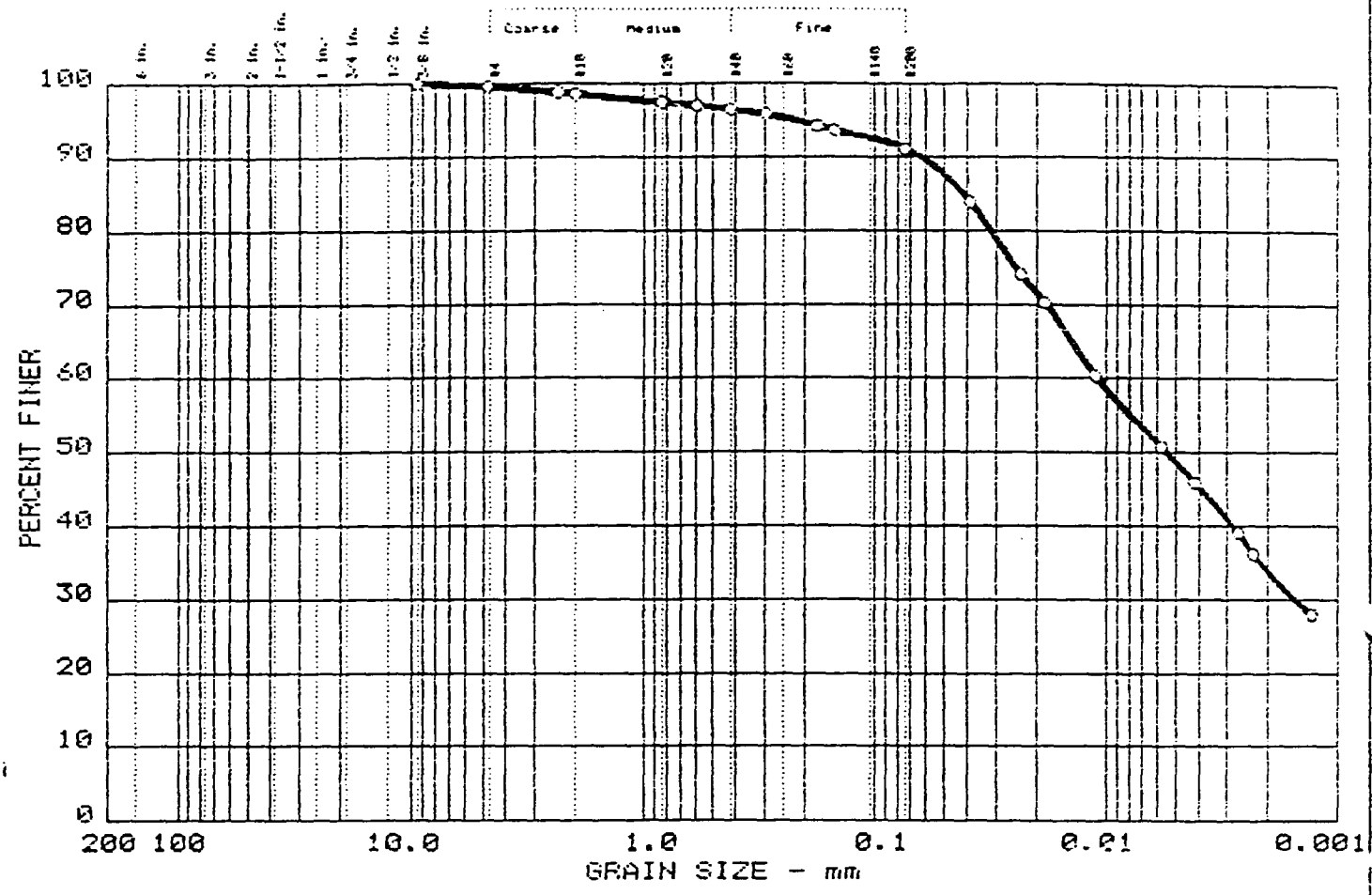


Symbol	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
○	0.0	0.4	8.5	42.4	48.7

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	29	13			0.01	0.002				

MATERIAL DESCRIPTION	USCS
○ Brown Lean CLAY, Little Sand	CL

Project No.: 10010201/38133
Project: H.O.D. LANDFILL RI/FS, Antioch, Illinois
○ Sample: HD-SSB5-47

Date: 5/24/93

Remarks:
TESTED BY TWP/CLS
CHECKED BY CLS
APPROVED BY DTL

GRAIN SIZE DISTRIBUTION TEST REPORT
WARZYN, INC.

Sheet No.

J

APPENDIX J

GROUNDWATER MONITORING WELL BORING LOGS AND WELL CONSTRUCTION DETAILS

APPENDIX J

GROUNDWATER MONITORING WELL BORING LOGS AND WELL CONSTRUCTION DETAILS

Soil Borehole Logs
W2D
W3SA
W3SB
W3D
W4S
W5S
W6S
W7D
W8D

Monitor Well Construction Summary
W2D
W3SA
W3SB
W3D
W4S
W5S
W6S
W7D
W8D

SOIL BOREHOLE LOG

SITE NAME AND LOCATION H.O.D. Landfill - Antioch, Illinois	DRILLING METHOD: 4 1/4" ID HSA	BORING NO. W2D
		SHEET 1 OF 2
	SAMPLING METHOD: 5' CME SAMPLING TUBE	
	2" OD SPLIT SPOON (84-88 FT)	DRILLING START / FINISH
BORING LOCATION: SE 1/4 of SE 1/4 of Section 17 , T 46 N, R 10 E/W	WATER LEVEL / TIME	TIME / TIME
NORTHING 2116648.2 EASTING 1052499.9	DATE	DATE / DATE
DATUM ELEVATION 770.7	CASING DEPTH	4/17/93 / 4/17/93
DRILL RIG CME 750 ATV	SURFACE CONDITIONS GRASS COVERED PRAIRIE	
ANGLE Vertical BEARING ------		
SAMPLE HAMMER TORQUE FT-LBS		

DEPTH IN FEET (ELEVATION)	BLOWS/6 IN. ON SAMPLER	RECOVERY %	SYMBOL		SAMPLE NUMBER AND DESCRIPTION OF MATERIALS	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	TEST RESULTS: WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TESTS
769.2	–	75		1	Stiff to Very Stiff Reddish Brown Organic Top Soil (OH), Roots to 1 ft then Brown Silty Sandy Clay	SB							1-3.5
					Brown Silty CLAY (CL), Limonite Precipitate, Magnesium Nodules Present								
766.7 / 765.7 (5)	–	83		2	Soft to Stiff Brown and Gray Mottled Clayey SILT to Silty CLAY (ML/CL)	SB				30	11		.25-1.0
					Grades to more silty CLAY (CL) Trace to Little Fine to Coarse Sand and Fine Gravel, Sand Pocket at 9 Ft								
761.7 / 760.7 (10)	–	75		3	Brown SAND Layer (SP)	SB							2->4.5
759.2					Brown Silty CLAY (CL) to 11.5'								
					Gray Silty CLAY (CL), Little to Some Fine to Coarse Sand, Trace to Little, Fine to Coarse Gravel, Sand Lens at 12' and 14', Shale Fragments Present								
756.7 (15)	–	100		4	Gravelly Stiff to Very Stiff Gray Silty CLAY (CL)	SB							1.5-4.0
752.7													
(20)	–	95		5	Gray Very Stiff Lean CLAY (CL), Little to Some Silt, Trace to Little Gravel and Fine to Coarse Sand	SB							2.5-3.0
					Gray Stiff to Very Stiff Lean CLAY (CL) Little to Some Silt, Trace to Little Fine to Coarse Sand, Trace Fine Gravel								
(25)	–	95		6		SB							1.5-2.5
(30)	–	90		7	Shelby Tube 29 - 31' Shale Fragments Present	SB				38	19		1.5-2.5
					Lean Clay (CL) Trace Gravel and Sand								
(35)	–	100		8		SB							1-2.5
	–	93		9		SB							1.5-

LOGGED BY SJC DRILLING CONTR E & F

DATE 9/17/93 CHK'D BY DAP CHAS. MARKGRAF

Template ID: WM1 ID: WM1

SOIL BOREHOLE LOG

SITE NAME AND LOCATION H.O.D. Landfill - Antioch, Illinois

SHEET 2 OF 2

BORING NO. W2D

DEPTH IN FEET (ELEVATION)	BLOWS/6 IN. ON SAMPLER	RECOVERY %	SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIALS	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	TEST RESULTS: WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TESTS
												2.5
45 725.2	–	97		10 Grades to Lean Clay, Little Fine to Coarse Sand Grades to Medium Stiff to Very Stiff Coarse Gravelly Lean CLAY (CL)	SB							.75-2.5
50	–			11 Ribbon of Sample Pushed Rock, no Recovery, Gray CLAY	SB							–
55 716.2	–	27		12 Fossiliferous Limestone Cobble in Sample Possibly Pushed from Above Gray Lean Clay (CL) with a Silty Layer Grading into Silty CLAY, Clayey SILT (CL/ML) to 59'	SB							.5-3.0
60 711.7	–	97		13 Gray Stiff to Very Stiff Lean CLAY (CL) Trace Little Silt, Little Fine to Coarse Sand, Trace Fine Gravel	SB							1.5-2.5
65	–	100		14 2" Silty Fine Sand Layer at 65' and 1/2" Sand Lens 65.8'	SB							1.5-2.5
70	–	95		15 4" Silt Layer at 69.5' Over 1/2" Fine to Medium Sand Lens	SB							1.0-3.0
697.7 696.7	–	98		Gray Lean CLAY (CL), Little Fine Sand and Silt, Trace to Little Fine Gravel, Trace Coarse Sand 16 Gravelly Medium Stiff to Very Stiff Pinkish Gray Clay Layer from 73'-74' Pinkish/Reddish-Gray Lean CLAY (CL), Little to Some Silt and Fine to Coarse Sand, Trace to Little Fine Gravel, Trace Coarse Sand	SB							.75-3.0
75 691.7	–	13		17 Fine to Coarse SAND and Fine GRAVEL (SP/GP)	SB							–
80												
85	9 11 14 14			19 No Recovery	SS							–
				18	SS							–
682.2	7 12 15 17			20 Fine to Coarse Medium Dense SAND (SP), Some Gravel, Little Silt, Trace Clay	SS							–
90				End of Boring 88.5 Feet PID = None Detected * = PID Malfunctioning Monitoring Well Set at 88.33 Feet								
95												

SOIL BOREHOLE LOG

SITE NAME AND LOCATION H.O.D. Landfill - Antioch, Illinois	DRILLING METHOD: 4 1/4" ID HSA	BORING NO. W3SA
		SHEET 1 OF 1
	SAMPLING METHOD: 2" OD SPLIT SPOON	
		DRILLING START / FINISH
BORING LOCATION: NE 1/4 of NE 1/4 of Section 17, T 46 N, R 10 E/W	WATER LEVEL / TIME	TIME / TIME
NORTHING 2115185.3 EASTING 1051029.2	TIME / DATE	DATE / DATE
DATUM ELEVATION 763.8	CASING DEPTH	4/6/93 / 4/6/93
DRILL RIG CME 750 ATV	SURFACE CONDITIONS MARSH/WETLAND, SURFACE WATER	
ANGLE Vertical BEARING ------		
SAMPLE HAMMER TORQUE FT-LBS		

DEPTH IN FEET (ELEVATION)	BLOWS/6 IN. ON SAMPLER	RECOVERY %	SYMBOL		SAMPLE NUMBER AND DESCRIPTION OF MATERIALS	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	TEST RESULTS: WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TESTS
	6 3 1 1	67		1	Frozen Black Muck - Peaty, Vegetation Debris (PT)	SS							-
	WT	75		2	Greenish Light Gray Soft Clay (OH) Silt Lenses Vegetation Debris, Gastropod Shells and Other Shell Material Present, Spongy Peat Like	SS							-
5 758.8	5 4 1 1	83		3		SS							-
	5 5 5 5	46		4	Very Loose Light Gray Fine SAND to Silty Sand (SP/SM), Some Medium, Trace Coarse Sand Little to Some Silt	SS							-
755.7 754.8	5 5 4 4	83		5	Greenish Soft Clay (CH) Trace Silt, Gastropod Shells Present	SS							-
10	2 3 4 6	66		6	Very Loose Gray Fine to Coarse SAND and Fine GRAVEL (SP/GP), Grades to Coarse to Fine to Coarse	SS							-
	2 2 4 5	92		7	Medium SAND (SP) to 13.5 Feet Grades to Medium to Coarse Sand	SS							-
15	5 7 9 13	75		8	Trace Fine Gravel	SS							-
747.8					End of Boring at 16 Feet Monitoring Well Set at 15.64' PID = None Detected								
20													
25													
30													
35													

LOGGED BY SJC DRILLING CONTR E & F

DATE 9/22/93 CHK'D BY DAP CHAS. MARKGRAF

Template ID: WM1 ID: WM1

SOIL BOREHOLE LOG

SITE NAME AND LOCATION H.O.D. Landfill - Antioch, Illinois	DRILLING METHOD: 4 1/4 ID HSA	BORING NO. W3SB
	SAMPLING METHOD: 2" OD SPLIT SPOON	SHEET 1 OF 1
		DRILLING START / FINISH
BORING LOCATION: NE 1/4 of NE 1/4 of Section 17, T 46 N, R 10 E/W	WATER LEVEL / TIME	TIME / TIME
NORTHING 2115189.4 EASTING 1051027.8	DATE	DATE / DATE
DATUM ELEVATION 763.7	CASING DEPTH	4/7/93 / 4/7/93
DRILL RIG CME 750 ATV	SURFACE CONDITIONS MARSH/WETLAND, SURFACE WATER	
ANGLE Vertical BEARING ------		
SAMPLE HAMMER TORQUE FT-LBS		

DEPTH IN FEET (ELEVATION)	BLOWS/6 IN. ON SAMPLER	RECOVERY %	SYMBOL	SAMPLE NUMBER	SAMPLE NUMBER AND DESCRIPTION OF MATERIALS	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	TEST RESULTS: WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TESTS
					Blind Drill to 16 Feet See Boring Log W3SA for Geologic Description to 16 Feet								
747.7	WT/12"	100		1	Loose Gray Fine to Coarse SAND (SP), Trace Silt, Grades to Fine to Medium Sand to 19 Feet Then Fine to Coarse	SS							-
	2 3 5 6	100		2		SS							-
	2 3 5 5	63		3	Loose Gray-Brown Fine to Coarse SAND (SP) Little Fine Gravel, and Silt, Trace Clay	SS							-
	6 8 7 7	42		4		SS							-
	6 11 13 11	58		5		SS							-
	6 9 7 6	42		6	Medium Dense Fine to Coarse SAND (SP), Trace to Little Fine Gravel and Silt 3" Gray Silty CLAY Layer at 26'	SS							-
734.2	6 9 7 6	71		7		SS							-
	3 4 6 6	67		8	Very Stiff Gray Silty CLAY (CL), Trace Medium to Coarse Sand, Trace to Little Fine Sand, Grades to Clayey Silty CLAY (CL/ML), Shale Fragments Present	SS							2.0-2.75
731.7					End of Boring at 32 Feet Monitoring Well Set at 29.5 Feet PID = None Detected								

LOGGED BY SJC DRILLING CONTR E & F

DATE 9/22/93 CHK'D BY DAP CHAS. MARKGRAF

Template ID: WM1 ID: WM1

SOIL BOREHOLE LOG

SITE NAME AND LOCATION H.O.D. Landfill - Antioch, Illinois	DRILLING METHOD: 6" RB WITH MUD	BORING NO. W3D
	SAMPLING METHOD: 2" SPLIT SPOON, SHELBY TUBE (34.5 - 38 FT)	SHEET 1 OF 2
BORING LOCATION: NE 1/4 of NE 1/4 of Section 17 , T 46 N, R 10 E/W	WATER LEVEL / TIME / DATE / CASING DEPTH	DRILLING START TIME 4/8/93; FINISH TIME 5/25/93
NORTHING 2115187.6 EASTING 1051022.7		
DATUM ELEVATION 763.7		
DRILL RIG CME750 ATV/Track Rig	SURFACE CONDITIONS MARSH/WETLAND WET	
ANGLE Vertical BEARING ------		
SAMPLE HAMMER TORQUE FT-LBS		

DEPTH IN FEET (ELEVATION)	BLOWS/6 IN. ON SAMPLER	RECOVERY %	SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIALS	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	TEST RESULTS: WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TESTS
				Blind Drill to 34.5 Feet See Logs W3SA and W3SB for Geologic Descriptions of Upper 35 Feet								
5												
10												
15												
20												
25												
734.2				Gray Silty CLAY (CL)								
30												
729.2	–	17		1	SS							–
35				Shelby Tube 34.5 to 36.5, Pushed Rocks and Gravel in End of Tube (Tube Destroyed)								
	–	0		2	SS							–

LOGGED BY SJC DRILLING CONTR E & F, ETI

DATE 9/22/93 CHK'D BY DAP CM/JR

Template ID: WM1 ID: WM1

SOIL BOREHOLE LOG

SITE NAME AND LOCATION H.O.D. Landfill - Antioch, Illinois

SHEET 2 OF 2

BORING NO. W3D

DEPTH IN FEET (ELEVATION)	BLOWS/6 IN. ON SAMPLER	RECOVERY %	SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIALS	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	TEST RESULTS: WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TESTS
				Shelby Tube 36 to 38 Ft								
	5 7 9 16	100		3	SS				18	6		3-1.5
40 723.7	7 12 8 12	71		4 Gray Stiff to Very Stiff Sandy Silty CLAY to Clayey SAND (CL/SC) Grades to Silty Clay (CL) Little to Some, Fine to Coarse Sand, Trace Fine Gravel, Pyrite Fragments Present	SS							1.25-2.25
721.7	4 5 9 10	83		Clayey SAND (SC) at 40' Shale Fragments Present 5 Gray Stiff to Very Stiff Silty CLAY (CL), Little to Some Fine to Coarse Sand, Little Fine Gravel	SS							2.25-1.25
45	5 7 9 11	100		6	SS							1.25-0.75
	5 7 11 12	100		7	SS							4-2
	4 8 10 13	29		8 Sand and Gravel Lens at Approximately 48.5', Grades to Some Fine to Coarse Sand, Little Gravel	SS							2
50	5 8 11 15	100		9 Gray Stiff to Very Stiff Lean CLAY (CL), Trace to Little Silt and Fine to Coarse Sand, Trace Fine Gravel, Shale Fragments, Pyrite Fragments Present	SS							1.5-2.5
	12 11 13 15	100		10	SS							1.75
55 708.7	6 10 23 21	0		11	SS							–
705.7				Gray Fine to Coarse SAND (SP) Little to Some Fine Gravel, Trace Coarse Gravel, Little Silt Gray Silty CLAY (CL) Little Fine to Coarse Sand, Trace to Little Fine Gravel								
60	6 9 11 14			12	SS							–
	8 10 16 18	85		13 Gray Silty CLAY (CL), Trace Fine to Coarse Sand and Gravel	SS							–
65	12 14 23 38	100		14	SS							–
	5 15 39 50.5	0		15	SS							
	27 30 32 50	75		16	SS							–
70	14 17 29 30	100		1" Fine to Coarse Sand Seam at 69 Ft 17 Gray Silty CLAY (CL)	SS							–
▽ 692.2	9 10 27 27	90		18 Brown/Gray Silty Fine to Coarse SAND (SP)	SS							–
75	16 26 30 26	90		19 1/2" Silty CLAY Lens at 74.5 and 75.5 Ft	SS							–
	15 23 27 31	75		20 Clayey SILT Seam at 77 Feet	SS							–
	12 23 30 30	75		21	SS							–
80 683.8				End of Boring at 80 Feet Well Installed to 78 Feet PID = None Detected								
85												

SOIL BOREHOLE LOG

SITE NAME AND LOCATION H.O.D. Landfill - Antioch, Illinois	DRILLING METHOD: 4 1/4" ID HSA	BORING NO. W4S
	SAMPLING METHOD: 2" OD SPLIT SPOON	SHEET 1 OF 1
		DRILLING START / FINISH
BORING LOCATION: NW 1/4 of NE 1/4 of Section 17 , T 46 N, R 10 E/W	WATER LEVEL / TIME	TIME / TIME
NORTHING 2115202.0 EASTING 1050628.3	TIME / DATE	DATE / DATE
DATUM ELEVATION 767.5	CASING DEPTH	5/25/93 / 5/26/93
DRILL RIG CME 850	SURFACE CONDITIONS ASPHALT SURFACE/STOCK YARD	
ANGLE Vertical BEARING ------		
SAMPLE HAMMER TORQUE FT-LBS		

DEPTH IN FEET (ELEVATION)	BLOWS/6 IN. ON SAMPLER	RECOVERY %	SYMBOL		SAMPLE NUMBER AND DESCRIPTION OF MATERIALS	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	TEST RESULTS: WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TESTS
					Asphalt Surface Over FILL								
765.5	2 2 2 2	15		1	FILL: Brown Silty Fine to Coarse Gravel and Sand	SS							–
763.5					Brown Silty Clay and Trace Sand, Probable Fill								
	1 2 2 2	0		2		SS							–
5					Black Clayey PEAT (PT)								
	2 9 9 10	20		3	Trace to Some Fine to Coarse Gravel	SS							–
759.5													
	5 10 10 9	50		4	Gray Fine to Coarse Silty SAND and GRAVEL (SP/GP) Trace Clay	SS							–
10	5 7 7 11	50		5		SS							–
	11 17 30 50/3"	50		6	PID = None Detected	SS							–
15	–	50		7		SS							–
751.5					End of Boring at 16 Feet Well Set at to 15 Feet PID = None Detected								
20													
25													
30													
35													

LOGGED BY PMS DRILLING CONTR ETI (for E & F)

DATE 9/17/93 CHK'D BY DAP JOEL RUDA

Template ID: WM1 ID: WM1

SOIL BOREHOLE LOG

SITE NAME AND LOCATION H.O.D. Landfill - Antioch, Illinois	DRILLING METHOD: 4 1/4" ID HSA	BORING NO. W5S
		SHEET 1 OF 1
	SAMPLING METHOD: 5' CME SAMPLING TUBE	
	2" OD SPLIT SPOON (14 - 16 FT)	DRILLING
		START / FINISH
BORING LOCATION: SE 1/4 of SE 1/4 of Section 8 , T 46 N, R 10 E/W	WATER LEVEL / TIME	TIME / TIME
NORTHING 2115375.1 EASTING 1050760.5	TIME / DATE	DATE / DATE
DATUM ELEVATION 771.1	CASING DEPTH	4/21/93 / 4/21/93
DRILL RIG CME 750 ATV	SURFACE CONDITIONS GRASS COVERED LANDFILL AREA, DRY	
ANGLE Vertical BEARING ------		
SAMPLE HAMMER TORQUE FT-LBS		

DEPTH IN FEET (ELEVATION)	BLOWS/6 IN. ON SAMPLER	RECOVERY %	SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIALS	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	TEST RESULTS: WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TESTS
770.1	–	54		1 Brown Clayey Top Soil Over 4" Brown and Black Organic Clay Possible Peat (OH), Roots Present, Possible Fill	SB							.75
767.1				Clayey Fine to Medium SAND (SC), Wood Fragments Over Fine to Coarse Sand, Trace to Little Fine Gravel Possible FILL								
5	–	50		2	SB				63	NP		–
765.1 / 764.6				Black Silty Organic SAND (SM), Some Gravel, Little Clay / Wet Fine to Coarse Sand Layer								
10	–	57		3 Wet SAND (SM) Little Fine Gravel, Some Silt, Trace Gravel Grades to Fine to Coarse Sand 1/4" Silt Lens at Approximately 11.5"	SB							–
15	7 10 9 9	92		4 Fine to Medium SAND (SM) Trace to Little Gravel Grades to Fine to Coarse Sand, Little Coarse Gravel	SS							–
755.1				End of Boring at 16 Feet Monitoring Well Set at 15.51 Feet PID = None Detected								
20												
25												
30												
35												

LOGGED BY SJC DRILLING CONTR E & F

DATE 9/17/93 CHK'D BY DAP CHAS. MARKGRAF

ID: WM1

G

APPENDIX G

GEOPHYSICAL LOGS

WLI Wooddell Logging Inc.
Mattoon, Illinois
217 234-8525

Gamma-Den-Fltemp-Neut

COMPANY: WARZYN
WELL: LP01
FIELD: HOD Antioch, IL

LOCATION:
2116410.7
1050909.7

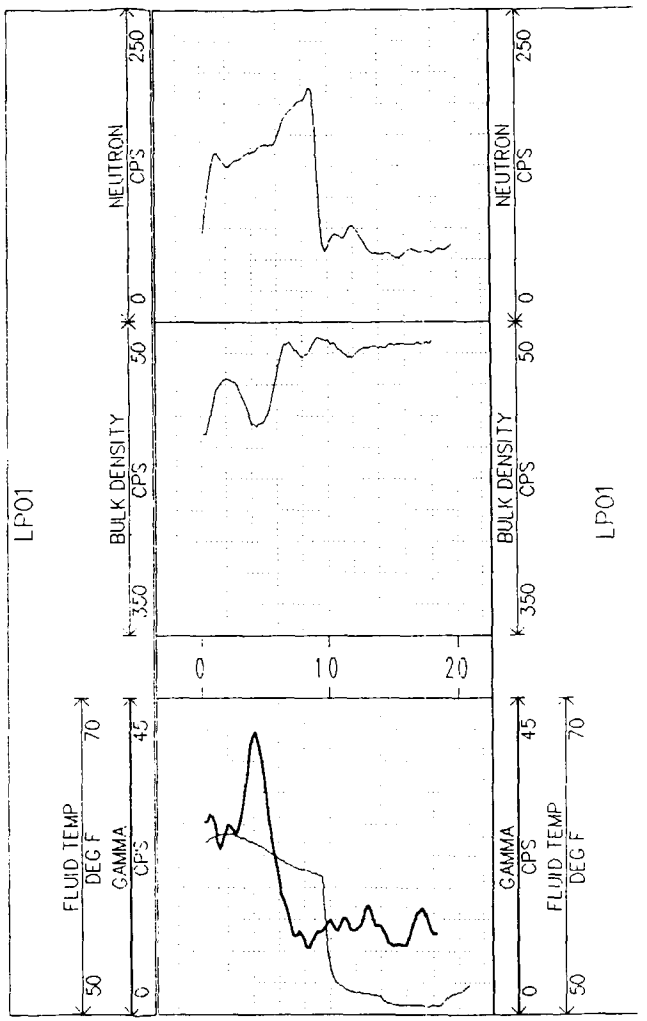
OTHER LOGS:

PERM. DATUM: GROUND LEVEL
ELEVATION: 775.6
LOG MEASURED FROM: GROUND LEVEL

DATE:	14 May 93			
RUN NUMBER:	ONE			
DRILLER:				
TYPE OF CASING	6" PVC			
SCREEN INTERVAL				
LOGGER:				
DEPTH	20.6'			
CASING DEPTH				
BOT LOG INTERVAL				
TOP LOG INTERVAL	0.00	0.00	0.00	0.00
TYPE FLUID IN HOLE	Leachate			
FLUID LEVEL				
SAMPLE SOURCE				
FLUID LVL/CIRC.				
TIME SINCE CIRC.STOP.				
RECORDED BY:	Drake & Wooddell			
OBSERVER:	Mr. Steve Chillson			

RUN #	GAMMA	FLTEMP	B. DENSITY	NEUTRON
PROBE TYPE / S.N.	COM-G 1 1/4	GO-T 1 1/4	GO-BD 2 1/8	COM-N 1 1/4
MODULE TYPE / S.N.	CS01 F22	CS01 F00	CS22 F22	CS10 F22
LOGGING SPEED	10 ft./minute	~7 ft./minute	10 ft./minute	10 ft./minute
AFTER SURVEY DEPTH ERROR				
SAMPLE INTERVAL =	0.2	0.2	0.2	0.2

COMMENTS:



WLI Wooddell Logging Inc.

Mattoon, Illinois
217 234-8525

Gamma-Den-Fltemp-Neut

COMPANY: WARZYN
WELL: LP02
FIELD: HOD Antioch, IL

LOCATION:
2116428.7
1051349.0

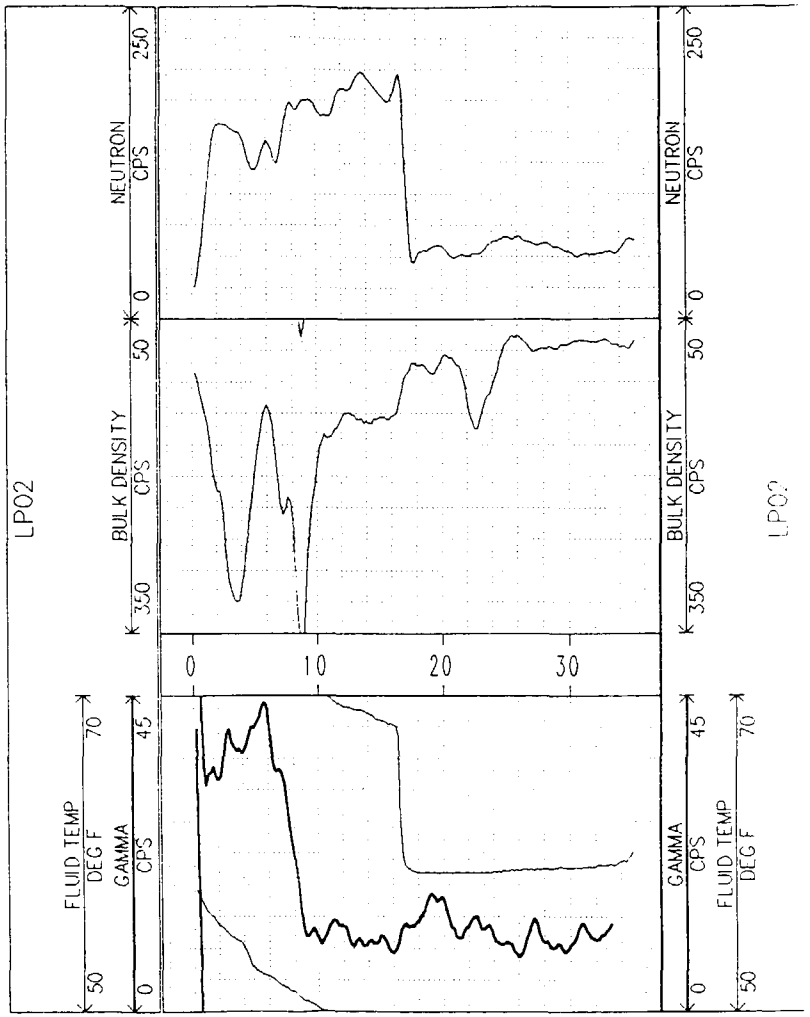
OTHER LOGS:

PERM. DATUM: GROUND LEVEL
ELEVATION: 785.5
LOG MEASURED FROM: GROUND LEVEL

DATE:	14 May 93			
RUN NUMBER:	ONE			
DRILLER:				
TYPE OF CASING	6" PVC			
SCREEN INTERVAL				
LOGGER:				
DEPTH	35.0'			
CASING DEPTH				
BOT LOG INTERVAL				
TOP LOG INTERVAL	0.00	0.00	0.00	0.00
TYPE FLUID IN HOLE	Leachate			
FLUID LEVEL				
SAMPLE SOURCE				
FLUID LVL/CIRC.				
TIME SINCE CIRC.STOP.				
RECORDED BY:	Drake & Wooddell			
OBSERVER:	Mr. Steve Chillson			

RUN #	GAMMA	FLTEMP	B.DENSITY	NEUTRON
PROBE TYPE / S.N	COM-G 1 1/4	GO-T 1 1/4	GO-BD 2 1/8	COM-N 1 1/4
MODULE TYPE / S.N	CS01 F22	CS01 F00	CS22 F22	CS10 F22
LOGGING SPEED	10 ft./minute	-7 ft./minute	10 ft./minute	10 ft./minute
AFTER SURVEY DEPTH ERROR				
SAMPLE INTERVAL =	0.2	0.2	0.2	0.2

COMMENTS:



WLI

Wooddell Logging Inc.

Mattoon, Illinois
217 234-8525

Gamma–Den–Fltemp–Neut

COMPANY: WARZYN
WELL: LP03
FIELD: HOD Antioch, IL

LOCATION:
2116082.7
1050918.9

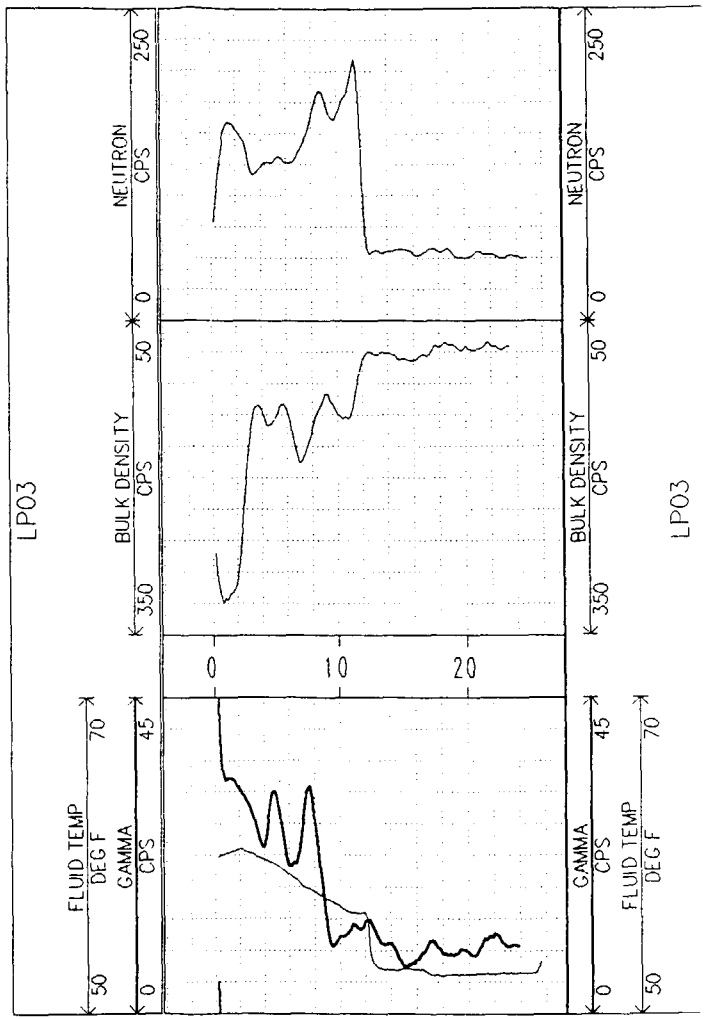
OTHER LOGS:

PERM. DATUM: GROUND LEVEL
ELEVATION: 778.1'
LOG MEASURED FROM: GROUND LEVEL

DATE:	14 May 93			
RUN NUMBER:	ONE			
DRILLER :				
TYPE OF CASING	6" PVC			
SCREEN INTERVAL				
LOGGER :				
DEPTH	25.4'			
CASING DEPTH				
BOT LOG INTERVAL				
TOP LOG INTERVAL	0.00	0.00	0.00	0.00
TYPE FLUID IN HOLE	Leachate			
FLUID LEVEL				
SAMPLE SOURCE				
FLUID LVL/CIRC.				
TIME SINCE CIRC.STOP.				
RECORDED BY:	Drake & Wooddell			
OBSERVER:	Mr. Steve Chillson			

RUN #	GAMMA	FLTEMP	B DENSITY	NEUTRON
PROBE TYPE / S.N.	COM-G11/4	GO-T11/4	GO-BD21/8	COM-N11/4
MODULE TYPE / S.N.	CS01 F22	CS01 F00	CS22 F22	CS10 F22
LOGGING SPEED	10 ft./minute	-7 ft./minute	10 ft./minute	10 ft./minute
AFTER SURVEY DEPTH ERROR				
SAMPLE INTERVAL =	0.2	0.2	0.2	0.2

COMMENTS:



WLI

Wooddell Logging Inc.

Mattoon, Illinois
217 234-8525

Gamma-Den-Fltemp-Neut

COMPANY: WARZYN
WELL: LP04
FIELD: HOD Antioch, IL

LOCATION:
2116110.6
1051338.6

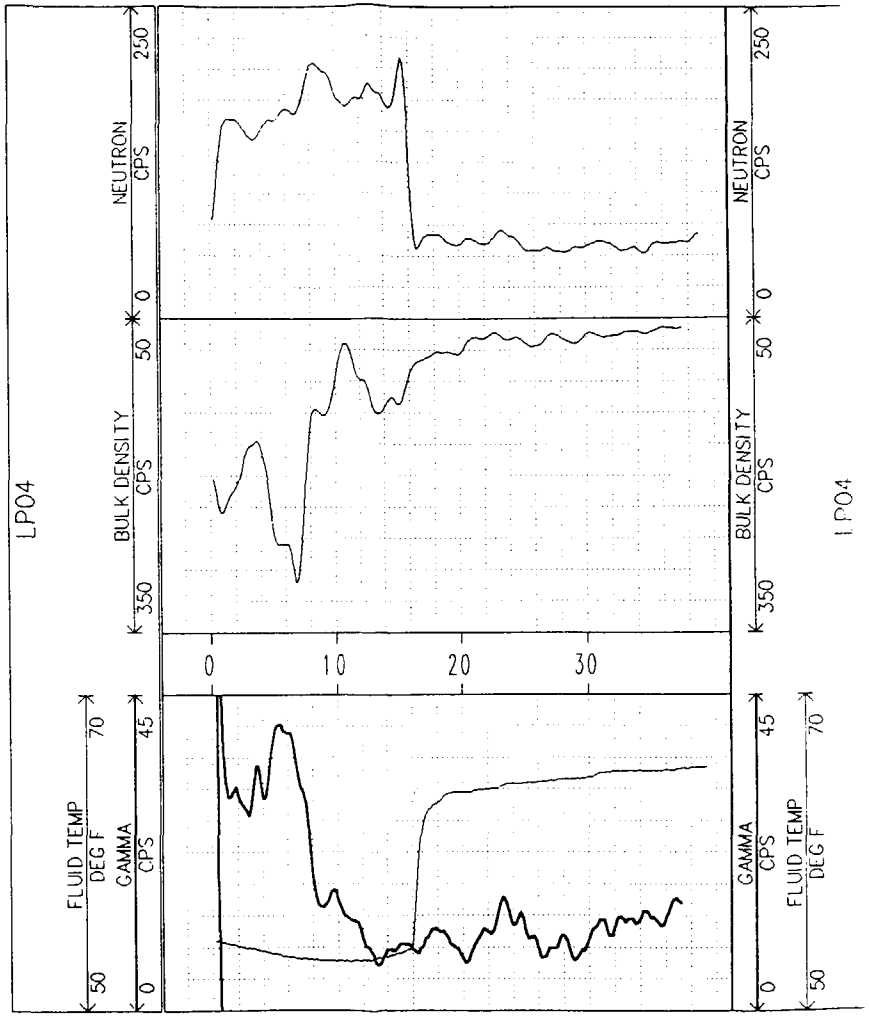
OTHER LOGS:

M. DATUM: GROUND LEVEL
VATION: 788.9
G MEASURED FROM: GROUND LEVEL

	20 May 93			
MBER:	ONE			
DRILLER:				
F CASING	6" PVC			
INTERVAL				
LOGGER:				
	39.0'			
DEPTH				
G INTERVAL				
G INTERVAL	0.00	0.00	0.00	0.00
UID IN HOLE	Leachate			
EVEL				
SOURCE				
VL/CIRC.				
NCE CIRC.STOP.				
ED BY:	Drake & Wooddell			
ER:	Mr. Steve Chillson			

RUN #	GAMMA	FLTEMP	B. DENSITY	NEUTRON
PROBE TYPE / S.N	COM-G 1 1/4	GO-T 1 1/4	GO-BD 2 1/8	COM-N 1 1/4
MODULE TYPE / S.N	CS01 F22	CS01 F00	CS22 F22	CS10 F22
LOGGING SPEED	10 ft./minute	-7 ft./minute	10 ft./minute	10 ft./minute
AFTER SURVEY DEPTH ERROR				
SAMPLE INTERVAL =	0.2	0.2	0.2	0.2

COMMENTS:



WLI Wooddell Logging Inc.
Mattoon, Illinois
217 234-8525

Gamma-Den-Fltemp-Neut

COMPANY: WARZYN
WELL: LP05
FIELD: HOD Antioch, IL

LOCATION:
2116230.0
1051719.6

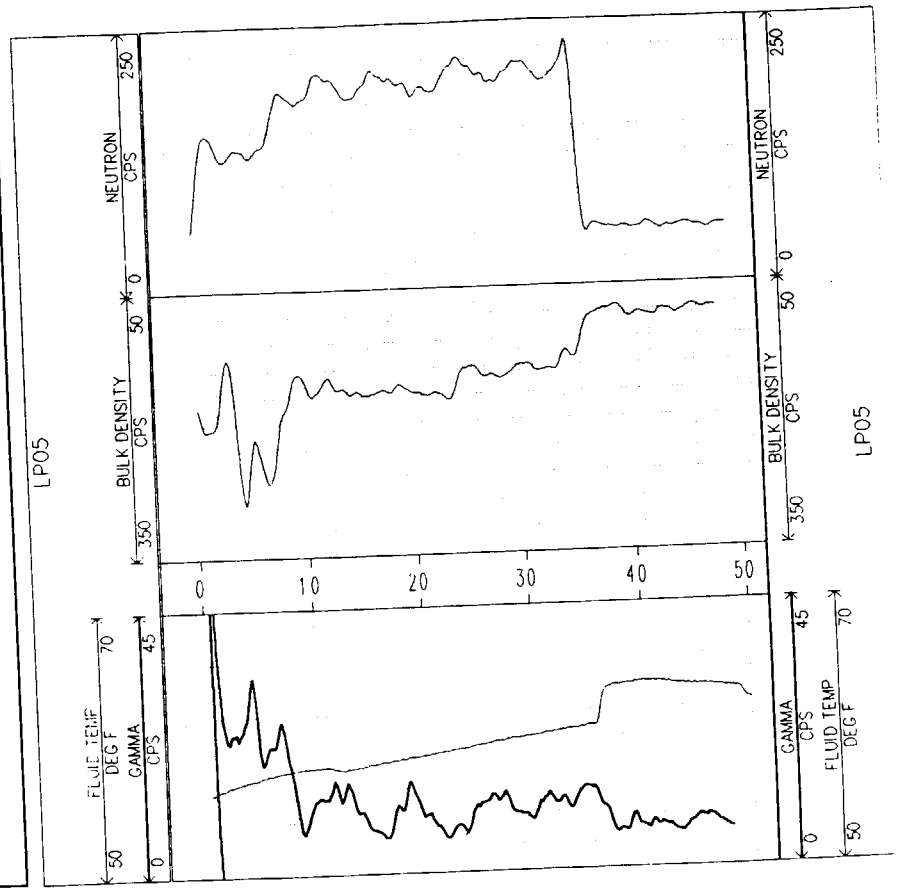
OTHER LOGS:

PERM. DATUM: GROUND LEVEL
ELEVATION: 796.6'
LOG MEASURED FROM: GROUND LEVEL

DATE	19 May 93			
RUN NUMBER	ONE			
DRILLER				
TYPE OF CASING	6" PVC			
SCREEN INTERVAL				
LOGGER				
DEPTH	50.0'			
CASING DEPTH				
BOT LOG INTERVAL				
TOP LOG INTERVAL	0.00	0.00	0.00	0.00
TYPE FLUID IN HOLE	Leachate			
FLUID LEVEL				
SAMPLE SOURCE				
FLUID LVL/CIRC				
TIME SINCE CIRC.STOP.				
RECORDED BY	Drake & Wooddell			
OBSERVER	Mr. Steve Chillson			

RUN #	GAMMA	FLTEMP	B DENSITY	NEUTRON
PROBE TYPE / S.N.	COM-G11/4	GO-T11/4	GO-BD 21/8	COM-N11/4
MODULE TYPE / S.N.	CS01 F22	CS01 F00	CS22 F22	CS10 F22
LOGGING SPEED	10 ft./minute	-7 ft./minute	10 ft./minute	10 ft./minute
AFTER SURVEY DEPTH ERROR	0.2	0.2	0.2	0.2
SAMPLE INTERVAL =				

COMMENTS.



WLI Wooddell Logging Inc.

Mattoon, Illinois
217 234-8525

Gamma-Den-Fltemp-Neut

COMPANY: WARZYN
WELL: LP06
FIELD: HOD Antioch, IL

LOCATION:
2115990.2
1051732.1

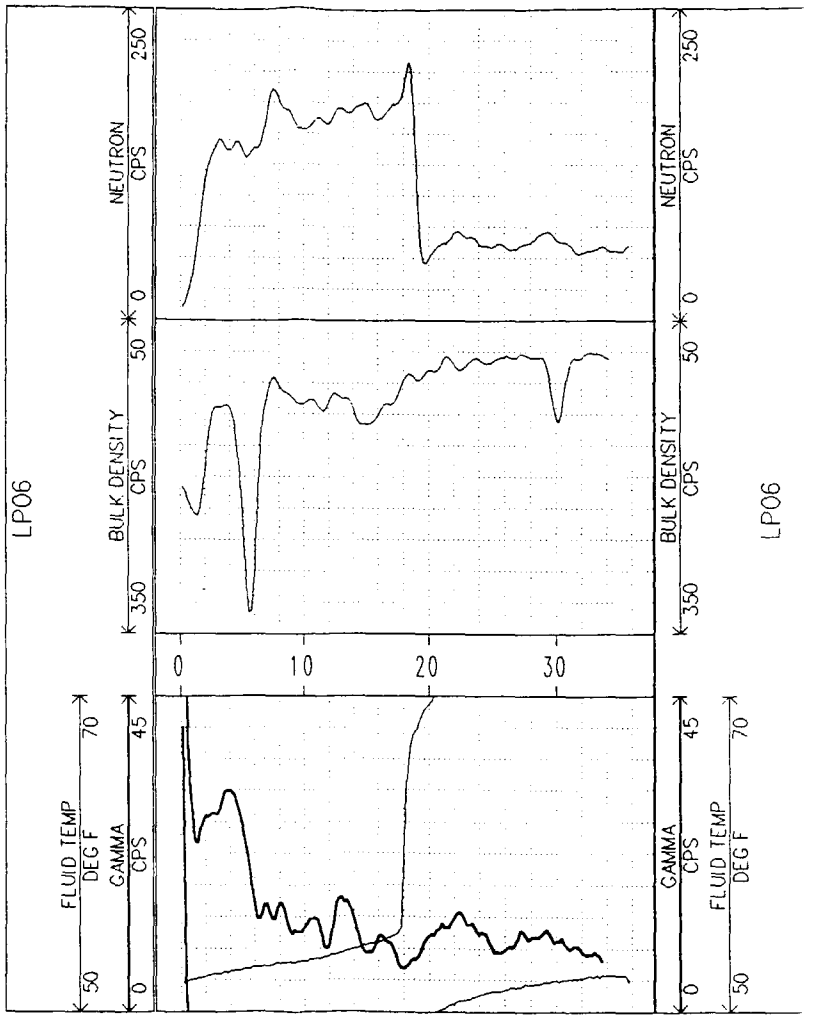
OTHER LOGS:

ERM. DATUM: GROUND LEVEL
ELEVATION: 794.6'
OG MEASURED FROM: GROUND LEVEL

ATE:	19 May 93			
N NUMBER:	ONE			
DRILLER :				
YPE OF CASING	6" PVC			
REEN INTERVAL				
LOGGER :				
PTH	35.6'			
ASING DEPTH				
LOG INTERVAL				
UP LOG INTERVAL	0.00	0.00	0.00	0.00
E FLUID IN HOLE	Leachate			
ID LEVEL				
AMPLE SOURCE				
ID LVL/CIRC.				
SINCE CIRC.STOP.				
ECORDED BY:	Drake & Wooddell			
ERVER:	Mr. Steve Chillson			

RUN #	GAMMA	FLTEMP	B. DENSITY	NEUTRON
PROBE TYPE / S.N.	COM-G1 1/4	GO-T1 1/4	GO-BD2 1/8	COM-N1 1/4
MODULE TYPE / S.N.	CS01 F22	CS01 F00	CS22 F22	CS10 F22
LOGGING SPEED	10 ft./minute	-7 ft./minute	10 ft./minute	10 ft./minute
AFTER SURVEY DEPTH ERROR				
SAMPLE INTERVAL =	0.2	0.2	0.2	0.2

COMMENTS:



WLI Wooddell Logging Inc.

Mattoon, Illinois
217 234-8525

Gamma-Den-Fltemp-Neut

COMPANY: WARZYN
WELL: LP07
FIELD: HOD Antioch, IL

LOCATION:
2116197.8
1052105.4

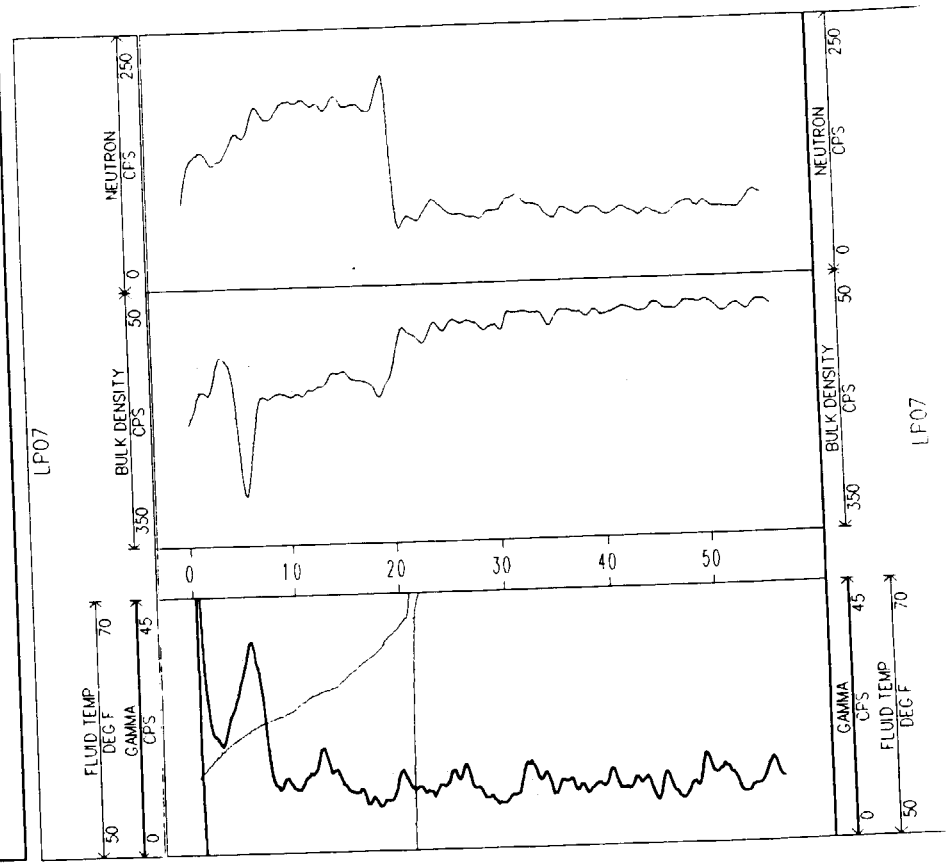
OTHER LOGS:

PERM. DATUM: GROUND LEVEL
ELEVATION: 794.7'
LOG MEASURED FROM: GROUND LEVEL

DATE	19 May 93			
RUN NUMBER	ONE			
DRILLER:				
TYPE OF CASING	6" PVC			
SCREEN INTERVAL				
LOGGER				
DEPTH	58.4'			
CASING DEPTH				
BOT LOG INTERVAL				
TOP LOG INTERVAL	0.00	0.00	0.00	0.00
TYPE FLUID IN HOLE	Leachate			
FLUID LEVEL				
SAMPLE SOURCE				
FLUID LVL/CIRC.				
TIME SINCE CIRC.STOP.				
RECORDED BY	Drake & Wooddell			
OBSERVER	Mr. Steve Chillison			

RUN #	GAMMA	FLTEMP	B DENSITY	NEUTRON
PROBE TYPE / SN	COM-G 1 1/4	CO-T 1 1 1/4	GO-BD 2 1/8	COM-N 1 1/4
MODULE TYPE / SN	CS01 F22	CS01 F00	CS22 F22	CS10 F22
LOGGING SPEED	10 ft/minute	-7 ft/minute	10 ft/minute	10 ft/minute
AFTER SURVEY DEPTH ERROR		0.2	0.2	0.2
SAMPLE INTERVAL =	0.2			

COMMENTS:



WLI Wooddell Logging Inc.
Mattoon, Illinois
217 234-8525

Gamma-Den-Fltemp-Neut

COMPANY: WARZYN
WELL: LP08
FIELD: HOD Antioch, IL

LOCATION:
2116218.6
1052519.4

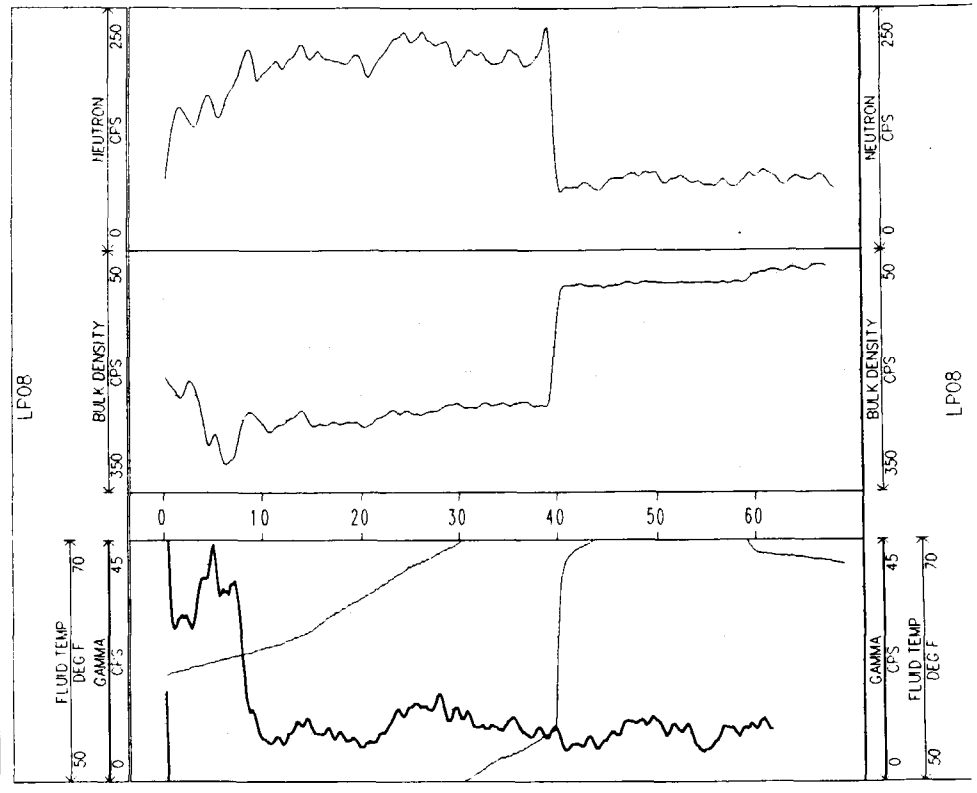
OTHER LOGS:

PERM. DATUM: GROUND LEVEL
ELEVATION: 793.5'
LOG MEASURED FROM: GROUND LEVEL

DATE	19 May 93			
RUN NUMBER	ONE			
DRILLER				
TYPE OF CASING	6" PVC			
SCREEN INTERVAL				
LOGGER				
DEPTH	69.0'			
CASING DEPTH				
BOT LOG INTERVAL				
TOP LOG INTERVAL	0.00	0.00	0.00	0.00
TYPE FLUID IN HOLE	Leachate			
FLUID LEVEL				
SAMPLE SOURCE				
FLUID LVL/CIRC				
TIME SINCE CIRC.STOP				
RECORDED BY	Drake & Wooddell			
OBSERVER	Mr. Steve Chillson			

RUN #	GAMMA	FLTEMP	B.DENSITY	NEUTRON
PROBE TYPE / S.N.	CON-C11/4	CO-T11/4	CO-BD21/8	CON-N11/4
MODULE TYPE / S.N.	CS01 F22	CS01 F00	CS22 F22	CS10 F22
LOGGING SPEED	10 ft/minute	-7 ft/minute	10 ft/minute	10 ft/minute
AFTER SURVEY DEPTH ERROR				
SAMPLE INTERVAL =	0.2	0.2	0.2	0.2

COMMENTS:



WLI Wooddell Logging Inc.
Mattoon, Illinois
217 234-8525

Gamma-Den-Fltemp-Neut

COMPANY: WARZYN
WELL: LP09
FIELD: HOD Antioch, IL

LOCATION:
2116220.4
1052769.9

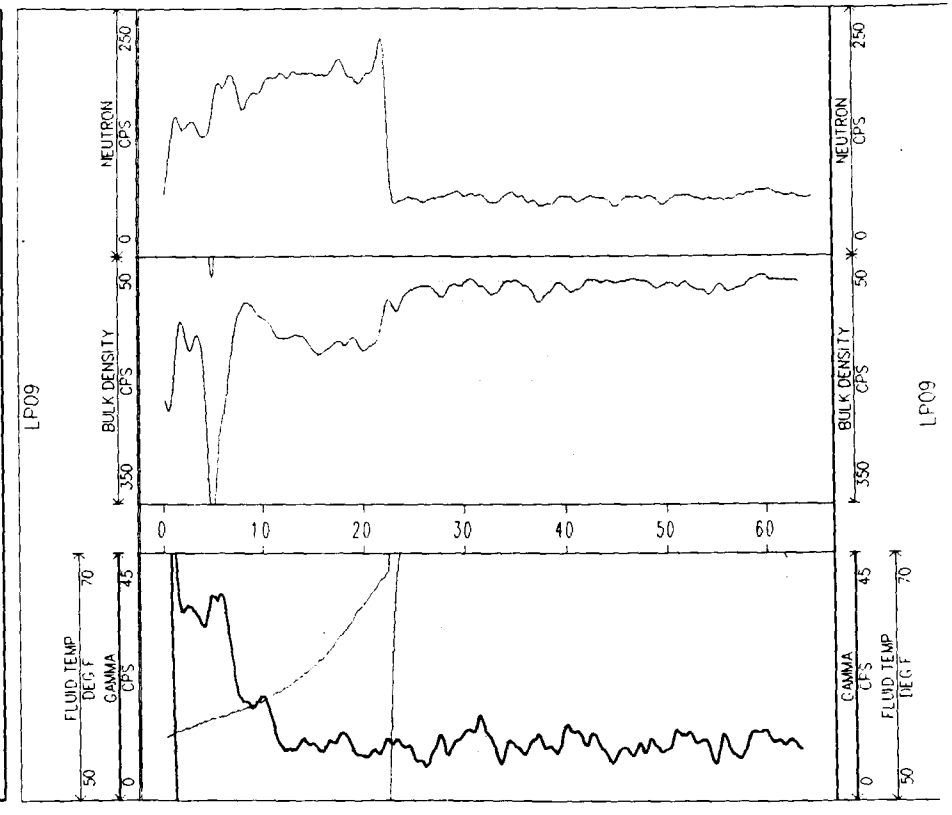
OTHER LOGS:

PERM. DATUM: GROUND LEVEL
ELEVATION: 785.8'
LOG MEASURED FROM: GROUND LEVEL

DATE	19 May 93			
RUN NUMBER	ONE			
DRILLER				
TYPE OF CASING	6" PVC			
SCREEN INTERVAL				
LOGGER				
DEPTH	64.6'			
CASING DEPTH				
BOT LOG INTERVAL				
TOP LOG INTERVAL	0.00	0.00	0.00	0.00
TYPE FLUID IN HOLE	Leachate			
FLUID LEVEL				
SAMPLE SOURCE				
FLUID LVL/CIRC				
TIME SINCE CIRC.STOP				
RECORDED BY	Drake & Wooddell			
OBSERVER	Mr. Steve Chilison			

RUN #	GAMMA	FLTEMP	B DENSITY	NEUTRON
PROBE TYPE / S.N.	COM-G11/4	GO-T11/4	GO-BD21/8	COM-N11/4
MODULE TYPE / S.N.	CS01F22	CS01F00	CS22F22	CS10F22
LOGGING SPEED	10 ft./minute	-7 ft./minute	10 ft./minute	10 ft./minute
AFTER SURVEY DEPTH ERROR				
SAMPLE INTERVAL =	0.2	0.2	0.2	0.2

COMMENTS:



WLI

Wooddell Logging Inc.

Mattoon, Illinois
217 234-8525

Gamma-Den-Fltemp-Neut

COMPANY: WARZYN
WELL: LP10
FIELD: HOD Antioch, IL

LOCATION:
2115810.4
1050919.8

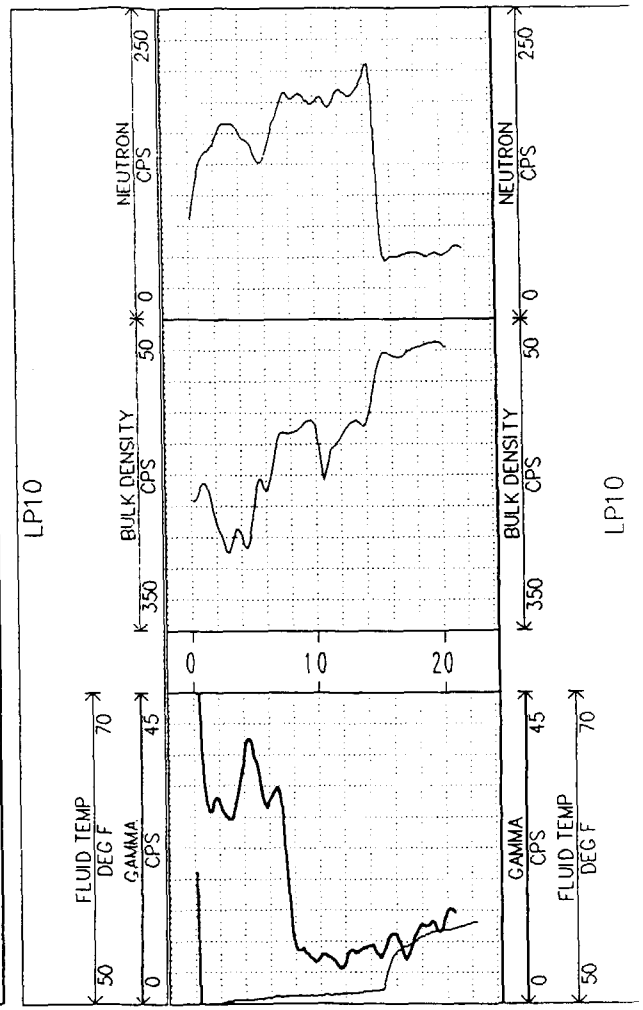
OTHER LOGS:

PERM. DATUM: GROUND LEVEL
ELEVATION: 781.1
LOG MEASURED FROM: GROUND LEVEL

DATE:	20 May 93			
RUN NUMBER:	ONE			
DRILLER:				
TYPE OF CASING	6" PVC			
SCREEN INTERVAL				
LOGGER:				
DEPTH	22.4'			
CASING DEPTH				
BOT LOG INTERVAL				
TOP LOG INTERVAL	0.00	0.00	0.00	0.00
TYPE FLUID IN HOLE	Leachate			
FLUID LEVEL				
SAMPLE SOURCE				
FLUID LVL/CIRC.				
TIME SINCE CIRC.STOP.				
RECORDED BY:	Drake & Wooddell			
OBSERVER:	Mr. Steve Chillson			

RUN #	GAMMA	FLTEMP	B. DENSITY	NEUTRON
PROBE TYPE / S.N.	COM-G 1 1/4	GO-T 1 1/4	GO-BD 2 1/8	COM-N 1 1/4
MODULE TYPE / S.N.	CS01 F22	CS01 F00	CS22 F22	CS10 F22
LOGGING SPEED	10 ft./minute	-7 ft./minute	10 ft./minute	10 ft./minute
AFTER SURVEY DEPTH ERROR				
SAMPLE INTERVAL =	0.2	0.2	0.2	0.2

COMMENTS:



WLI Wooddell Logging Inc.

Mattoon, Illinois
217 234-8525

Gamma-Den-Fltemp-Neut

COMPANY: WARZYN
WELL: LP11
FIELD: HOD Antioch, IL

LOCATION:
2115807.1
1051321.8

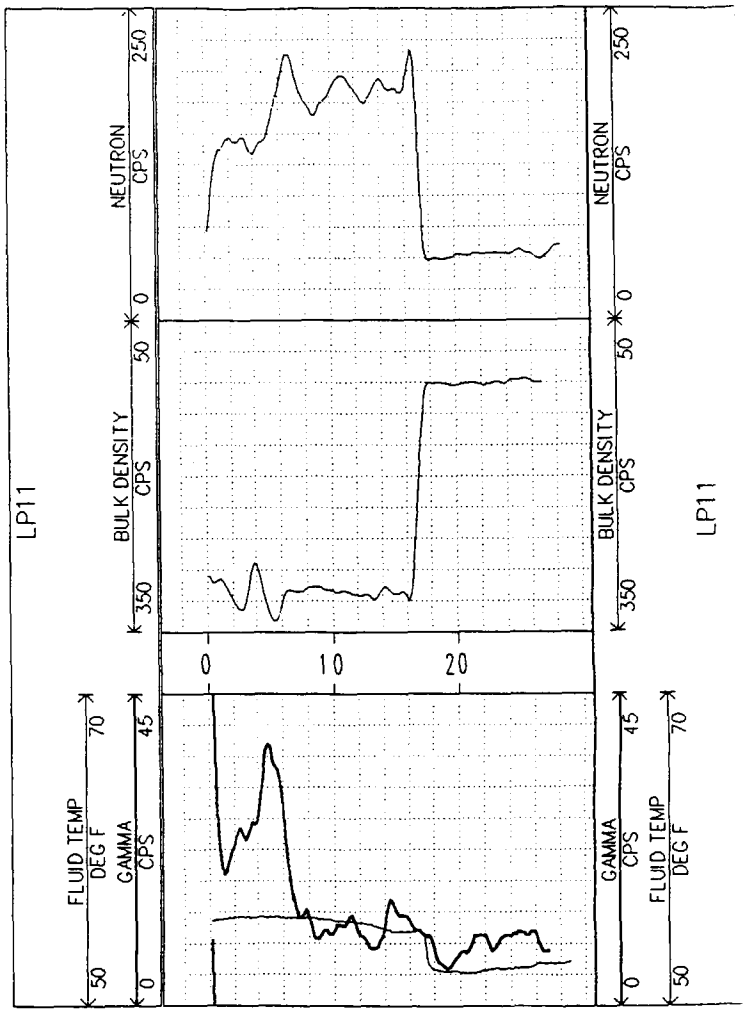
OTHER LOGS:

PERM. DATUM: GROUND LEVEL
ELEVATION: 787.8'
LOG MEASURED FROM: GROUND LEVEL

DATE:	19 May 93			
RUN NUMBER:	ONE			
DRILLER :				
TYPE OF CASING	6" PVC			
SCREEN INTERVAL				
LOGGER :				
DEPTH	28.6'			
CASING DEPTH				
BOT LOG INTERVAL				
TOP LOG INTERVAL	0.00	0.00	0.00	0.00
TYPE FLUID IN HOLE	Leachate			
FLUID LEVEL				
SAMPLE SOURCE				
FLUID LVL/CIRC.				
TIME SINCE CIRC.STOP.				
RECORDED BY:	Drake & Wooddell			
OBSERVER:	Mr. Steve Chillson			

RUN #	GAMMA	FLTEMP	B. DENSITY	NEUTRON
PROBE TYPE / S.N.	COM-G 1 1/4	GO-T 1 1/4	GO-BD 2 1/8	COM-N 1 1/4
MODULE TYPE / S.N.	CS01 F22	CS01 F00	CS22 F22	CS10 F22
LOGGING SPEED	10 ft./minute	-7 ft./minute	10 ft./minute	10 ft./minute
AFTER SURVEY DEPTH ERROR				
SAMPLE INTERVAL =	0.2	0.2	0.2	0.2

COMMENTS:



WLI

Wooddell Logging Inc.

Mattoon, Illinois
217 234-8525

Gamma-Den-Fltemp-Neut

COMPANY: WARZYN
WELL: LP12
FIELD: HOD Antioch, IL

LOCATION:
2115515.5
1051138.4

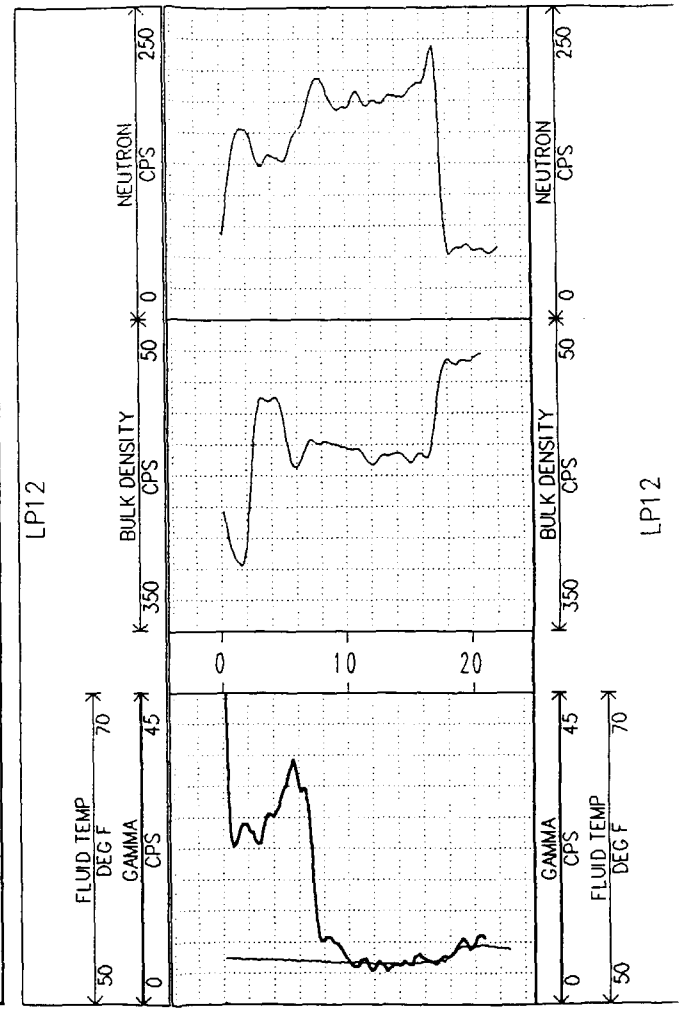
OTHER LOGS:

PERM. DATUM: GROUND LEVEL
ELEVATION: 782.6'
LOG MEASURED FROM: GROUND LEVEL

DATE:	20 MAY 93			
RUN NUMBER:	ONE			
DRILLER :				
TYPE OF CASING	6" PVC			
SCREEN INTERVAL				
LOGGER :				
DEPTH	22.8'			
CASING DEPTH				
BOT LOG INTERVAL				
TOP LOG INTERVAL	0.00	0.00	0.00	0.00
TYPE FLUID IN HOLE	Leachate			
FLUID LEVEL				
SAMPLE SOURCE				
FLUID LVL/CIRC.				
TIME SINCE CIRC.STOP.				
RECORDED BY:	Drake & Wooddell			
OBSERVER:	Mr. Steve Chillson			

RUN #	GAMMA	FLTEMP	B.DENSITY	NEUTRON
PROBE TYPE / S.N.	COM-G11/4	CO-T11/4	CO-BD21/8	COM-N11/4
MODULE TYPE / S.N.	CS01 F22	CS01 F00	CS22 F22	CS10 F22
LOGGING SPEED	10 ft./minute	-7 ft./minute	10 ft./minute	10 ft./minute
AFTER SURVEY DEPTH ERROR				
SAMPLE INTERVAL =	0.2	0.2	0.2	0.2

COMMENTS:



WLI Wooddell Logging Inc.

Mattoon, Illinois
217 234-8525

Gamma-Den-Fltemp-Neut

COMPANY: WARZYN
WELL: LP13
FIELD: HOD Antioch, IL

LOCATION:
2115448.4
1050899.8

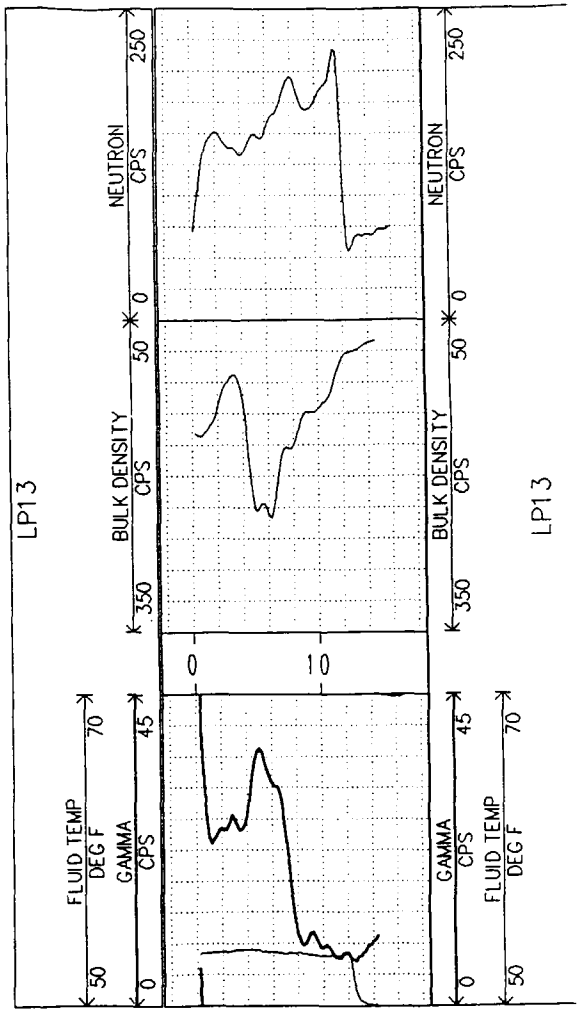
OTHER LOGS:

PERM. DATUM: GROUND LEVEL
ELEVATION: 779'
LOG MEASURED FROM: GROUND LEVEL

DATE:	20 May 93			
RUN NUMBER:	ONE			
DRILLER :				
TYPE OF CASING	6" PVC			
SCREEN INTERVAL				
LOGGER :				
DEPTH	16.6'			
CASING DEPTH				
BOT LOG INTERVAL				
TOP LOG INTERVAL	0.00	0.00	0.00	0.00
TYPE FLUID IN HOLE	Leachate			
FLUID LEVEL				
SAMPLE SOURCE				
FLUID LVL/CIRC.				
TIME SINCE CIRC.STOP.				
RECORDED BY:	Drake & Wooddell			
OBSERVER:	Mr. Steve Chillson			

RUN	GAMMA	FLTEMP	B. DENSITY	NEUTRON
PROBE TYPE / S.N.	COM-G 1 1/4	GO-T 1 1/4	GO-BD 2 1/8	COM-N 1 1/4
MODULE TYPE / S.N.	CS01 F22	CS01 F00	CS22 F22	CS10 F22
LOGGING SPEED	10 ft./minute	-7 ft./minute	10 ft./minute	10 ft./minute
AFTER SURVEY DEPTH ERROR				
SAMPLE INTERVAL =	0.2	0.2	0.2	0.2

COMMENTS:



WLI

Wooddell Logging Inc.

Mattoon, Illinois
217 234-8525

Gamma-Den-Fltemp-Neut

COMPANY: WARZYN
WELL: LP14
FIELD: HOD Antioch, IL

LOCATION:
2115474.5
1051389.5

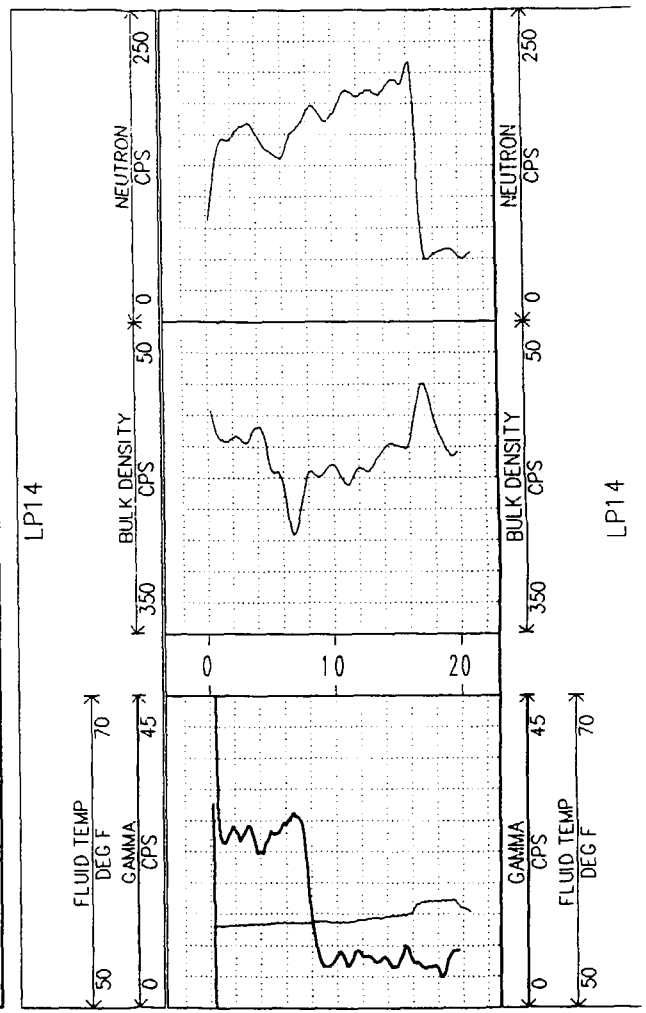
OTHER LOGS:

PERM. DATUM: GROUND LEVEL
ELEVATION: 781.7'
LOG MEASURED FROM: GROUND LEVEL

DATE:	20 May 93			
RUN NUMBER:	ONE			
DRILLER:				
TYPE OF CASING	6" PVC			
SCREEN INTERVAL				
LOGGER:				
DEPTH	21.0'			
CASING DEPTH				
BOT LOG INTERVAL				
TOP LOG INTERVAL	0.00	0.00	0.00	0.00
TYPE FLUID IN HOLE	Leachate			
FLUID LEVEL				
SAMPLE SOURCE				
FLUID LVL/CIRC.				
TIME SINCE CIRC.STOP.				
RECORDED BY:	Drake & Wooddell			
OBSERVER:	Mr. Steve Chillson			

RUN #	GAMMA	FLTEMP	B DENSITY	NEUTRON
PROBE TYPE / S.N.	COM-G11/4	GO-T11/4	GO-BD21/8	COM-N11/4
MODULE TYPE / S.N.	CS01 F22	CS01 F00	CS22 F22	CS10 F22
LOGGING SPEED	10 ft./minute	-7 ft./minute	10 ft./minute	10 ft./minute
AFTER SURVEY DEPTH ERROR				
SAMPLE INTERVAL =	0.2	0.2	0.2	0.2

COMMENTS:



WLI Wooddell Logging Inc.
Mattoon, Illinois
217 234-8525

Gamma–Density–Neutron

COMPANY: WARZYN
WELL: W2D
FIELD: HOD Antioch, IL

LOCATION:
2116648.2
1052499.9

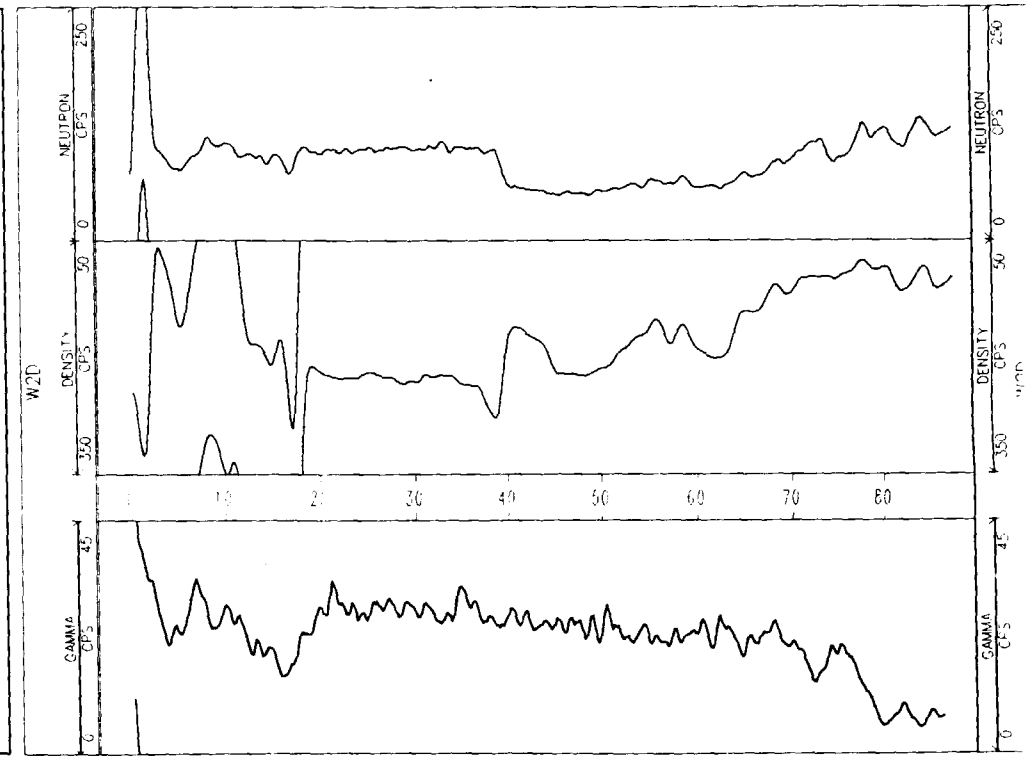
OTHER LOGS:

PERM. DATUM: GROUND LEVEL
ELEVATION: 770.7'
LOG MEASURED FROM: GROUND LEVEL

DATE	04 June 93			
RUN NUMBER	ONE			
DRILLER				
BIT DIA. TO	8 1/2" TO 88.33'			
SCREEN INTERVAL	83.3 TO 88.3'			
TYPE OF CASING	PVC			
SIZE OF CASING				
LOGGER				
DEPTH	87.4'			
CASING DEPTH				
BOT LOG INTERVAL				
TOP LOG INTERVAL				
TYPE FLUID IN HOLE	Water			
FLUID LEVEL				
SAMPLE SOURCE				
FLUID LVL / CIRC				
TIME SINCE CIRC STOP				
RECORDED BY	Drake & Wooddell			
OBSERVER	Mr. Steve Chillson			

RUN #	GAMMA			B DENSITY			NEUTRON		
PROBE TYPE / S/N	CON-G 1 1/4			GO-BD 2 1/8			CON-N 1 1/4		
MODULE TYPE / S/N	CS01 F22			CS22 F22			CS10 F22		
LOGGING SPEED	10 ft/min			10 ft/min			10 ft/min		
AFTER SURVEY DEPTH ERROR									
SAMPLE INTERVAL =	0.2			0.2			0.2		

COMMENTS:



WLI Wooddell Logging Inc.

Mattoon, Illinois
217 234-8525

Gamma

COMPANY: WARZYN
WELL: W3D
FIELD: HOD Antioch, IL

LOCATION:
2115187.6
1051022.7

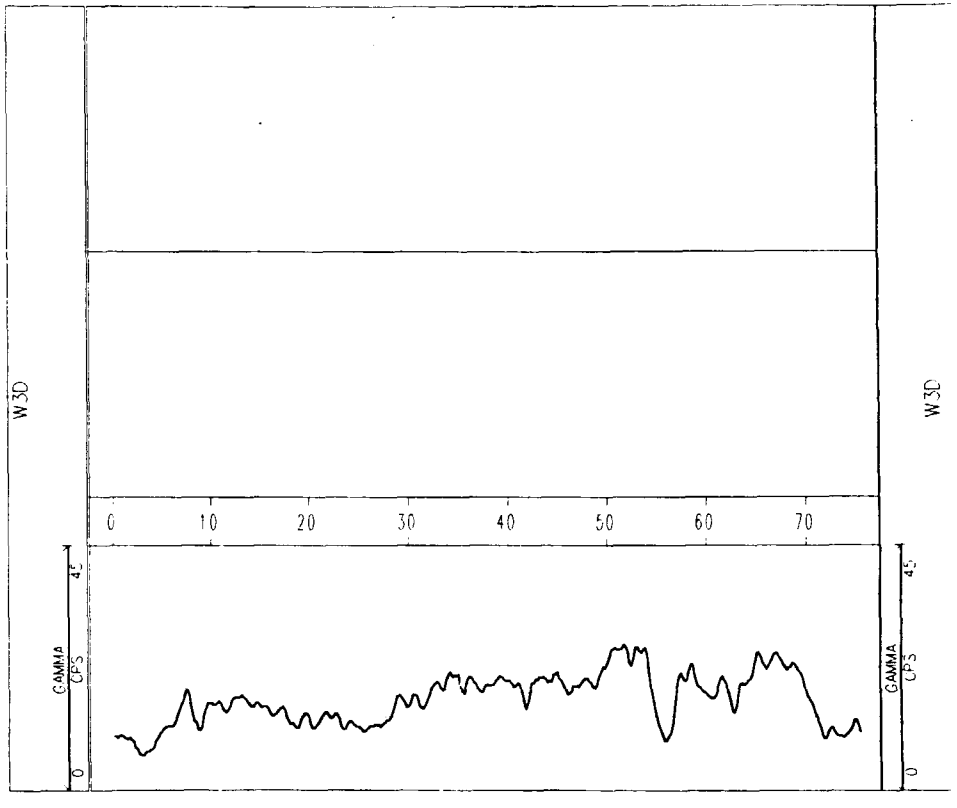
OTHER LOGS:

PERM. DATUM: GROUND LEVEL
ELEVATION: 763.7'
LOG MEASURED FROM: GROUND LEVEL

DATE	03 June 93			
RUN NUMBER	ONE			
DRILLER				
BIT DIA. TO	8 1/2" TO 78'			
SCREEN INTERVAL	73.3' TO 77.6'			
TYPE OF CASING	PVC			
SIZE OF CASING				
LOGGER				
DEPTH	75.4'			
CASING DEPTH				
BOT LOG INTERVAL				
TOP LOG INTERVAL				
TYPE FLUID IN HOLE	Water			
FLUID LEVEL				
SAMPLE SOURCE				
FLUID LVL/CIRC				
TIME SINCE CIRC.STOP				
RECORDED BY	Drake & Wooddell			
OBSERVER	Mr. Steve Chillson			

RUN #	GAMMA
PROBE TYPE / S/N	CON-G 1 1/4
MODULE TYPE / S/N	CS01 F22
LOGGING SPEED	10 ft/minute
AFTER SURVEY DEPTH ERROR	
SAMPLE INTERVAL =	0.2

COMMENTS:



WLI Wooddell Logging Inc.

Mattoon, Illinois
217 234-8525

Gamma-Density-Neutron

COMPANY: WARZYN
WELL: W7D
FIELD: HOD Antioch, IL

LOCATION:
2116326
1053153.3

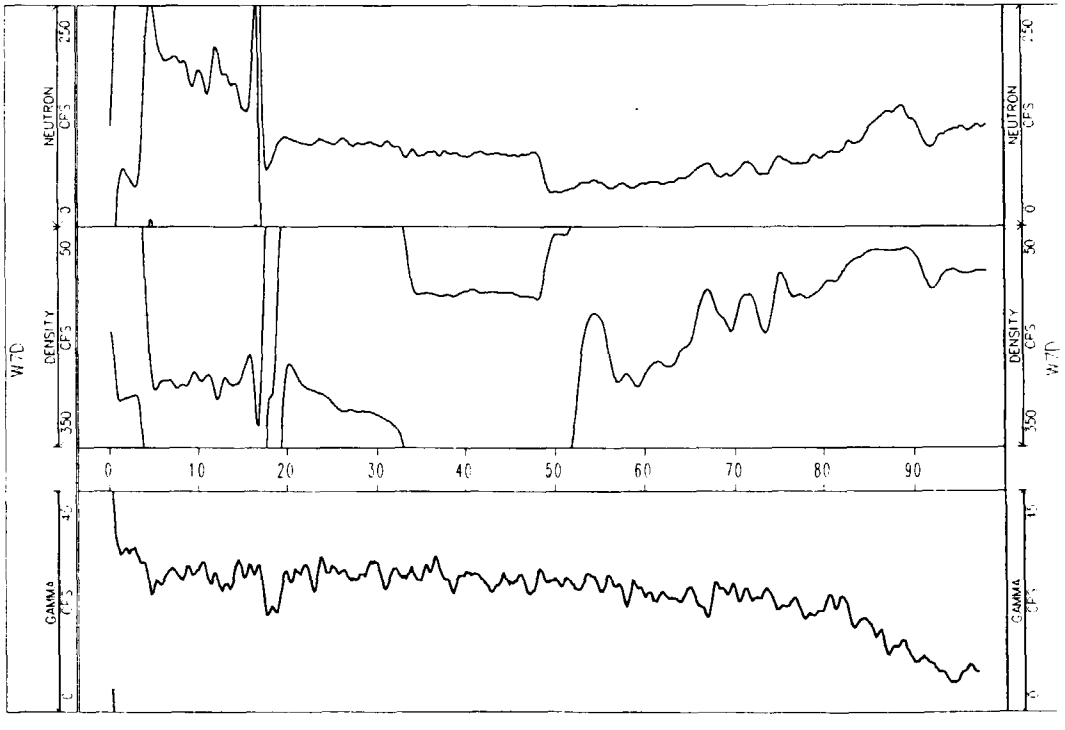
OTHER LOGS.

PERM. DATUM: GROUND LEVEL
ELEVATION: 780.2'
LOG MEASURED FROM: GROUND LEVEL

DATE	04 June 93			
RUN NUMBER	ONE			
DRILLER				
BIT DIA. TO	8 1/2" TO 99.72'			
SCREEN INTERVAL	95.4' TO 99.72'			
TYPE OF CASING	PVC			
SIZE OF CASING				
LOGGER				
DEPTH	98.2'			
CASING DEPTH				
BOT LOG INTERVAL				
TOP LOG INTERVAL				
TYPE FLUID IN HOLE	Water			
FLUID LEVEL				
SAMPLE SOURCE				
FLUID LVL/CIRC				
TIME SINCE CIRC.STOP				
RECORDED BY	Drake & Wooddell			
OBSERVER	Mr. Steve Chillson			

RUN #	GAMMA	B DENSITY	NEUTRON
PROBE TYPE / S.N.	COM-G1 1/4	GO-BD 2 1/8	COM-N1 1/4
MODULE TYPE / S.N.	CS01 F22	CS22 F22	CS10 F22
LOGGING SPEED	10 ft/minute	10 ft/minute	10 ft/minute
AFTER SURVEY DEPTH ERROR			
SAMPLE INTERVAL =	0.2	0.2	0.2

COMMENTS:



WLI Wooddell Logging Inc.
Mattoon, Illinois
217 234-8525

Gamma-Density-Neutron

COMPANY: WARZYN
WELL: US4D
FIELD: HOD Antioch, IL

LOCATION:
2115377.8
1050754.4

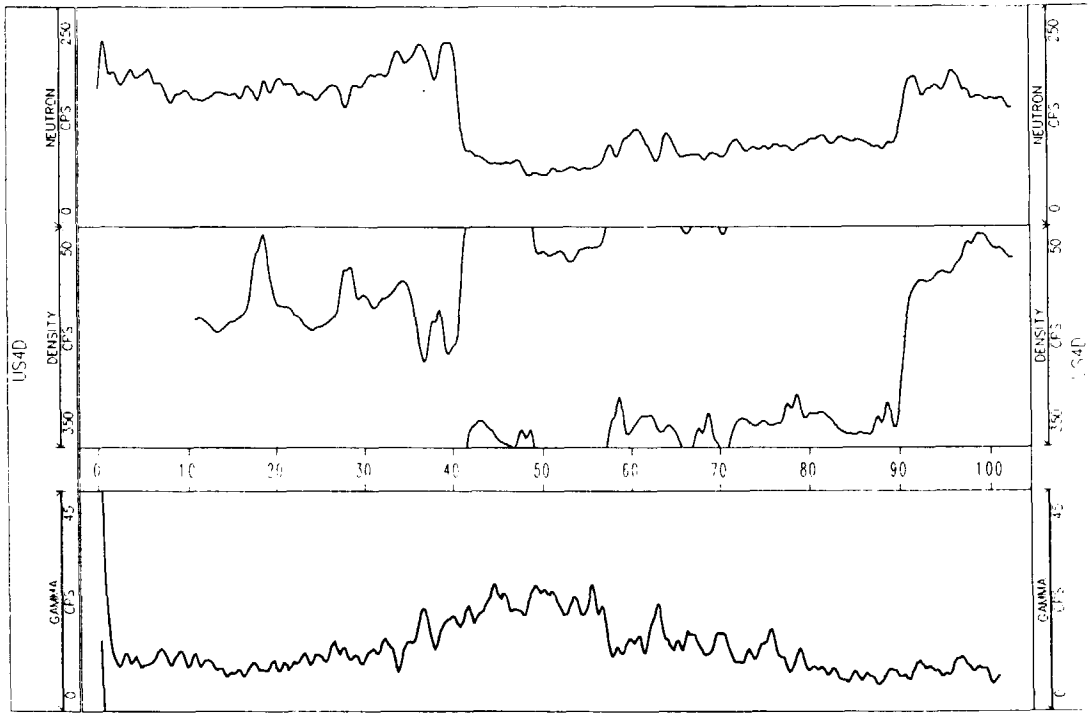
OTHER LOGS:

PERM. DATUM: GROUND LEVEL
ELEVATION: 770.5'
LOG MEASURED FROM: GROUND LEVEL

DATE	04 June 93			
RUN NUMBER	ONE			
DRILLER				
BIT DIA TO				
SCREEN INTERVAL				
TYPE OF CASING				
SIZE OF CASING				
LOGGER				
DEPTH	1024'			
CASING DEPTH				
BOT LOG INTERVAL				
TOP LOG INTERVAL				
TYPE FLUID IN HOLE	Water			
FLUID LEVEL				
SAMPLE SOURCE				
FLUID LVL/CIRC				
TIME SINCE CIRC.STOP				
RECORDED BY	Drake & Wooddell			
OBSERVER	Mr. Steve Chillson			

RUN #	GAMMA			DENSITY			NEUTRON		
PROBE TYPE / S.N	CON-G 1 1/4			CO-BD 2 1/8			CON-N 1 1/4		
MODULE TYPE / S.N	CS01 F22			CS22 F22			CS10 F22		
LOGGING SPEED	10 ft/minute			10 ft/minute			10 ft/minute		
AFTER SURVEY DEPTH ERROR									
SAMPLE INTERVAL =	0.2			0.2			0.2		

COMMENTS:



WLI Wooddell Logging Inc.
Mattoon, Illinois
217 234-8525

Gamma–Density–Neutron

COMPANY: WARZYN
WELL: US6D
FIELD: HOD Antioch, IL

LOCATION:
2115387.7
1051523.3

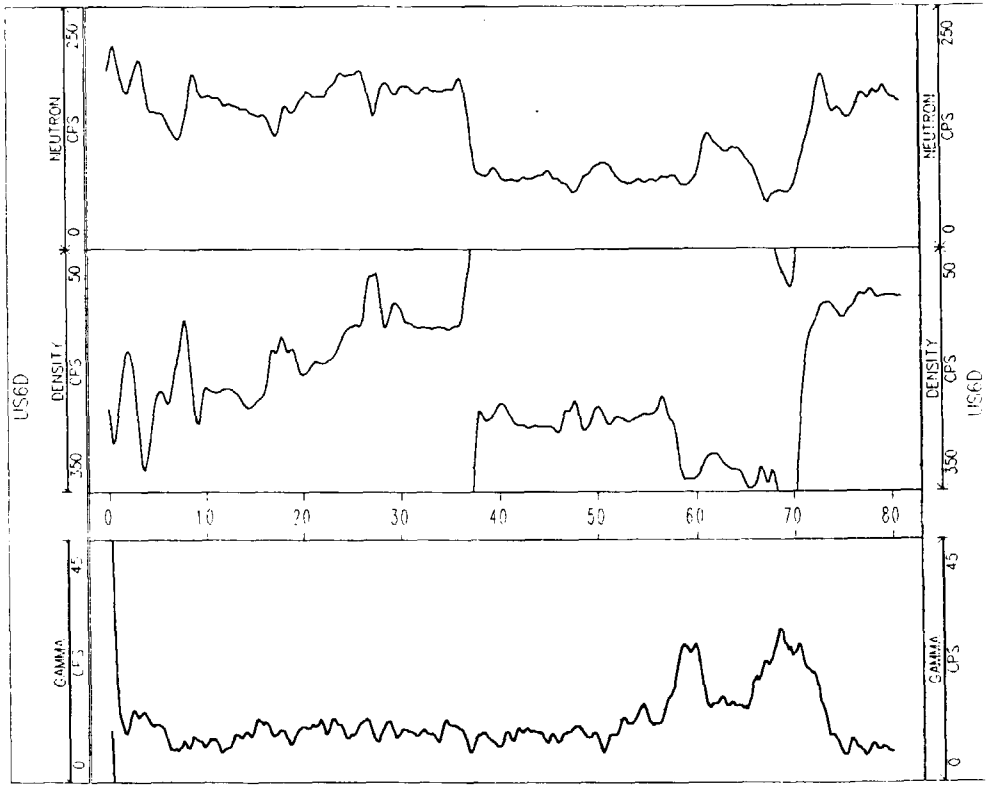
OTHER LOGS:

PERM. DATUM: GROUND LEVEL
ELEVATION: 767.1'
LOG MEASURED FROM. GROUND LEVEL

DATE	04 June 93			
RUN NUMBER	ONE			
DRILLER:				
BIT DIA TO	8 1/2" TO 83.17			
SCREEN INTERVAL	77.5' TO 83.17			
TYPE OF CASING	STAINLESS			
SIZE OF CASING				
LOGGER				
DEPTH	81.0			
CASING DEPTH				
BOT LOG INTERVAL				
TOP LOG INTERVAL				
TYPE FLUID IN HOLE	Water			
FLUID LEVEL				
SAMPLE SOURCE				
FLUID LVL/CIRC				
TIME SINCE CIRC STOP				
RECORDED BY	Drake & Wooddell			
OBSERVER	Mr. Steve Chillson			

	GAMMA	B. DENSITY	NEUTRON
PROBE TYPE / S/N	COM-G 1 1/4	GD-BD 2 1/8	COM-N 1 1/4
MODULE TYPE / S/N	CS01 F22	CS22 F22	CS10 F22
LOGGING SPEED	10 ft/min	10 ft/min	10 ft/min
AFTER SURVEY DEPTH ERROR			
SAMPLE INTERVAL =	0.2	0.2	0.2

COMMENTS:



H

APPENDIX H

LANDFILL BORING LOGS

APPENDIX H

LANDFILL BORING LOGS

Soil Borehole Logs
B1
B2
B2A
B3
B4
B5

SOIL BOREHOLE LOG

SITE NAME AND LOCATION H.O.D. Landfill - Antioch, Illinois

DRILLING METHOD: 4 1/4" IDHSA

SAMPLING METHOD: 2" OD SPLIT SPOON

BORING NO. B1

SHEET 1 OF 1

					DRILLING START	DRILLING FINISH
WATER LEVEL					TIME	TIME
TIME						
DATE					DATE	DATE
CASING DEPTH					4/27/93	4/27/93

BORING LOCATION:
SE 1/4 of SE 1/4 of Section 8 , T 46 N, R 10 E/W

NORTHING 2115338.7 EASTING 1053435.5

DATUM ELEVATION 774.7

DRILL RIG CME 750 ATV

SURFACE CONDITIONS GRASS COVERED LANDFILL CAP

ANGLE Vertical BEARING ------

SAMPLE HAMMER TORQUE FT-LBS

DEPTH IN FEET (ELEVATION)	BLOWS/6 IN. ON SAMPLER	RECOVERY %	SYMBOL		SAMPLE NUMBER AND DESCRIPTION OF MATERIALS	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	TEST RESULTS: WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TESTS
					FILL: Brown CLAY Over Black CLAY Cap Material								
769.7													
768.2	4 6 7 6	92		1	FILL: Very Stiff Brown Clay, Gray Clay, White Plaster Like Material Over Brown and Black Peat Like Material	SS							3-4.5
766.4	4 7 10 6	92		2	FILL: Refuse Over Brown and Black Clay Fill	SS							–
765.7	2 2 2 2	100		3	Brown Fine to Coarse SAND 4" Over Gray Fine to Coarse SAND	SS							–
	2 3 4 4	100		4	Fibrous PEAT (PT), Little Clay, Grades to Organic CLAY (OH)	SS							–
760.7	8 4 6 7	83		5		SS							–
	4 5 4 7	67		6	Loose Brown and Tan Fine to Coarse SAND (SP), Little Fine to Coarse Gravel and Silt	SS							–
757.7	3 7 8 8	92		7	Silty Fine to Medium SAND (SP), Little to Some Coarse Sand, Trace Fine Gravel	SS							–
	5 8 5 9	92		8	Medium Dense Gray Fine to Coarse SAND (SP), Trace to Little Fine Gravel and Silt	SS							–
	4 4 5 9	42		9	Medium Dense Fine to Medium SAND and Some Silt (SP-SM), Trace to Little Fine Gravel and Coarse Sand to 20 Feet, Grades to Fine to Coarse SAND (SP), Trace to Little Fine Gravel	SS							–
	5 7 6 6	46		10		SS							–
	10 15 16 18	58		11	Fine to Coarse SAND (SP-SM) Some Gravel, Trace Silt and Clay	SS							–
	–	46		12	Grades to Medium SAND, Trace to Little Fine to Coarse Sand	SS							–
745.7	8 5 5 5	71		13	Grades to Fine to Coarse SAND and Fine Gravel	SS							1-1.5
743.7	4 6 7 7	100		14	Stiff Gray Sandy Silty CLAY to Clayey Silt (CL/ML) to Clayey Silty Sand (SM)	SS				31	15		1.75-2.75
	3 3 3 4	75		15	Stiff to Very Stiff Gray Lean CLAY (CL) Little Fine to Coarse Sand, Trace Fine Gravel	SS							1.25-2
739.7					End of Boring at 35 Feet Boring Backfilled with Bentonite Slurry and Chips								

LOGGED BY SJC

DRILLING CONTR E&F

DATE 9/23/93 CHK'D BY DAP

CHAS. MARKGRAF

Template ID: WM1 ID: WM1

SOIL BOREHOLE LOG

SITE NAME AND LOCATION H.O.D. Landfill - Antioch, Illinois	DRILLING METHOD: 4 1/4" IDHSA		BORING NO. B2
	SAMPLING METHOD: 2" OD SPLIT SPOON		SHEET 1 OF 2
			DRILLING START / FINISH
BORING LOCATION: SE 1/4 of SE 1/4 of Section 8 , T 46 N, R 10 E/W	WATER LEVEL		TIME / TIME
NORTHING 2115329.8 EASTING 1050990.5	TIME		
DATUM ELEVATION 772.1	DATE		DATE / DATE
	CASING DEPTH		4/26/93 / 4/27/93
DRILL RIG CME 750 ATV	SURFACE CONDITIONS GRASS COVERED LANDFILL CAP		
ANGLE Vertical BEARING ------			
SAMPLE HAMMER TORQUE FT-LBS			

DEPTH IN FEET (ELEVATION)	BLOWS/6 IN. ON SAMPLER	RECOVERY %	SYMBOL		SAMPLE NUMBER AND DESCRIPTION OF MATERIALS	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	TEST RESULTS: WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TESTS
					FILL: Clay Cap Material to Approximately 4 Feet								
768.1													
5					Refuse to Approximately 10 Feet								
10 762.1													
761.1	2 3 1 1	67		1	Tan Fine to Coarse SAND (SP)	SS							–
760.1					Peat and Organic CLAY (PT/OH)								
	2 1 1 1	33		2	Soft Gray Fat CLAY (CH), Little to Some Sand, 1/4" Woody Peat Lense at 13.5 Feet	SS							–
758.1	7 7 7 7	71		3	Medium Dense Fine to Coarse SAND (SP), Trace to Little Fine Gravel	SS							–
15 756.1													
755.1	6 5 7 6	71		4	Silty Fine to Coarse SAND (SM) 1" Silt Layer at 17 Feet	SS							–
	3 6 10 12	25		5	Medium Dense Fine to Coarse SAND (SP), Trace Fine Gravel	SS							–
20	7 15 19 19	50		6	Trace to Little Silt 1/4" Silt Lenses at 21 and 21.9 Feet	SS							–
	7 9 12 9	58		7	Grades to Fine to Coarse SAND (SP), Little to Some Fine Gravel	SS							–
25	7 8 8 12	58		8	Grades to Fine to Medium SAND	SS							–
	4 6 8 10	38		9	Grades to Fine to Coarse SAND and Fine GRAVEL (SP/GP)	SS							–
	4 5 7 10	54		10	Grades to Fine to Medium SAND (SP), Trace to Little Coarse Sand, Trace Gravel	SS							–
30	8 9 9 40	63		11	Fine to Medium SAND, Little Coarse Sand, Trace Fine Gravel	SS							–
739.1	8 5 3 5	71		12		SS							1.25-2.5
35	5 6 6 6	71		13	Stiff Gray Silty Sandy CLAY (CL) Grades to More Clayey Sand and Silt (CL/ML) Gray Sandy Silty CLAY (CL) Silt Lenses	SS				23	9		–
	4 6 7 10	83		14		SS							1.5

LOGGED BY SJC DRILLING CONTR E&F

DATE 9/22/93 CHK'D BY DAP CHAS. MARKGRAF

Template ID: WM1 ID: WM1

SOIL BOREHOLE LOG

SITE NAME AND LOCATION H.O.D. Landfill - Antioch, Illinois

SHEET 2 OF 2

BORING NO. B2

DEPTH IN FEET (ELEVATION)	BLOWS/6 IN. ON SAMPLER	RECOVERY %	SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIALS	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	TEST RESULTS: WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TESTS
734.1				Stiff Gray Lean Clay (CL), Little to Some Fine to Coarse Sand and Silt, Trace to Little Fine Gravel								
				End of Boring at 38 Feet Boring Backfilled with Bentonite Slurry and Chips								
40												
45												
50												
55												
60												
65												
70												
75												
80												
85												

SOIL BOREHOLE LOG

SITE NAME AND LOCATION H.O.D. Landfill - Antioch, Illinois	DRILLING METHOD: 4 1/4" ID HSA	BORING NO. B2A
	SAMPLING METHOD: 2" OD SPLIT SPOON	SHEET 1 OF 1
		DRILLING START / FINISH
BORING LOCATION: SE 1/4 of SE 1/4 of Section 8 , T 46 N, R 10 E/W	WATER LEVEL / TIME	TIME / TIME
NORTHING 2115329.8 EASTING 1051000.3	TIME / DATE	DATE / DATE
DATUM ELEVATION 772.1	CASING DEPTH	4/27/93 / 4/27/93
DRILL RIG CME 75	SURFACE CONDITIONS GRASS COVERED LANDFILL CAP	
ANGLE Vertical BEARING ------		
SAMPLE HAMMER TORQUE FT-LBS		

DEPTH IN FEET (ELEVATION)	BLOWS/6 IN. ON SAMPLER	RECOVERY %	SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIALS	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	TEST RESULTS: WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TESTS
				FILL: Brown Clay Cap Material, Blind Drilled to 15 Feet								
768.1				FILL: Refuse to 10 Feet, Logged from Cuttings								
5												
762.1												
10												
15	12 11 13 12	100		1 Medium Dense Brown and Gray, Fine to Coarse SAND (SP), Some Gravel, Little Silt, Trace Clay	SS							
755.1				End of Boring at 17 Feet Boring Backfilled with Bentonite Chips								
20												
25												
30												
35												

LOGGED BY PMS DRILLING CONTR E & F

DATE 9/22/93 CHK'D BY DAP CHAS. MARKGRAF

Template ID: WM1 ID: WM1

SOIL BOREHOLE LOG

SITE NAME AND LOCATION H.O.D. Landfill - Antioch, Illinois	DRILLING METHOD: 4 1/4" IDHSA	BORING NO. B3
	SAMPLING METHOD: 2" OD SPLIT SPOON 2.5" ID	SHEET 1 OF 2
	SPLIT SPOON 22'-24'; SHELBY TUBE 48'-50'	DRILLING
BORING LOCATION: SE 1/4 of SE 1/4 of Section 8 , T 46 N, R 10 E/W	WATER LEVEL / TIME / DATE / CASING DEPTH	START TIME / FINISH TIME
NORTHING 2115331.9 EASTING 105115.3		DATE 4/26/93 / DATE 4/26/93
DATUM ELEVATION 773.7		
DRILL RIG CME 750 ATV	SURFACE CONDITIONS GRASS COVERED LANDFILL CAP	
ANGLE Vertical BEARING ------		
SAMPLE HAMMER TORQUE FT-LBS		

DEPTH IN FEET (ELEVATION)	BLOWS/6 IN. ON SAMPLER	RECOVERY %	SYMBOL	SAMPLE NUMBER	SAMPLE NUMBER AND DESCRIPTION OF MATERIALS	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	TEST RESULTS: WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TESTS
					FILL: Clay Cap Material to Approximately 4 Feet								
769.7					FILL: Refuse to Approximately 10.5 Feet								
5													
10 763.2	5 4 5 3	38		1	Black and Brown PEAT (PT) and Wood Chips Present	SS							–
	1 1 2 2	33		2	Brown Organic CLAY to PEAT (PT/OH)	SS							–
15 758.7	2 3 7 8	67		3	2" Layer of Organic Silt and Clay, Over 1" Layer of Fine to Medium Sand Over Gray Organic Clay	SS							–
	5 6 8 8	58		4	Medium Dense Gray Fine to Medium SAND (SP)	SS							–
754.7	5 2 1 1	67		5		SS							–
20 753.7					Gray Organic CLAY (OH)								
	5 8 10 8	50		6	Medium Dense Fine to Coarse SAND (SP), Little Fine Gravel	SS							–
	7 17 18 15	75		7	Some Gravel, Little Silt, Trace Clay	SS							–
25	5 6 10 11	58		8	Grades to Fine then Coarse Sand	SS							–
	5 6 13 10	25		9		SS							–
	4 5 6 6	79		10	1/2" Gray SILT to Clayey Silt Lens at 28'	SS							–
30	6 8 9 9	42		11	Medium Dense Fine to Coarse SAND and Trace to Little Fine Gravel, Trace Coarse Sand 2" Fine to Medium Sand Lens, Grades to Fine to Coarse SAND and Fine GRAVEL (SP/GP)	SS							–
	6 7 8 9	50		12	Medium Dense Fine to Coarse SAND (SP), Little to Some Fine Gravel Trace Coarse Sand	SS							–
35	6 8 9 10	63		13		SS							–
	12 8 8 8	67		14		SS							–

LOGGED BY SJC DRILLING CONTR E&F

DATE 9/22/93 CHK'D BY DAP CHAS. MARKGRAF

Template ID: WM1 ID: WM1

SOIL BOREHOLE LOG

SITE NAME AND LOCATION H.O.D. Landfill - Antioch, Illinois

SHEET 2 OF 2

BORING NO. B3

DEPTH IN FEET (ELEVATION)	BLOWS/6 IN. ON SAMPLER	RECOVERY %	SYMBOL		SAMPLE NUMBER AND DESCRIPTION OF MATERIALS	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	TEST RESULTS: WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TESTS
	5 6 8 8	50		15		SS							–
40 733.7	6 6 10 10	33		16	Gray Clayey SILT (ML) Grades to Gray Sandy Silty CLAY (CL)	SS							–
730.7	6 8 18 18	75		17	Very Stiff Gray Silty CLAY (CL), Trace to Little Fine to Coarse Sand	SS							2.75-3.25
728.7	5 10 10 8	75		18	Gray Fine to Medium SAND (SP), Little Coarse Sand, Trace Fine Gravel	SS							–
45 727.7	6 7 9 10	88		19	Silt to Sandy SILT (ML), Trace to Little Fine Gravel, and Fine to Coarse Sand, Grades to Sandy Silty Clay	SS							2.25-2.75
	–	100		20	Very Stiff Gray Lean CLAY (CL), Little Fine to Coarse Sand, Trace Fine Gravel	SB							–
50 723.7					End of Boring at 50 Feet Boring Backfilled with Bentonite Slurry and Chips								
55													
60													
65													
70													
75													
80													
85													

SOIL BOREHOLE LOG

SITE NAME AND LOCATION H.O.D. Landfill - Antioch, Illinois	DRILLING METHOD: 4 1/4" IDHSA	BORING NO. B4
		SHEET 1 OF 2
	SAMPLING METHOD: 2" OD SPLIT SPOON 2 1/2" ID	
	SPLIT SPOON 37'-39'	DRILLING
		START / FINISH
BORING LOCATION: SE 1/4 of SE 1/4 of Section 8 , T 46 N, R 10 E/W	WATER LEVEL	TIME / TIME
	TIME	
NORTHING 2115328.1 EASTING 1051350.4	DATE	DATE / DATE
DATUM ELEVATION 774.1	CASING DEPTH	4/23/93 / 4/23/93
DRILL RIG CME 750 ATV	SURFACE CONDITIONS GRASS COVERED LANDFILL CAP	
ANGLE Vertical BEARING ------		
SAMPLE HAMMER TORQUE FT-LBS		

DEPTH IN FEET (ELEVATION)	BLOWS/6 IN. ON SAMPLER	RECOVERY %	SYMBOL		SAMPLE NUMBER AND DESCRIPTION OF MATERIALS	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	TEST RESULTS: WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TESTS
					FILL: Blind Drilled to 5 Feet Brown and Black Clay Cap Material								
770.1													
5	2 10 6 4	25		1	FILL: Refuse Paper, Metal, Plastic, Etc.	SS							–
10	5 7 3 4	17		2	FILL: Refuse Concrete, Paper, Plastic, Metal, Etc.	SS							–
760.6													
15	3 7 7 8	67		3	Medium Dense Tan Fine Silty SAND to Fine Sandy SILT (SM)	SS							–
757.6	5 7 8 9	71		4	Medium Dense Gray Fine SAND (SP), Trace to Little SILT	SS							–
20	3 4 5 7	75		5	Loose Brown Fine SAND (SP), Trace Silt, Trace to Little Medium Sand	SS							–
	4 5 6 7	71		6	Medium Dense Brown Fine to Medium SAND	SS							–
	3 4 6 8	54		7	Grades to Fine to Coarse SAND and Fine GRAVEL (SP/GP)	SS							–
25	5 7 7 7	67		8	Fine to Coarse SAND (SP), Little Fine Gravel	SS							–
	2 5 7 8	75		9		SS							–
30	–	75		10	Sand Grades Fine to Coarse	SB							–
	8 8 8 10	67		11	Medium Dense Gray Fine to Medium SAND (SP)	SS							–
	6 10 11 13	88		12	SILT and SAND (SP/ML)	SS							–
35	5 7 8 8	71		13	Medium Dense Fine Sandy SILT to Silty SAND (SM), Silt	SS							–

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DATE 9/22/93 CHK'D BY DAP CHAS. MARKGRAF

ID: WM1

SOIL BOREHOLE LOG

SITE NAME AND LOCATION H.O.D. Landfill - Antioch, Illinois

SHEET 2 OF 2

BORING NO. B4

DEPTH IN FEET (ELEVATION)	BLOWS/6 IN. ON SAMPLER	RECOVERY %	SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIALS	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	TEST RESULTS: WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TESTS
	5 6 7 9	71		14 and Sand Fine Sand, Some Silt, Trace Clay and Gravel	SS							–
40	6 7 8 10	75		15	SS							–
	5 8 9 11	96		16 Fine Sand, Little Medium Sand	SS							–
	4 3 3 5	96		17 Medium Dense Fine to Coarse SAND (SP), and Fine Gravel	SS							–
45	11 10 9 10	75		18 Medium Dense Fine to Coarse SAND (SP), Trace to Little Fine Gravel	SS							–
727.1	–	75		19 Stiff Gray Lean CLAY (CL), Little to Some Silt, Little Fine to Coarse Sand, Trace Gravel	SB				25	11		1.5-2.0
725.1				End of Boring at 49 Feet Boring Backfilled with Bentonite Slurry and Chips								
50												
55												
60												
65												
70												
75												
80												
85												

SOIL BOREHOLE LOG

SITE NAME AND LOCATION H.O.D. Landfill - Antioch, Illinois	DRILLING METHOD: 4 1/4" IDHSA	BORING NO. B5
	SAMPLING METHOD: 2" OD SPLIT SPOON	SHEET 1 OF 2
BORING LOCATION: SE 1/4 of SE 1/4 of Section 8 , T 46 N, R 10 E/W	WATER LEVEL / TIME / DATE / CASING DEPTH	DRILLING START TIME 4/23/93; FINISH TIME 4/23/93
NORTHING 2115444.5 EASTING 1051463.4		
DATUM ELEVATION 775.2		
DRILL RIG CME 750 ATV	SURFACE CONDITIONS GRASS COVERED LANDFILL CAP	
ANGLE Vertical BEARING ------		
SAMPLE HAMMER TORQUE FT-LBS		

DEPTH IN FEET (ELEVATION)	BLOWS/6 IN. ON SAMPLER	RECOVERY %	SYMBOL	SAMPLE NUMBER	SAMPLE NUMBER AND DESCRIPTION OF MATERIALS	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	TEST RESULTS: WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TESTS
					FILL: Brown Clay Cap Material to 5 Feet Blind Drilled to 10 Feet								
5					FILL: Refuse and Clay								
10	5 8 5 12	25		1	FILL: Refuse	SS							–
15	6 6 6 12	13		2		SS							–
758.2	5 10 11 12	79		3	Refuse, Little Sand in Tip of Spoon	SS							–
20	5 6 11 12	63		4	Medium Dense Fine to Medium SAND (SP), Trace to Little Clayey Sand	SS							–
	5 2 1 1	46		5	2" Organic Sandy Clay, Wood Fibers in End of Spoon	SS							–
25	5 12 13 16	25		6	Medium Dense Fine to Medium SAND (SP) Grades to Fine to Coarse Little Fine Gravel, Little Clay	SS							–
	5 8 10 9	50		7	Medium Dense Fine to Coarse SAND (SP), Little Fine Gravel	SS							–
30	3 6 9 10	71		8		SS							–
	5 7 8 8	83		9	Fine to Coarse Sand, Some Gravel, Little Silt, Trace Clay	SS							–
	10 9 10 10	67		10	Grades to Medium Dense Fine SAND (SP), Less Coarse Sand, Grades Back to Fine to Coarse Sand	SS							–
35	6 9 11 14	67		11		SS							–
740.2	7 10 10 11	67		12	3" Gray Clayey Silt Layer Over Fine Silty SAND (SM), Grades to Fine to Coarse Sand in Tip of Spoon	SS							–

LOGGED BY SJC DRILLING CONTR E&F

DATE 9/22/93 CHK'D BY DAP CHAS. MARKGRAF

Template ID: WM1 ID: WM1

SOIL BOREHOLE LOG

SITE NAME AND LOCATION H.O.D. Landfill - Antioch, Illinois

SHEET 2 OF 2

BORING NO. B5

DEPTH IN FEET (ELEVATION)	BLOWS/6 IN. ON SAMPLER	RECOVERY %	SYMBOL		SAMPLE NUMBER AND DESCRIPTION OF MATERIALS	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	TEST RESULTS: WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TESTS
	3 10 10 10	75		13	Fine Silty SAND (SM)	SS							–
40	5 7 9 6	58		14	Fine Silty SAND to Fine SAND (SM/SP), Trace to Some Silt	SS							–
	6 11 10 10	63		15	Fine Silty SAND (SM) Grades to Silt in Tip of Spoon	SS							–
731.7	5 7 4 6	58		16	6" Fine to Coarse Sand and Silt, Trace Fine Gravel; Very Stiff Gray Silty CLAY (CL)	SS							2.25-2.75
45	6 8 10 12	100		17	Stiff Gray Silty CLAY (CL), Little Fine to Coarse Sand, Shale Fragments Present	SS				29	13		1.25-2.50
	4 6 9 9	100		18		SS							1.25-2.[illegible]
726.2					End of Boring at 49 Feet Boring Backfilled with Bentonite Slurry and Chips								
50													
55													
60													
65													
70													
75													
80													
85													

APPENDIX I

GEOTECHNICAL LABORATORY DATA

WARZYN

ONE SCIENCE COURT
P.O. BOX 5385
MADISON, WI 53705
(608) 231-4747
FAX (608) 231-4777

LABORATORY RESULTS

Project: HOD Landfill **Project #:** 10010201

Location: Antioch, Illinois

Sample Number	Description	Liquid Limit %	Plasticity Index %	Natural Moisture %
6764-0001	HD-SU01-01	28	12	27.8
6764-0002	HD-SU02-01	33	8	28.3
6764-0003	HD-SU03-01	51	21	44.2
6764-0004	HD-SU04-01	26	10	24.0
6764-0005	HD-SU04-91	25	9	22.7
6764-0006	HD-SU05-01	29	12	18.5

Ck'd: CLS **App'd:** DTL
Date Issued: 6-9-93

WARZYN

P.O. BOX 5385
MADISON, WI 53705
(608) 231 4747
FAX (608) 231 4777

LABORATORY RESULTS

Project: HOD Landfill RI/FS **Project #:** 10010201

Location: Antioch, Illinois

Sample Number	Description	Loss on Ignition %	Estimated Total Porosity
6619-0006	HD-SSW3D-38	1.64	0.24

Ck'd: JMP **App'd:** DTL
Date Issued: 6-4-93

WARZYN

ONE SCIENCE COURT
P.O. BOX 5385
MADISON, WI 53705
(608) 231-4747
FAX (608) 231-4777

LABORATORY RESULTS

Project: HOD Landfill RI/FS

Project #: 10010201

Location: Antioch, Illinois

Sample Number	Description	Loss on Ignition %	Estimated Total Porosity
6877-0008	HD-SSW2D-31	3.6	0.38
6878-0006	HD-SSW5S-9	11.7	--

-- Not requested.

Ck'd: DR App'd: VJR
Date Issued: 6-16-93

Job No. 100102
Date: 05/25/93

LLING HEAD PERMEABILITY TEST

yn Inc., 1 Science Court, Madison, WI 53711 Phone: (608) 231-6955 or 231-4747

JECT	H.J.D. LANDFILL RI/FS
TATION	Antioch, Illinois
LE	HD-SSW2D-31
PTH (ft)	
DESCRIPTION (a)	Gray Lean CLAY (CL)
LE DIAMETER (cm)	7.4
LE AREA, A(cm²)	42.6

	INITIAL	FINAL
LE LENGTH, L(cm)	18.0	17.6
TURE CONTENT, %	21.6	20.9
Y INSITY (lb/cu ft)	104.9	106.1
ENT COMPACTION	--	--

RUN	COEFFICIENT OF PERMEABILITY, k(cm/sec)
1	1.3E-08
2	1.5E-08
3	1.4E-08
4	1.7E-08
5	1.6E-08
6	1.3E-08
7	1.8E-08
8	1.2E-08
9	1.3E-08
10	1.6E-08

AVERAGE COEFFICIENT OF PERMEABILITY = 1.5E-08 cm/sec
(Based on run numbers 8 through 10)

$$k = \frac{2.3aL}{At} \log_{10} \frac{h_0}{h_1}$$

, Where a = cross-sectional area of standpipe,
t = time for water level to fall from initial height, h_0, to final height, h_1
(All other terms are defined above)

NOTES: (a) Visual Soil Description.

[illegible]: This permeability test was performed on a relatively undisturbed 3-inch diameter Shelby tube sample.

[illegible] CLS [illegible] 5-26-93 [illegible] DTL [illegible] 6-8-93

Job No. 100102
Date: 05/21/93

[illegible] HEAD PERMEABILITY TEST

[illegible] Inc., 1 Science Court, Madison, WI 53711 Phone: (608) 231-6955 or 231-4747

[illegible]ECT	H.O.D. LANDFILL RI/FS
[illegible]ATION	Antioch, Illinois
[illegible]MPLE	HD-SSW3D-38
[illegible]TH (ft)	
[illegible]DESCRIPTION (a)	Gray Lean CLAY, Some Sand, Little Gravel (CL)
[illegible]PLE DIAMETER (cm)	7.4
[illegible]MPLE AREA, A (cm²)	42.6

	INITIAL	FINAL
[illegible]MPLE LENGTH, L (cm)	18.7	18.6
[illegible]STURE CONTENT, %	11.7	11.6
[illegible] DENSITY (lb/cu ft)	127.4	127.7
[illegible]UENT COMPACTION	-	-

RUN	COEFFICIENT OF PERMEABILITY, k (cm/sec)
1	1.9E-08
2	1.8E-08
3	1.8E-08
4	1.6E-08
5	1.9E-08
6	2.0E-08
7	1.4E-08
8	1.7E-08
9	1.7E-08
10	1.7E-08

AVERAGE COEFFICIENT OF PERMEABILITY = 1.7E-08 cm/sec
(Based on run numbers 8 through 10)

$$\text{[illegible]} = \frac{2.3a}{At} \log_{10} \frac{h_0}{h_1}$$

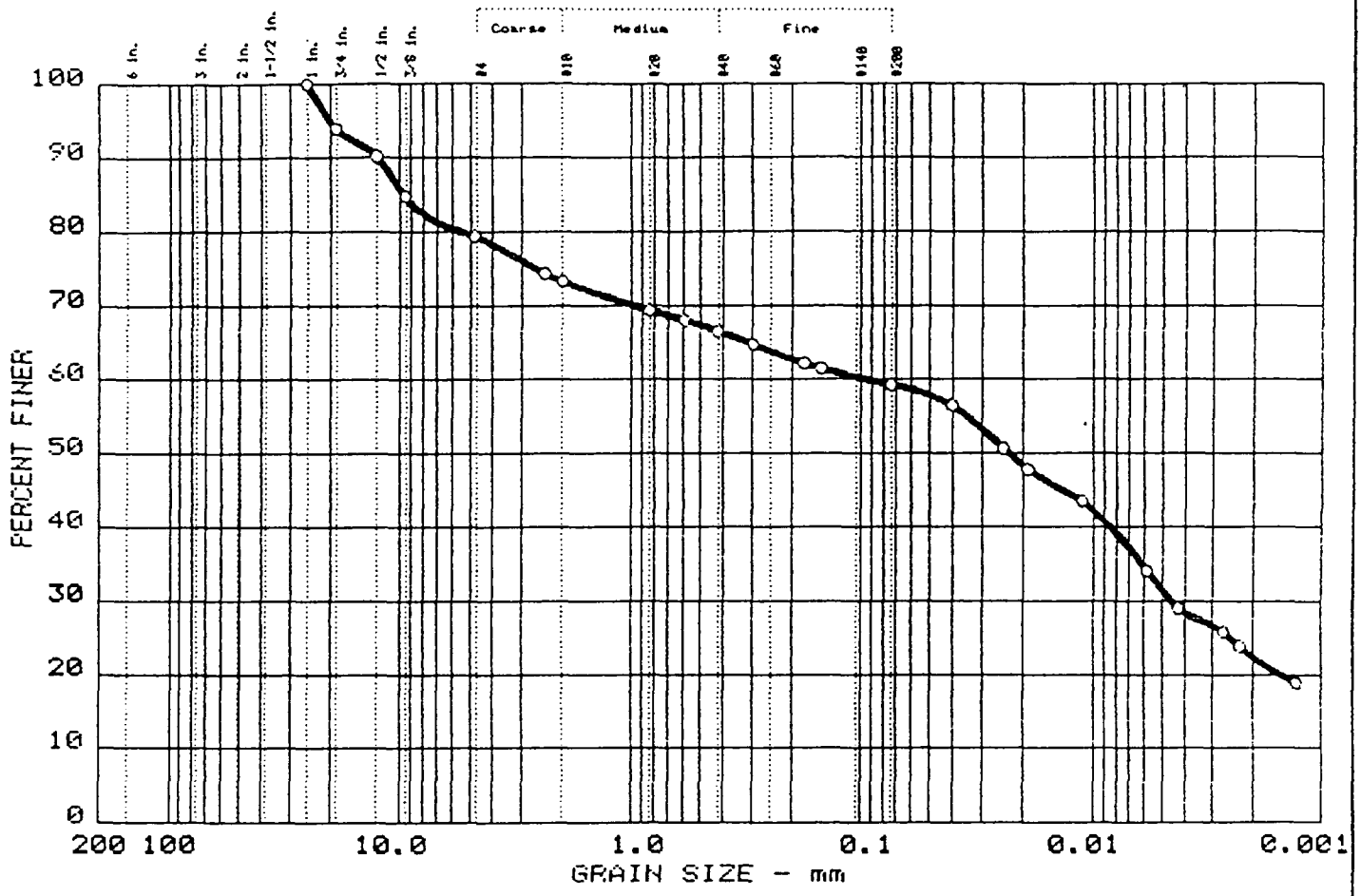
, Where a = cross-sectional area of standpipe,
t = time for water level to fall from initial height, h_0, to final height, h_1
(All other terms are defined above)

[illegible] Soil Description

[illegible] permeability test was performed on a relatively undisturbed [illegible] diameter Shelby tube sample.

CLS 5/21/93 DTL 5/27/93

GRAIN SIZE DISTRIBUTION TEST REPORT



Symbol	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
○	0.0	20.6	20.1	28.1	31.2

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	28	12	9.66	0.09	0.02	0.005				

MATERIAL DESCRIPTION	USCS
○ Gray Lean CLAY, Some Gravel and Sand	CL

Project No.: 10010201
Project: H.O.D. LANDFILL RI/FS, Antioch, Illinois
○ Sample: HD-SU01-01

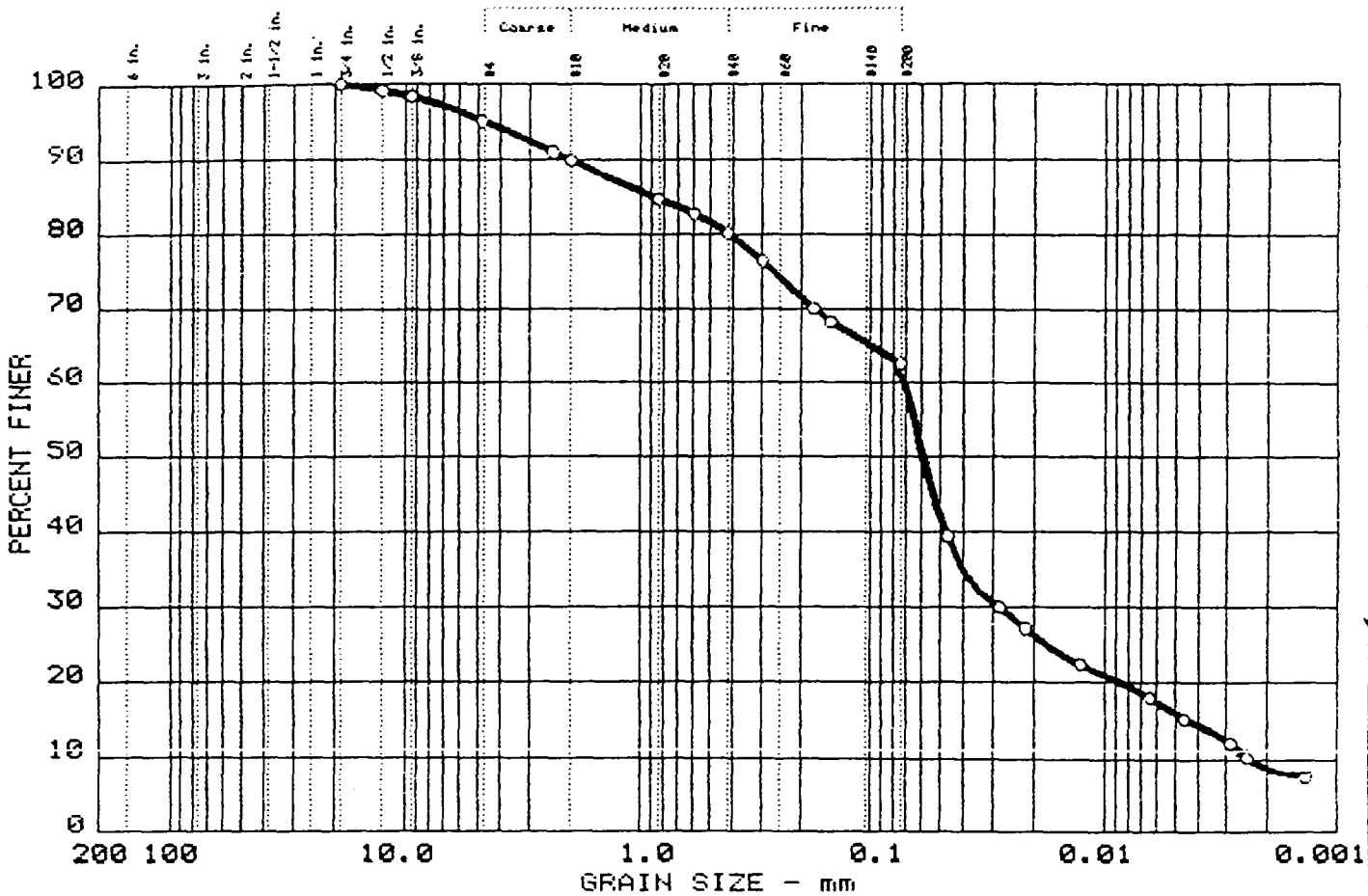
Date: 5/27/93

Remarks:
TESTED BY CLS
CHECKED BY CLS
APPROVED BY DTL

GRAIN SIZE DISTRIBUTION TEST REPORT
WARZYN, INC.

Sheet No.

GRAIN SIZE DISTRIBUTION TEST REPORT



Symbol	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
○	0.0	4.9	32.4	47.0	15.7

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	33	8	0.87		0.06	0.028	0.0046	0.0024	4.62	29.9

MATERIAL DESCRIPTION	USCS
○ Gray Lean CLAY, Some Sand, Trace Gravel	CL

Project No.: 10010201
Project: H.O.D. LANDFILL RI/FS, Antioch, Illinois
○ Sample: HD-SU02-01

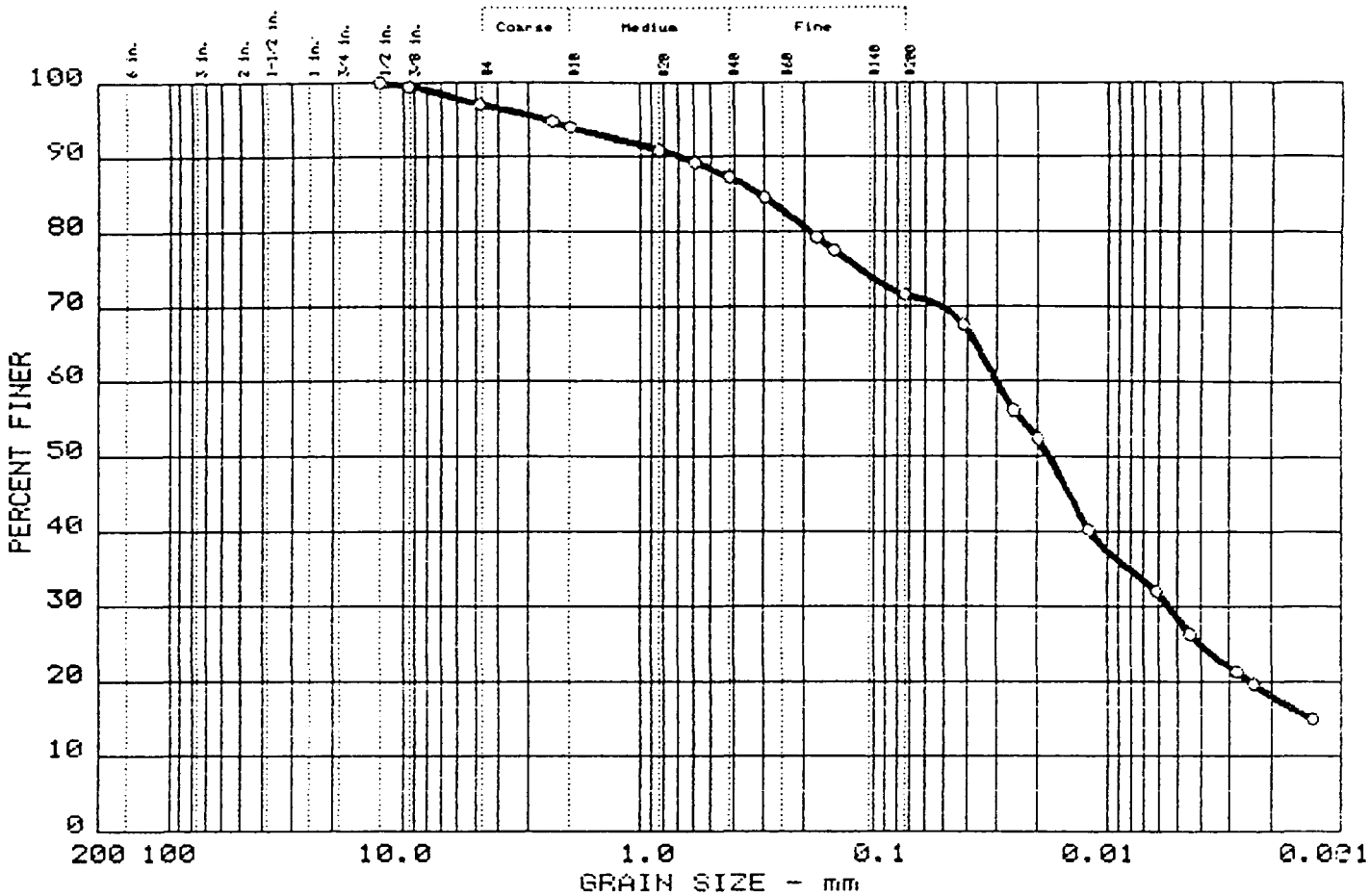
Date: 5/27/93

Remarks:
TESTED BY CLS
CHECKED BY CLS
APPROVED BY DTL

GRAIN SIZE DISTRIBUTION TEST REPORT
WARZYN, INC.

Sheet No.

GRAIN SIZE DISTRIBUTION TEST REPORT



Symbol	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
○	0.0	3.0	25.5	43.2	28.3

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	51	21	0.31		0.02	0.005				

MATERIAL DESCRIPTION	USCS
○ Gray-Brown Elastic SILT, Some Clay and Sand, Trace Gravel	MH

Project No.: 10010201
Project: H.O.D. LANDFILL RI/FS, Antioch, Illinois
○ Sample: HD-SU03-01

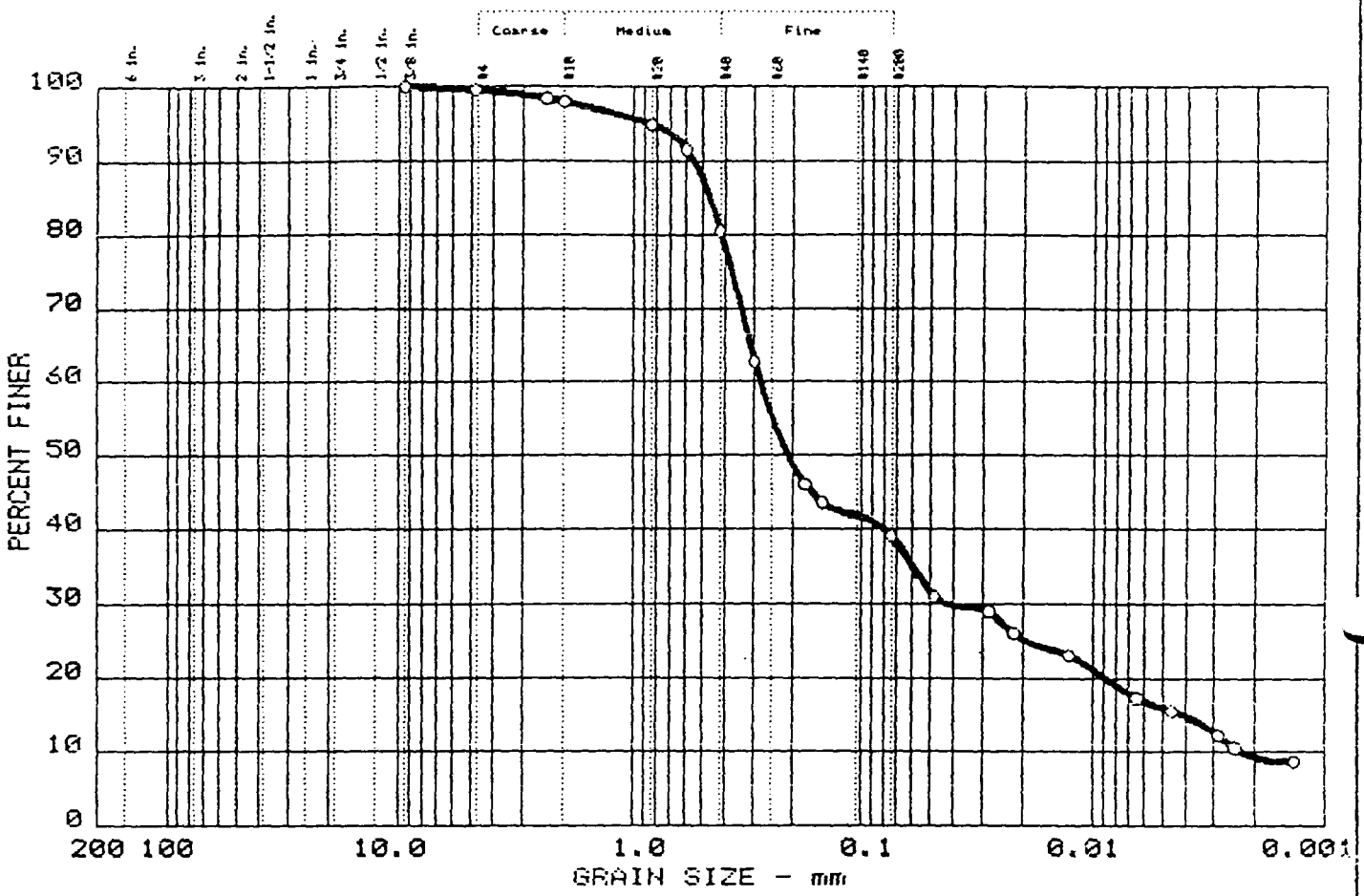
Date: 5/27/93

Remarks:
TESTED BY CLS
CHECKED BY CLS
APPROVED BY DTL

GRAIN SIZE DISTRIBUTION TEST REPORT
WARZYN, INC.

Sheet No.

GRAIN SIZE DISTRIBUTION TEST REPORT



Symbol	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
○	0.0	0.5	60.5	23.2	15.8

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	26	10	0.47	0.28	0.21	0.043	0.0041	0.0023	2.88	123.0

MATERIAL DESCRIPTION	USCS
○ Brown Clayey SAND, Trace Gravel	SC

Project No.: 10010201
Project: H.O.D. LANDFILL RI/FS, Antioch, Illinois
○ Sample: HD-SU04-01

Date: 5/27/93

Remarks:
TESTED BY CLS
CHECKED BY CLS
APPROVED BY DTL

GRAIN SIZE DISTRIBUTION TEST REPORT
WARZYN, INC.

Sheet No.

SOIL BOREHOLE LOG

SITE NAME AND LOCATION H.O.D. Landfill - Antioch, Illinois	DRILLING METHOD: 4 1/4" ID HSA	BORING NO. W6S
		SHEET 1 OF 1
	SAMPLING METHOD: 5' CME SAMPLING TUBE 2" OD SPLIIT SPOON 14 - 16 FT	DRILLING START TIME / FINISH TIME
BORING LOCATION: SE 1/4 of SE 1/4 of Section 8 , T 46 N, R 10 E/W	WATER LEVEL / TIME	
NORTHING 2115399.4 EASTING 1051541.1	DATE / CASING DEPTH	DATE 4/16/93 / DATE 4/16/93
DATUM ELEVATION 764.9		
DRILL RIG CME 750 ATV	SURFACE CONDITIONS LOW LYING GRASS COVERED, TREED AREA	
ANGLE Vertical BEARING ------		
SAMPLE HAMMER TORQUE FT-LBS		

DEPTH IN FEET (ELEVATION)	BLOWS/6 IN. ON SAMPLER	RECOVERY %	SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIALS	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	TEST RESULTS: WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TESTS
	–	38		1 Black PEAT (PT)	SB							–
5 759.9	–	57		2 1" Moist Greenish Organic Silty Clay Lens, Grades to 2" Light Tan-Gray Silty to Fine Sand Layer over Fine to Medium SAND (SM), Little Silt, Trace Clay	SB							–
10	–	73		3 Grades Little Coarser Sand (1/4" Gray Clayey Silt Lense at 12')	SB							–
750.5	–	96		4 Stiff Greenish Gray Fat CLAY (CH), Trace Fine to Coarse Sand, Little to Some Silt	SS							1.5
15 749.5 749.0				SAND (SP)								
				End of Boring at 16 Feet Monitoring Well Set at 15 Ft PID = None Detected								
20												
25												
30												
35												

LOGGED BY SJC DRILLING CONTR E & F

DATE 9/17/93 CHK'D BY DAP CHAS MARKGRAF

Template ID: WM1 ID: WM1

SOIL BOREHOLE LOG

SITE NAME AND LOCATION H.O.D. Landfill - Antioch, Illinois	DRILLING METHOD: 4 1/4" ID HSA	BORING NO. W7D	
	SAMPLING METHOD: 5' CME SAMPLE TUBE (0 - 94 FT) 2" OD SPLIT SPOON (94 - 100 FT) SHELBY TUBE (29 - 31 FT)	SHEET 1 OF 3	
		DRILLING	
		START	FINISH
BORING LOCATION: SW 1/4 of SW 1/4 of Section 9 , T 46 N, R 10 E/W	WATER LEVEL	TIME	TIME
	TIME		
NORTHING 2116326.0 EASTING 1053153.3	DATE	DATE	DATE
DATUM ELEVATION 780.2	CASING DEPTH	4/13/93	4/13/93
DRILL RIG CME 750 ATV	SURFACE CONDITIONS GRASS COVERED PRAIRIE		
ANGLE Vertical BEARING ------			
SAMPLE HAMMER TORQUE FT-LBS			

DEPTH IN FEET (ELEVATION)	BLOWS/6 IN. ON SAMPLER	RECOVERY %	SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIALS	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	TEST RESULTS: WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TESTS
779.2	–	92		1 Approximately 6 - 12" Black Top Soil, Organic Silt	SB							3.0-1.25
				Tan Laminated Silt (ML) With Limonite Precipitate, Grades to More Grayish with Laminated Limonite					33	14		
5 775.2	–	97		2 Gray Laminated Silty CLAY to Clayey SILT (CL/ML) Interbedded with Tan Silt	SB							3.0-1.25
				Gray Lean Clay (CL), Little to Some Silt								
10	–	98		3 Gray Lean CLAY (CL) with Little to Some Silt, with Laminated Lenses of Silt, Little to Some Fine to Coarse Sand	SB							2.25-1.25
15	–	97		4 Gray Lean CLAY (CL) Little to Some Silt, Sand Pocket with Coarse Gravel at 15 Feet, Trace to Little Fine to Coarse Sand, and Fine Gravel, Shale Fragments Present	SB							2.5-3.25
20	–	97		5 Gray Massive Lean CLAY (CL), Trace to Little Silt and Trace Fine to Coarse Sand, Trace Fine to Coarse Gravel, Shale Fragments Approximately 6" Sandy Zone at 20 Ft	SB							2.0-1.5
25	–	85		6	SB				34	15		2.5-3.0
30	–	92		7 Shelby Tube to 31' Collected CME Tube Sample 29' to 34'	SB							1.5-2.5
35	–	97		8 Trace Shale Fragments	SB							2.5-3.0
	–	97		9	SB							2.0-

LOGGED BY SJC DRILLING CONTR E & F

DATE 9/17/93 CHK'D BY DAP CHAS. MARKGRAF

Template ID: WM1 ID: WM1

SOIL BOREHOLE LOG

SITE NAME AND LOCATION H.O.D. Landfill - Antioch, Illinois

SHEET 2 OF 3

BORING NO. W7D

DEPTH IN FEET (ELEVATION)	BLOWS/6 IN. ON SAMPLER	RECOVERY %	SYMBOL		SAMPLE NUMBER AND DESCRIPTION OF MATERIALS	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	TEST RESULTS: WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TESTS
					Trace Shale Fragments								3.25
45	–	97		10		SB							2.5-3.0
50	–	97		11		SB							1.25-2.5
55	–	100		12		SB							2-3
60	–	100		13	Gray Lean CLAY (CL), Little Silt, Little Fine to Coarse Sand, Trace Fine to Coarse Gravel, Approximately 1/4mm to 1mm thick Silt Lenses and Pockets Interbedded in Clay	SB							1-2
65	–	100		14		SB							1.25-3
					Approximately 10" Silt Layer at 67 to 68 Feet								
70	–	100		15		SB							2.25->4.5
					3" Silt Layer at 71'								
					1/2" Silt Layer at 73', Silt Lenses Interbed								
75	–	97		16		SB							2.75-4.25
					Cobbles at 75'								
					3" Silt Layer at 76.5', Trace to Little Shale Fragments Present, Few Silt Pockets and Lenses in Clay								
80	–	98		17		SB							2.5-4
					Silty 2" Layer (Silty Clay Clayey Silt) at 81.5 Feet 2mm Silt Lens at 83'								
85	–	100		18		SB							3->4.5
692.7					1/2" Lens of Reddish Silty CLAY, Clayey SILT over 1" Lense of Gray Clayey SILT at 85' Grades to Grey CLAY (CL)								
90 690.2	–	75		19	Light Pinkish Gray Silty CLAY (CL), Little to Some Fine to Coarse Sand Little Fine Gravel, Trace Coarse Sand Fine to Medium Sand (SP)	SB							–
					7" Gray Clay Layer at 92', Grades to Coarse Sand and Trace Clay, Gravel, and Silt, Fine Gravel at 95'								
95	16 12 12 12	8		20	Medium Dense Fine to Medium SAND (SP)	SS							–
	10 30 30 20	100		21	Very Dense Fine to Medium SAND to 97', Grades to	SS							–

SOIL BOREHOLE LOG

SITE NAME AND LOCATION H.O.D. Landfill - Antioch, Illinois

SHEET 3 OF 3

BORING NO. W7D

DEPTH IN FEET (ELEVATION)	BLOWS/6 IN. ON SAMPLER	RECOVERY %	SYMBOL		SAMPLE NUMBER AND DESCRIPTION OF MATERIALS	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	TEST RESULTS: WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TESTS
	8 10 16 20	75		22	More Fine, Trace to Little Fine Gravel Medium Dense Fine to Medium SAND (SP), Little Coarse Sand, Trace to Little Fine Gravel	SS							–
100 680.2					End of Boring at 100 Feet Monitoring Well Set at 99.94 Feet PID = None Detected								
105													
110													
115													
120													
125													
130													
135													
140													
145													
150													

SOIL BOREHOLE LOG

SITE NAME AND LOCATION: H.O.D. Landfill - Antioch, Illinois

DRILLING METHOD: 4.25" IDHSA Surface to 52'
8.25" IDHSA Surface to 50.5' 5 7/8" Rotary
Wash Water to 77'; Mud to 99'

SAMPLING METHOD:

BORING NO. W8D

SHEET 1 OF 4

					DRILLING START	DRILLING FINISH
WATER LEVEL					TIME	TIME
TIME						
DATE					DATE	DATE
CASING DEPTH					3/15/94	3/17/94

BORING LOCATION:
SW 1/4 of SW 1/4 of Section 9, T 46 N, R 10 E/W
NORTHING 2115325.8 EASTING 1052660.8
DATUM MSL ELEVATION 766.7

DRILL RIG: CME-850 Track Rig
SURFACE CONDITIONS: Grass Covered Berm
ANGLE: Vertical BEARING: ------
SAMPLE HAMMER TORQUE: FT-LBS

DEPTH IN FEET (ELEVATION)	BLOWS/6 IN. ON SAMPLER	RECOVERY %	SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIALS	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	TEST RESULTS: WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TESTS
	2 4 9 8	66		Berm FILL: Brown Stiff to Very Stiff Silty Clay, Vegetation Debris and Roots Present								
	3 2 3 2	54										
763.7				Brown SANDY CLAY (SC)								
762.9				Black Peat								
	2 1 1 2	25										
-5												
760.7												
	1/12" 1 1	50		Organic Very Soft Gray CLAY (OL), Little Silt, Trace fine to Medium Sand, Roots Present								
758.7												
	1 1 3 4	29		Gray Very Loose to Loose Fine to Coarse SAND (SM/GC) and Fine Gravel, Some Silt and Clay								
-10												
	3 4 5 4	21										
	2 4 4 4	33										
752.7												
	3 4 6 4	54		Gray Loose Fine to Coarse Sand Grades to Fine Sand (SP), Trace to Little Medium Sand, Trace Silt and Clay								
-15												
750.9												
750.2	2 5 6 6	58		Gray Silty CLAY (CL), Little Fine to Coarse Sand, Trace Fine Gravel								
				Gray Medium Dense Fine to Coarse Sand (SP) and Silt, Little Fine Gravel								
748.9												
	2 5 9 9	83		Gray Silty CLAY (CL)								
747.7												
746.8				Black and White Medium SAND (SP/GC/GM), Little to Some Coarse Sand, Grades to Fine to Coarse Gravel and Sand, Trace to Little Silt and Clay								
-20	6 10 10 9	13										
				Medium Dense Fine to Coarse GRAVEL (GC) Little to Some Fine to Coarse Sand								
744.7												
	12 9 5 4	33		Medium Dense Fine to Coarse SAND and GRAVEL (SP/GP), Trace to Little Silt and Clay								
	3 5 6 8	38										

LOGGED BY: Steven J. Chillson
DRILLING CONTR: Stearns Drilling Co.
Rich Bennett

ID: PS-WM1 DATE: 9/19/94 CHK'D BY: PMS

SOIL BOREHOLE LOG

SITE NAME AND LOCATION: H.O.D. Landfill - Antioch, Illinois

SHEET: 2 OF 4

BORING NO.: W8D

DEPTH IN FEET (ELEVATION)	BLOWS/6 IN. ON SAMPLER	RECOVERY %	SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIALS	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	TEST RESULTS: WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TESTS
	3 7 9 10	42										
	7 10 11 13	46										
30	5 10 10 9	42		Grades to Trace Silt and Clay								
	3 7 11 11	13		Medium Dense Fine to Coarse (SP), Trace to Little Fine Gravel								
732.9	7 10 9 9	46		Gray Very Stiff Silty CLAY and GRAVEL (CL-GC)								
35												
730.9	8 10 12 12	50		Fine to Coarse SAND and GRAVEL (SP-GP), Trace to Little Silt and Clay								
	8 11 11 13	46										
40 726.7	6 7 10 12	50		Stiff to Very Stiff Gray Silty, Sandy, Gravelly, CLAY (CL)								
724.7	5 7 8 8	46		Gray Stiff Silty CLAY (CL) Some Fine to Coarse Sand and Fine Gravel, Trace to Little Coarse Gravel								
722.7	7 11 18 20	50		Medium Dense Fine to Coarse SAND and GRAVEL and CLAY and SILT (SM/GC)								
45 720.7	5 7 7 12	54		Stiff to Very Stiff Gray Silty CLAY (CL), Trace to Little Fine to Coarse Sand								
	3 6 9 12	83										
50	3 7 8 11	100		Grades to Trace Fine to Coarse SAND								
	5 7 9 11	67										
	4 6 9 11	50										
55	11 25 25 12	33		6" Gray Silt Lens from 56.5' to 57', Grades from Very Stiff to Hard								
	4 8 10 15	75		Grades from Stiff to Very Stiff								
60												

SOIL BOREHOLE LOG

SITE NAME AND LOCATION: H.O.D. Landfill - Antioch, Illinois

SHEET: 3 OF 4

BORING NO.: W8D

DEPTH IN FEET (ELEVATION)	BLOWS/6 IN. ON SAMPLER	RECOVERY %	SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIALS	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	TEST RESULTS: WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TESTS
	6 8 12 11	33		Medium Stiff to Very Stiff Gray Lean CLAY, Trace Silt (CL)								
65												
	3 5 6 8	100		Stiff to Very Stiff Fat CLAY (CH) Trace Silt								
70												
	5 8 13 14	75		Gray Stiff to Very Stiff, Silty to Fat CLAY, Grades to Silty CLAY, (CL/CH), Trace to Little Fine Sand, Trace Fine Gravel								
75	3 6 11 14	75		Medium Stiff to Very Stiff Silty CLAY (CL), Little Sand, Trace to Little Medium to Coarse Sand, Trace Fine Gravel								
689.7	22 34 55 75	58		Very Dense Fine to Coarse SAND (SP), Trace to Little Fine Gravel and Trace Coarse Gravel								
	12 19 57 40	58		Very Dense Fine to Coarse SAND and Gravel (SP-GP)								
80	20 21 30 22	54										
85												
	16 18 21 23	67		Dense Fine to Coarse SAND and GRAVEL (SP-GP), Trace Silt and Clay								
90 676.7												
	13 29 31 25	75		Very Dense Fine to Medium SAND (SP)								
95												

SOIL BOREHOLE LOG

SITE NAME AND LOCATION	SHEET	BORING NO.
H.O.D. Landfill - Antioch, Illinois	4 OF 4	W8D

DEPTH IN FEET (ELEVATION)	BLOWS/6 IN. ON SAMPLER	RECOVERY %	SYMBOL	SAMPLE NUMBER AND DESCRIPTION OF MATERIALS	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	TEST RESULTS: WATER CONTENT %	LIQUID LIMIT %	PLASTIC LIMIT %	SPECIFIC GRAVITY	OTHER TESTS
	13 17 20 22	75		Grades to Dense								
667.7				End of Boring at 99 Feet Monitoring Well Installed at 94 Feet								
100												
105												
110												
115												
120												
125												
130												

Well No. W2D
Boring No. X-Ref: W2D

MONITOR WELL CONSTRUCTION SUMMARY

Survey Coords: 2116648.2 N
1052499.9 E

Elevation Ground Level 770.7
Top of Casing 773.04

Drilling Summary:

Total Depth 88.33 ft
Borehole Diameter 8.5 in
Casing Stick-up Height: 2.34 ft
Driller Charles Markgraf E & F

Rig CME750 ATV
Bit(s) 4¼ in ID X 8½ in. OD HSA

Drilling Fluid water

Protective Casing Aluminum WMX Spec. - 7ft

Construction Time Log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling	1993			
	4/20		4/20	
Geophys. Logging:				
Casing:				
Filter Placement:	4/20		4/20	
Cementing:				
Development:	5/6		5/6	

Well Design & Specifications

Basis: Geologic Log X Geophysical Log ____

Casing String (s): C=Casing S=Screen.

Depth		String(s)	Elevation
2.34	83.3	C1	773.04 - 687.4
83.3	88.33	S1	687.4 - 682.37
			-
			-
			-

Casing: C1 2 in. ID Schedule 40 PVC flush threaded
C2

Screen: S1 2 in. ID Schedule 40 PVC .010" Slot Size
S2

Filter Pack: #30 Red flint sand (81.3 to 83.3 ft) Fine silica sand (79.8 - 81.3 ft)

Grout Seal: Bentonite Slurry (0 - 79.8 ft)

Bentonite Seal: None
fine silica sand over filter pack

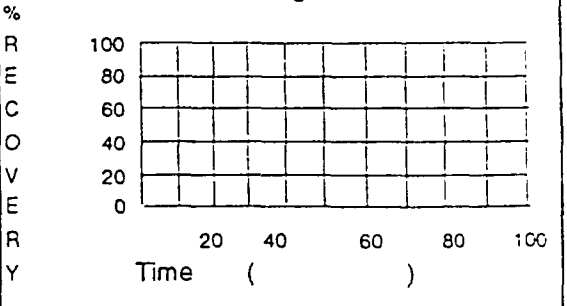
Well Development:
Surge /purge w/ PVC bailer and steel cable for 30 min. keck pump, one well volume = 7.97 gallons.

Stabilizaton Test Data:

Time	pH	Spec. Cond.	Temp (C)

Recovery Data:

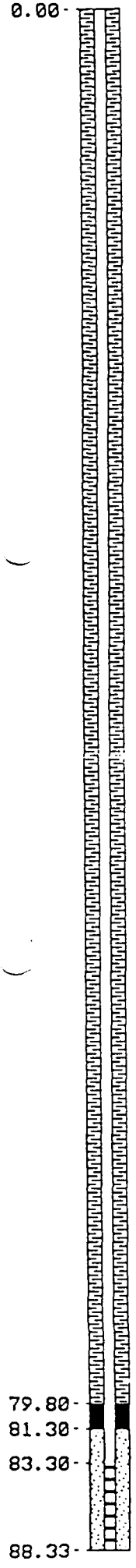
Q= S_O=

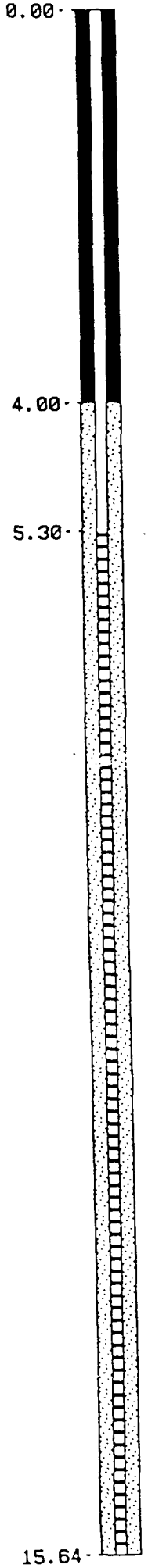


Comments:

SJC/llr/DAP

SITE NAME HOD Landfill
LOCATION Antioch, ILL.
WC
SUPERVISED BY S. Chillson - Warzyn Inc.





Well No. W3SA
Boring No. X-Ref: W3SA

MONITOR WELL CONSTRUCTION SUMMARY

Survey Coords: 2115185.3 N
1051029.2E

Elevation Ground Level 763.8
Top of Casing 766.54

Drilling Summary:

Total Depth 16'
Borehole Diameter 8.5 in.
Casing Stick-up Height: 2.74 in.
Driller Charles Markgraf
Environmental and Foundation Drilling Inc. (E & F)
Rig CME750 ATV
Bit(s) 4.25 in. ID X 8.5 in. OD HSA

Drilling Fluid None

Protective Casing Aluminum WMX Spec.- 5ft

Construction Time Log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling	4/7		4/7	
Geophys. Logging:				
Casing:				
Filter Placement:	4/7		4/7	
Cementing:				
Development:	5/5		5/5	

Well Design & Specifications

Basis: Geologic Log X Geophysical Log ____

Casing String (s): C=Casing S=Screen.

Depth		String(s)	Elevation
-2.74	- 5.3	C1	766.54-758.5
5.3	15.64	S1	758.5-748.16
			-
			-
			-

Casing: C1 2 in. ID Schedule 40 PVC flush Thread
C2

Screen: S1 2 in. ID Schedule 40 PVC,.010 Slot Size
S2

Filter Pack: #45-55 Red flint sand (5-15.64 ft) fine silica sand (4.0-5ft)

Grout Seal: None

Bentonite Seal: Bentonite Chips (0-4feet)

Well Development:

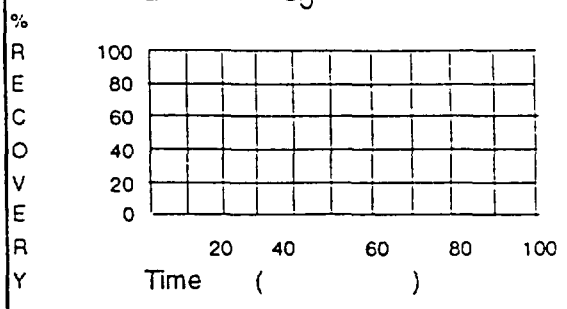
Surged and purged with stainless steel bailer and nylon rope. Purged 24 gallons. one well volume = 2.4 gallons

Stabilizaton Test Data:

Time	pH	Spec. Cond.	Temp (C)

Recovery Data:

Q= S_o=



Comments:

SJC/llr/DAP

SITE NAME HOD Landfill
LOCATION Antioch, ILL.
WC
SUPERVISED BY S. Chillson - Wayne

Well No. W3SB
Boring No. X-Ref: W3SB

MONITOR WELL CONSTRUCTION SUMMARY

Survey Coords: 2115189.4N
1051027.8E

Elevation Ground Level 763.7
Top of Casing 766.81

Drilling Summary:

Total Depth 32 ft.
Borehole Diameter 8.5 in.
Casing Stick-up Height: 3.11 ft
Driller Charles Markgraf Environmental & Foundation Drilling Inc. (E & F)
Rig CME750 ATV
Bit(s) 4¼ in. ID X 8¼ in. OD HSA

Drilling Fluid None

Protective Casing Alum. WMX Spec. - 5ft

Construction Time Log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling	1993			
	4/7		4/7	
Geophys. Logging:				
Casing:				
Filter Placement:	4/7		4/7	
Cementing:				
Development:	5/5		5/5	

Well Design & Specifications

Basis: Geologic Log X Geophysical Log ____

Casing String (s): C=Casing S=Screen.

Depth		String(s)	Elevation
-3.11	24.55	C1	766.81 - 739.15
24.55	29.57	S1	739.15 - 734.13

Casing: C1 2 in. ID Schedule 40 PVC flush thread
C2

Screen: S1 2 in. ID Schedule 40 PVC .010 Slot Size
S2

Filter Pack: #45-55 Red flint sand (22.55 - 29.57 ft)

Grout Seal: Bentonite Slurry (8.5 - 17.55 ft)

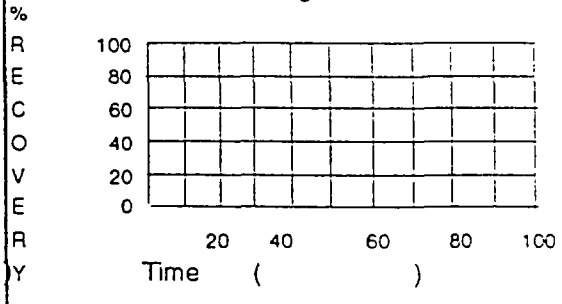
Bentonite Seal: Bentonite Chips (17.55 - 22.55 ft), (0 - 8.5ft)

Well Development:
Surged & Purged w/PVC bailer and steel cable. Purged 200 gallons, one well volume = 4.7 gallons

Stabilizaton Test Data:

Time	pH	Spec. Cond.	Temp (C)

Recovery Data:
Q= S_O=



Comments: 18" pipe wrench dropped into annular space

SJC/llr/DAP

SITE NAME HOD Landfill
LOCATION Antioch, ILL.
SUPERVISED BY S. Chillson - Warzyn Inc.
V.C

0.00
8.50
17.55
22.55
24.55
29.57

Well No. W3D
Boring No. X-Ref: W3D

MONITOR WELL CONSTRUCTION SUMMARY

Survey Coords: 2115187.6 N
1051022.7 E

Elevation Ground Level 763.73
Top of Casing 765.93

Drilling Summary:

Total Depth 80 ft.
Borehole Diameter 8.5 in.
Casing Stick-up Height: 2.2 ft.
Driller Charles Markgraf E & F
Joel Ruda, ETI

Rig CME750 ATV
Bit(s) 8in. - 6in. roller bit rotary wash
Drilling Fluid 50 lbs supergel X/100 gallon H_2O
Protective Casing Steel Well Box

Construction Time Log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling	1993 4/28		5/15	
Geophys. Logging:				
Casing:				
Filter Placement:	5/25		5/25	
Cementing:				
Development:	5/27		5/27	

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing String (s): C=Casing S=Screen.

Depth		String(s)	Elevation
0	34	C1	763.73 - 729.73
-2.2	73.3	C2	765.93 - 690.43
73.3	78	S1	690.43 - 685.73
			-
			-

Casing: C1 6in. ID Schedule 40 PVC, flush threaded
C2 2in. ID Schedule 40 PVC, flush threaded
Screen: S1 2in. ID Schedule 40 PVC, .010 Slot Size
S2

Filter Pack: #45-55 Red flint sand (70.9 - 78 ft.)

Grout Seal: 40 lb supergel/85 gallon H_2O (0-65 ft)

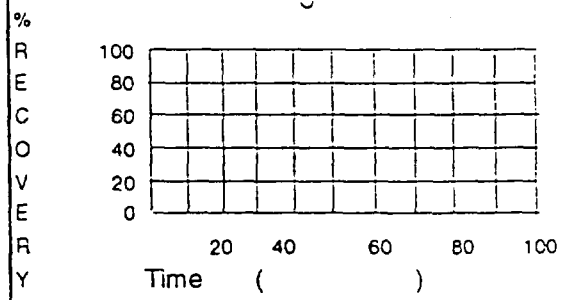
Bentonite Seal: Bentonite Chips (65-70.9)

Well Development:
Surged and Purged w/PVC bailers and steel cable, Purged 200 gallon, one well volume - 8 gals.

Stabilizaton Test Data:

Time	pH	Spec. Cond.	Temp (C)

Recovery Data:
Q= S_o=



Comments:

SJC/llr/DAP

0.00
65.00
70.90
73.30
78.00

SITE NAME HOD Landfill
LOCATION Antioch, Ill.
W.C
SUPERVISED BY S. Chillson - Wyn

Well No. W4S
Boring No. X-Ref: W4S

MONITOR WELL CONSTRUCTION SUMMARY

Survey Coords: 2115202N
1050628.3 E

Elevation Ground Level 767.5
Top of Casing 769.97

Drilling Summary:

Total Depth 16'
Borehole Diameter 8.5 in.
Casing Stick-up Height: 2.47 ft
Driller Joel Ruda
Exploration Technolgy Inc. (ETI)
for (E & F)
Rig CME850
Bit(s) 4¼ in. ID X 8.5 in. OD HSA

Drilling Fluid None

Protective Casing Alum. WMX Spec.

Construction Time Log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling	1993			
	5/26		5/26	
Geophys. Logging:				
Casing:				
Filter Placement:	5/26		5/26	
Cementing:				
Development:	6/1		6/1	

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing String (s): C=Casing S=Screen.

Depth		String(s)	Elevation
-2.47	5	C1	769.97 - 762.5
5	15	S1	762.5 - 752.5
			-
			-
			-

Casing: C1 2 in. ID Schedule 40 PVC flush threaded
C2

Screen: S1 2 in. ID Schedule 40 PVC .010 Slot Size
S2

Filter Pack: Red flint sand (4 - 15 ft)

Grout Seal: None

Bentonite Seal: Hydrated Granular Bentonite (0 - 4 ft)

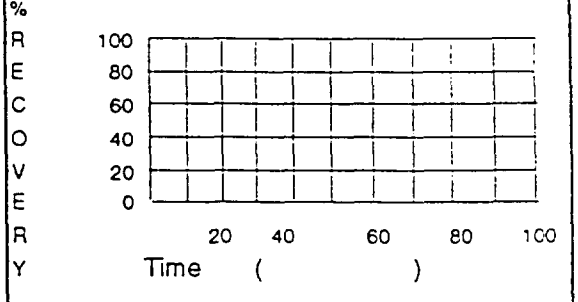
Well Development:
Surged & Purged with PVC bailer and steel cable. Purged 20 gals., one well volume = 1.5 gallons

Stabilizaton Test Data:

Time	pH	Spec. Cond.	Temp (C)

Recovery Data:

Q= S_o =



Comments: Pulled augers and redrilled w/wooden plug

SJC/llr/DAP

SITE NAME: HOD Landfill
LOCATION: Antioch, Ill.
WO
SUPERVISED BY: S. Chillson - Warzyn

0.00
4.00
5.00
15.00

Well No. W5S
Boring No. X-Ref: W5S

MONITOR WELL CONSTRUCTION SUMMARY

Survey Coords: 2115375.1 N
1050760.5 E

Elevation Ground Level 771.10 ft MSL
Top of Casing 773.49

Drilling Summary:

Total Depth 16'
Borehole Diameter 8.5'
Casing Stick-up Height: 2.39'
Driller Charles Markgraf
Environmental & Foundation Drilling Inc.
(E & F)
Rig CME 750 ATV
Bit(s) 4 1/4" ID x 8.5" IDHSA

Drilling Fluid None

Protective Casing Alum WMX Spec. 5.5 ft

Construction Time Log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling	1993			
	4/21		4/21	
Geophys. Logging:				
Casing:				
Filter Placement:	4/21		4/21	
Cementing:				
Development:	5/4		5/4	

Well Design & Specifications

Basis: Geologic Log X Geophysical Log ____

Casing String (s): C=Casing S=Screen.

Depth	String(s)	Elevation
-2.39 - 5.22	C1	773.49 - 765.88
5.22 - 15.51	S1	768.88 - 755.59

Casing: C1 2in ID Schedule 40 PVC flush Thread
C2

Screen: S1 2" Schedule 40 PVC, 010 in. Slot size
S2

Filter Pack: 45-55 Redflint filter sand (3.9 - 15.51 ft)

Grout Seal: None

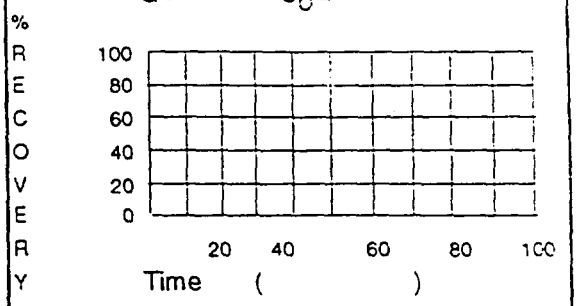
Bentonite Seal: Hydrated Granular Bentonite (0 - 3.9 ft)

Well Development:
Surged & purged w/PVC Bailer & nylon rope. Purged 59.4 gallons, one well volume = 1.1 gallons

Stabilizaton Test Data:

Time	pH	Spec. Cond.	Temp (C)

Recovery Data:
Q= S_O=



Comments: Alconox solution was used for pre decon, of development equipment.

SJC/llr/DAP

SITE NAME HOD Landfill
LOCATION Antioch, Ill.
SUPERVISED BY S. Chillson - Wyn Inc.

0.00
3.90
5.22
15.51

Well No. W6S
Boring No. X-Ref: W6S

MONITOR WELL CONSTRUCTION SUMMARY

Survey Coords: 2115399.4 N
1051541.1 E

Elevation Ground Level 764.9
Top of Casing 767.41

Drilling Summary:

Total Depth 16'
Borehole Diameter 8.5 in.
Casing Stick-up Height: 2.5'
Driller Charles Markgraf Environmental & Foundation Drilling, Inc. (E & F)
Rig CME750 ATV
Bit(s) 4¼ in. ID X 8.5 in OD HSA

Drilling Fluid None

Protective Casing Aluminum WMX Spec.

Construction Time Log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling	1993 4/16		4/16	
Geophys. Logging:				
Casing:				
Filter Placement:	4/16		4/16	
Cementing:				
Development:	5/4		5/4	

Well Design & Specifications

Basis: Geologic Log X Geophysical Log ____

Casing String (s): C=Casing S=Screen.

Depth		String(s)	Elevation
-2.51	5.02	C1	767.41 - 759.88
5.02	15	S1	759.88 - 749.9

Casing: C1 2 in. ID Schedule 40 PVC flush thread
C2

Screen: S1 2 in. ID Schedule 40 PVC .010" Slot Size
S2

Filter Pack: #45-55 Red flint sand (4 - 15 ft)

Grout Seal:

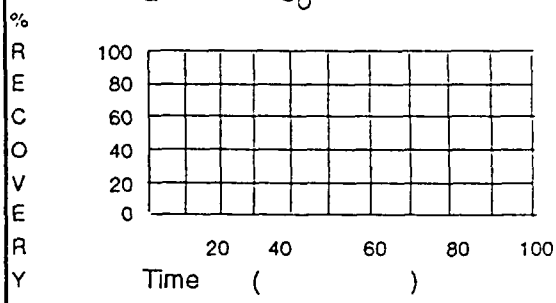
Bentonite Seal: Hydrated Bentonite Chips and Granular (0 - 4 ft)

Well Development:
Surged & purged w/stainless steel bailer and steel cable purged 75 gallons, one volume = 2.1 gallons

Stabilizaton Test Data:

Time	pH	Spec. Cond.	Temp (C)

Recovery Data:
Q= S_O =



Comments:

SJC/llr/DAP

CONSUM

SITE NAME HOD Landfill
LOCATION Antioch, ILL.
SUPERVISED BY S. Chillson - Warzyn Inc.
W/C

0.00
4.00
5.00
15.00

Well No. W7D
Boring No. X-Ref: W7D

MONITOR WELL CONSTRUCTION SUMMARY

Survey Coords: 2116326 N
1053153.3 E

Elevation Ground Level 780.2
Top of Casing 782.87

Drilling Summary:

Total Depth 100 ft
Borehole Diameter 8.5 in.
Casing Stick-up Height: 2.67 ft
Driller Charles Markgraf E & F

Rig CME750 ATV
Bit(s) 4¼ in. ID X 8½ in. OD HSA

Drilling Fluid Water

Protective Casing Alum. WMX Spec. - 7ft

Construction Time Log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling	1993			
	4/14		4/14	
Geophys. Logging:				
Casing:				
Filter Placement:	4/14		4/14	
Cementing:				
Development:	5/5		4/14	

Well Design & Specifications

Basis: Geologic Log X Geophysical Log ____

Casing String (s): C=Casing S=Screen.

Depth		String(s)	Elevation
-2.67	94.92	C1	782.87 - 685.28
94.92	99.94	S1	685.28 - 680.26

Casing: C1 2 in. ID Schedule 40 PVC, flush threaded
C2

Screen: S1 2 in. ID Schedule 40 PVC, .010 Slot Size
S2

Filter Pack: #45-55 Red flint sand (93-99.94 ft)

Grout Seal: Bentonite slurry (0-90 ft)

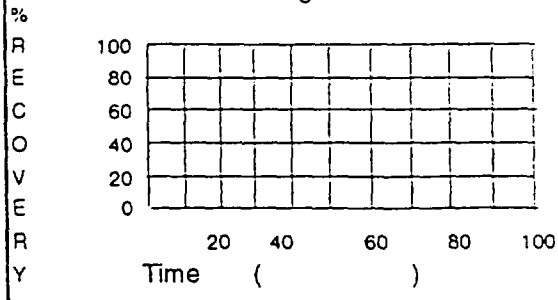
Bentonite Seal: Bentonite Chips (90-93 ft)

Well Development:
Surged & purged for 30 min. with PVC bailer and cable. Purged 100 gallons with keck pump. one well volume = 8.29 gallons

Stabilizaton Test Data:

Time	pH	Spec. Cond.	Temp (C)

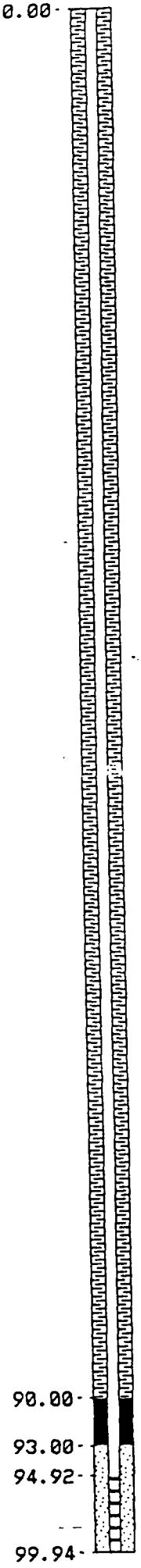
Recovery Data:
Q= S_o=



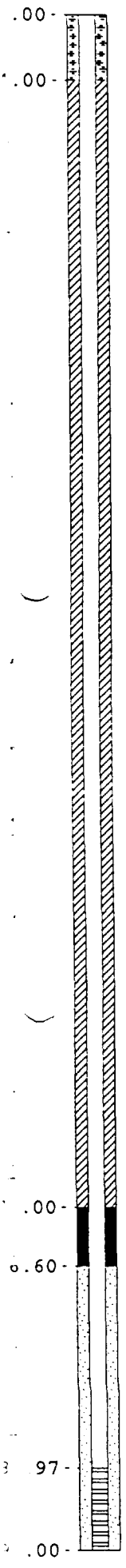
Comments:

SJC/llr/DAP

SITE NAME HOD Landfill
LOCATION Antioch, Ill.
SUPERVISED BY S. Chillson - W[illegible]yn Inc.
WC



Well No. W8D
Boring No. X-Ref: W8D



MONITOR WELL CONSTRUCTION SUMMARY

Survey Coords: N:2115325.82
E:1052660.77

Elevation Ground Level 766.68
Top of Casing 768.14

Drilling Summary:

Total Depth 94 Feet
Borehole Diameter 14.5 to 52", 5 1/6" 32' - 94'
Casing Stick-up Height:
Driller Steams Drilling Company
Rich Bennett

Rig CME850 Truck Rig
Bit(s) 4 1/4" ID x 8 1/2" ODHSA, 104/4" ID x 14 1/2 ODHSA, 5 7/8" Tricone roller bit Rotary Wash
Drilling Fluid Water and mud
mud = 45 lbs quickgel to appx. 90 gallon H2O
Protective Casing Steel Well Protective Top

Construction Time Log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling	1994			
	3/15		3/17	
Geophys. Logging:				
Casing:				
Filter Placement:	3/17		3/17	
Cementing:	3/16		3/16	
Development:	3/21		3/21	

Well Design & Specifications

Basis: Geologic Log X Geophysical Log

Casing String (s): C=Casing S=Screen.

Depth		String(s)	Elevation		
- 0.8ft	50.5	C1	767.48	-	716.18
-1.46 ft	88.97	C2	768.14	-	677.71
88.97 ft	94	S1	677.71	-	672.68
				-	
				-	

Casing: C1 6" Carbon Steel Black Pipe/Threaded
C2 2" ID Schedule 40 PVC Flush Thread

Screen: S1 2" ID x 4" OD Schedule 40 PVC U-Packit Screen with #7 Filter pack (45-55)
S2

Filter Pack: Global #45-55 U-Packit Filter Sand
#5 Sand Pack (#30-40) (94-76.6) #7 Global Sand (76.6-75)

Grout Seal: Black pipe casing - 255 gallons cement bentonite grout (6" 50.5'), PVC well casing - bentonite grout/175 lbs Benseal bentonite/85 gallons H2O 0.5 lbs of aqua grout catalyst (73-4)

Bentonite Seal: Bentonite Chips (75-73')

Well Development:

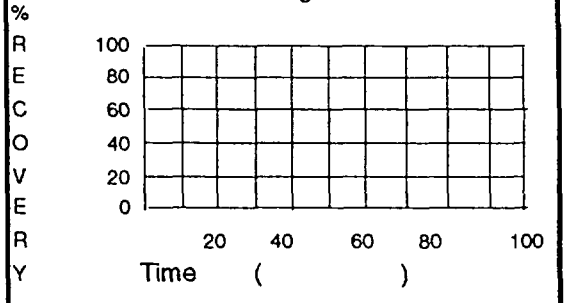
Surged and purged w/rod pump purged 300 gallons, one well volume -9.4 gallons

Stabilizaton Test Data:

Time	pH	Spec. Cond.	Temp (C)

Recovery Data:

Q= S_O =



Comments:

CONSUM

SITE NAME
LOCATION
WC
SUPERVISED BY

:02\wp\tbl\W8DMWCON.XLS

K

APPENDIX K

RESULTS OF IN-FIELD HYDRAULIC CONDUCTIVITY TESTING

<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>

A Q T E S O L V   R E S U L T S
Version 1.10

07/23/93 12:11:59

==

TEST DESCRIPTION

Data set........... hodus1s.dat
Data set title..... HODUS1S

Knowns and Constants:
No. of data points.................. 70
Radius of well casing............... 0.083
Radius of well...................... 0.42
Aquifer saturated thickness......... 7
Well screen length.................. 5.7
Static height of water in well...... 10.6
Log(Re/Rw).......................... 2.236
A, B, C............................. 0.000, 0.000, 1.446

==

ANALYTICAL METHOD

Bouwer-Rice (Unconfined Aquifer Slug Test)

==

RESULTS FROM STATISTICAL CURVE MATCHING

STATISTICAL MATCH PARAMETER ESTIMATES

	Estimate		Std. Error
K =	9.9055E-004	+/-	3.0552E-005
y0 =	2.7259E+000	+/-	2.7130E-002

ANALYSIS OF MODEL RESIDUALS

residual = calculated - observed
weighted residual = residual * weight

Weighted Residual Statistics:
Number of residuals............... 69
Number of estimated parameters.... 2
Degrees of freedom................ 67
Residual mean..................... 0.03595
Residual standard deviation....... 0.1162
Residual variance................. 0.01351

Model Residuals:

Time	Observed	Calculated	Residual	Weight

0.0033	3.22	2.7193	0.50072	1
0.0066	3.03	2.7127	0.31729	1
0.0099	2.85	2.7062	0.14385	1
0.0133	2.8	2.6994	0.10058	1
0.0166	2.78	2.6929	0.087106	1
0.0233	2.74	2.6797	0.060301	1
0.0266	2.72	2.6732	0.046776	1
0.03	2.71	2.6666	0.043431	1
0.0333	2.69	2.6601	0.029875	1
0.05	2.61	2.6278	-0.017755	1
0.0666	2.56	2.596	-0.035969	1
0.0833	2.52	2.5644	-0.04438	1
0.1	2.48	2.5332	-0.053175	1
0.1166	2.44	2.5025	-0.062533	1
0.1333	2.41	2.4721	-0.062081	1
0.15	2.37	2.442	-0.071999	1
0.1666	2.33	2.4125	-0.08246	1
0.1833	2.3	2.3831	-0.083104	1
0.2	2.27	2.3541	-0.084105	1
0.2166	2.24	2.3256	-0.085629	1
0.2333	2.2	2.2973	-0.09733	1
0.25	2.18	2.2694	-0.089374	1
0.2666	2.15	2.2419	-0.091924	1
0.2833	2.12	2.2146	-0.094642	1
0.3	2.09	2.1877	-0.097693	1
0.3166	2.07	2.1612	-0.091231	1
0.3333	2.04	2.1349	-0.094931	1
0.4167	1.91	2.0083	-0.098306	1
0.5	1.8	1.8893	-0.089329	1
0.5833	1.69	1.7774	-0.087401	1
0.6667	1.59	1.672	-0.081981	1
0.75	1.5	1.5729	-0.072929	1
0.8333	1.42	1.4797	-0.059746	1
0.9167	1.35	1.392	-0.04198	1
1	1.27	1.3095	-0.039516	1
1.0833	1.21	1.2319	-0.021937	1
1.1667	1.15	1.1589	-0.0088696	1
1.25	1.09	1.0902	-0.0002155	1
1.3333	1.04	1.0256	0.014371	1
1.4166	0.99	0.96487	0.025132	1
1.5	0.94	0.90764	0.032359	1
1.5833	0.91	0.85387	0.05613	1
1.6667	0.85	0.80323	0.046774	1
1.75	0.82	0.75564	0.064359	1
1.8333	0.77	0.71088	0.059125	1
1.9167	0.74	0.66871	0.071288	1
2	0.71	0.6291	0.080904	1
2.5	0.55	0.43603	0.11397	1
3	0.44	0.30222	0.13778	1
3.5	0.36	0.20947	0.15053	1
4	0.31	0.14519	0.16481	1
4.5	0.24	0.10063	0.13937	1
5	0.22	0.069749	0.15025	1
5.5	0.18	0.048344	0.13166	1
6	0.17	0.033507	0.13649	1
6.5	0.16	0.023224	0.13678	1
7	0.14	0.016097	0.1239	1
7.5	0.12	0.011157	0.10884	1
8	0.12	0.0077331	0.11227	1

8.5	0.12	0.0053599	0.11464	1
9	0.11	0.003715	0.10628	1
9.5	0.11	0.0025749	0.10743	1
10	0.1	0.0017847	0.098215	1
12	0.1	0.00041189	0.099588	1
14	0.11	9.5059E-005	0.1099	1
16	0.1	2.1938E-005	0.099978	1
18	0.11	5.0631E-006	0.10999	1
20	0.09	1.1685E-006	0.089999	1
22	0.1	2.6968E-007	0.1	1

==

RESULTS FROM VISUAL CURVE MATCHING

VISUAL MATCH PARAMETER ESTIMATES

	Estimate
K =	9.9055E-004
y0 =	2.7259E+000

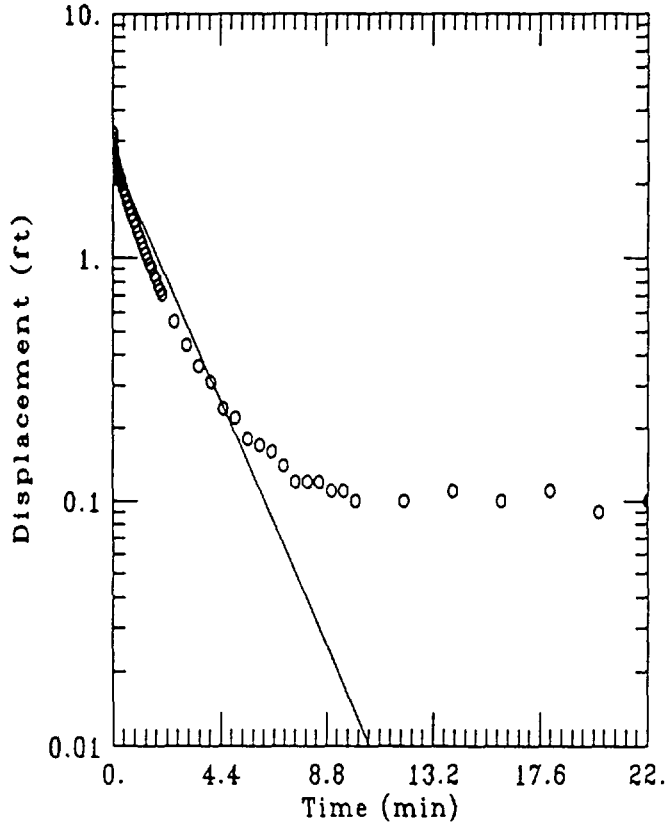
<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>

TYPE CURVE DATA

K = 7.10865E-004
y0 = 2.62271E+000

Time	Drawdown	Time	Drawdown	Time	Drawdown
0.000E+000	2.623E+000	2.200E+001	2.465E-005		

HODUS1S



DATA SET:
hodus1s.dat
07/23/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

ESTIMATED PARAMETERS:
K = 0.0007109 ft/min
y0 = 2.623 ft

TEST DATA:
H0 = 3.22 ft
rc = 0.083 ft
rw = 0.42 ft
L = 5.7 ft
b = 7. ft
H = 10.6 ft

<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>

A Q T E S O L V   R E S U L T S
Version 1.10

07/23/93 10:38:36

==

TEST DESCRIPTION

Data set........... hodus3s.dat
Data set title..... HODUS3S

Knowns and Constants:
No. of data points.................. 18
Radius of well casing............... 0.083
Radius of well...................... 0.42
Aquifer saturated thickness......... 23
Well screen length.................. 5.3
Static height of water in well...... 17.22
Log(Re/Rw).......................... 1.959
A, B, C............................. 1.964, 0.283, 0.000

==

ANALYTICAL METHOD

Bouwer-Rice (Unconfined Aquifer Slug Test)

==

RESULTS FROM STATISTICAL CURVE MATCHING

STATISTICAL MATCH PARAMETER ESTIMATES

	Estimate		Std. Error
K =	4.1747E-002	+/-	3.1394E-003
y0 =	2.9503E+000	+/-	1.2233E-001

ANALYSIS OF MODEL RESIDUALS

residual = calculated - observed
weighted residual = residual * weight

Weighted Residual Statistics:
Number of residuals............... 17
Number of estimated parameters.... 2
Degrees of freedom................ 15
Residual mean..................... -0.008399
Residual standard deviation....... 0.1431
Residual variance................. 0.02047

Model Residuals:

Time	Observed	Calculated	Residual	Weight

0.0033	2.85	2.6476	0.20236	1
0.0066	1.95	2.3761	-0.42608	1
0.0099	2.05	2.1324	-0.082361	1
0.0133	2.05	1.9074	0.14262	1
0.0166	1.87	1.7117	0.15826	1
0.02	1.65	1.5311	0.11886	1
0.0233	1.44	1.3741	0.065912	1
0.0266	1.21	1.2331	-0.023148	1
0.03	1.08	1.103	-0.023041	1
0.0333	0.95	0.9899	-0.039902	1
0.05	0.51	0.57246	-0.062462	1
0.0666	0.27	0.33214	-0.062143	1
0.0833	0.15	0.19208	-0.042079	1
0.1	0.08	0.11108	-0.031079	1
0.1166	0.04	0.064448	-0.024448	1
0.15	0.01	0.021554	-0.011554	1
0.1666	0.01	0.012505	-0.0025054	1

==

RESULTS FROM VISUAL CURVE MATCHING

VISUAL MATCH PARAMETER ESTIMATES

Estimate
K = 4.1747E-002
y0 = 2.9503E+000

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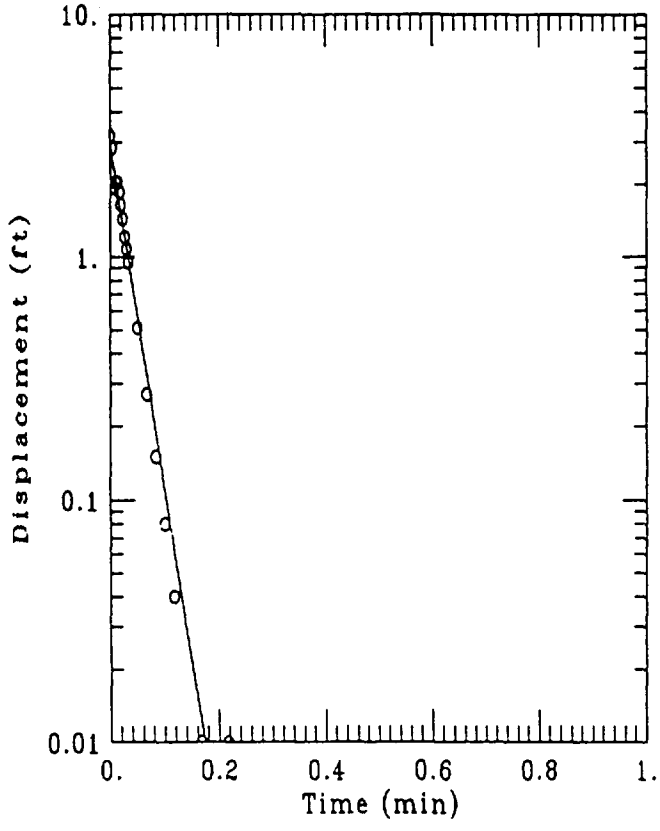
TYPE CURVE DATA

K = 4.17474E-002
y0 = 2.95025E+000

Time	Drawdown	Time	Drawdown	Time	Drawdown
0.000E+000	2.950E+000	1.000E+000	1.689E-014		

HODUS3S



DATA SET:
hodus3s.dat
07/23/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

ESTIMATED PARAMETERS
K = 0.04175 ft/min
y0 = 2.95 ft

TEST DATA:
H0 = 3.19 ft
rc = 0.083 ft
rw = 0.42 ft
L = 5.3 ft
b = 23. ft
H = 17.22 ft

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A Q T E S O L V   R E S U L T S
Version 1.10

07/23/93 09:39:32

==

TEST DESCRIPTION

Data set........... hodus3d.dat
Data set title..... HODUS3D

Knowns and Constants:
No. of data points.................. 73
Radius of well casing............... 0.083
Radius of well...................... 0.25
Aquifer saturated thickness......... 45
Well screen length.................. 5.3
Static height of water in well...... 46.3
Log(Re/Rw).......................... 3.44
A, B, C............................. 0.000, 0.000, 1.697

==

ANALYTICAL METHOD

Bouwer-Rice (Unconfined Aquifer Slug Test)

==

RESULTS FROM STATISTICAL CURVE MATCHING

STATISTICAL MATCH PARAMETER ESTIMATES

	Estimate		Std. Error
K =	3.1761E-004	+/-	6.9269E-006
y0 =	3.3793E+001	+/-	6.6736E-001

ANALYSIS OF MODEL RESIDUALS

residual = calculated - observed
weighted residual = residual * weight

Weighted Residual Statistics:
Number of residuals............... 23
Number of estimated parameters.... 2
Degrees of freedom................ 21
Residual mean..................... -0.1087
Residual standard deviation....... 0.3955
Residual variance................. 0.1565

Model Residuals:

Time	Observed	Calculated	Residual	Weight

3.5	19.77	20.552	-0.78185	1
4	18.98	19.142	-0.16247	1
4.5	17.82	17.83	-0.0097381	1
5	16.62	16.607	0.01297	1
5.5	15.59	15.468	0.12183	1
6	14.52	14.407	0.11259	1
6.5	13.67	13.419	0.2506	1
7	12.78	12.499	0.28086	1
7.5	12.02	11.642	0.37801	1
8	11.06	10.844	0.21639	1
8.5	10.33	10.1	0.23001	1
9	9.66	9.4074	0.25263	1
9.5	8.99	8.7622	0.22776	1
10	8.39	8.1614	0.22865	1
12	6.07	6.1426	-0.072571	1
14	4.56	4.6232	-0.063152	1
16	3.18	3.4796	-0.29958	1
18	2.14	2.6189	-0.47887	1
20	1.43	1.9711	-0.54107	1
22	0.91	1.4835	-0.57351	1
24	0.48	1.1166	-0.63655	1
26	0.22	0.84036	-0.62036	1
28	0.06	0.63249	-0.57249	1

===

RESULTS FROM VISUAL CURVE MATCHING

VISUAL MATCH PARAMETER ESTIMATES

Estimate
K = 3.1761E-004
y0 = 3.3793E+001

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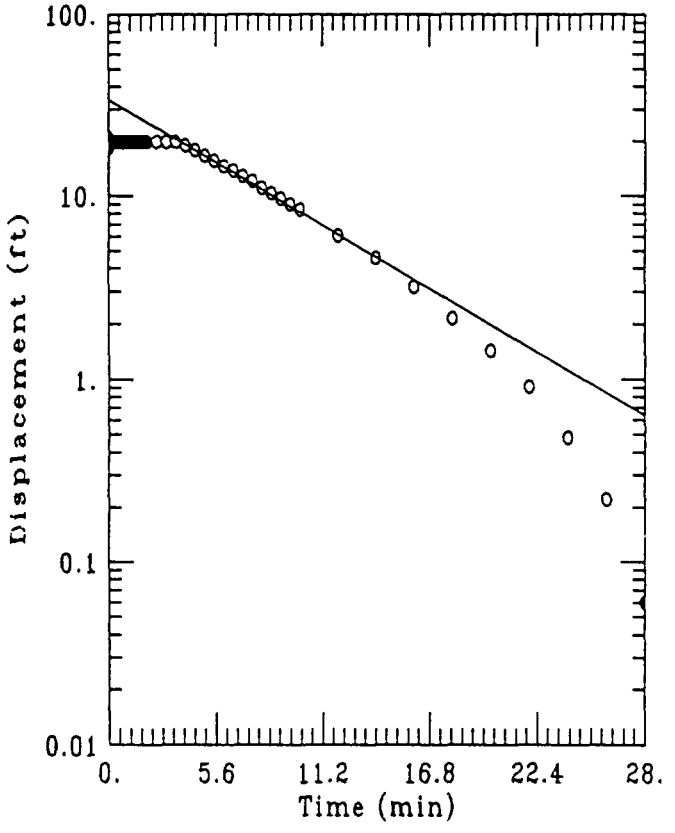
TYPE CURVE DATA

K = 3.17611E-004
y0 = 3.37926E+001

Time	Drawdown	Time	Drawdown	Time	Drawdown
0.000E+000	3.379E+001	2.800E+001	6.325E-001		

HODUS3D



DATA SET:
hodus3d.dat
07/23/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

ESTIMATED PARAMETERS:
K = 0.0003176 ft/min
y0 = 33.79 ft

TEST DATA:
H0 = 19.77 ft
rc = 0.083 ft
rw = 0.25 ft
L = 5.3 ft
b = 45. ft
H = 45.3 ft

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A Q T E S O L V   R E S U L T S
Version 1.10

07/23/93 11:05:16

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TEST DESCRIPTION

Data set........... hodus4s.dat
Data set title..... HODUS4S

Knowns and Constants:
No. of data points.................. 62
Radius of well casing............... 0.083
Radius of well...................... 0.42
Aquifer saturated thickness......... 13
Well screen length.................. 5.7
Static height of water in well...... 14.05
Log(Re/Rw).......................... 2.381
A, B, C............................. 0.000, 0.000, 1.446

==

ANALYTICAL METHOD

Bouwer-Rice (Unconfined Aquifer Slug Test)

==

RESULTS FROM VISUAL CURVE MATCHING

VISUAL MATCH PARAMETER ESTIMATES

	Estimate
K =	4.5331E-002
y0 =	2.6111E+000

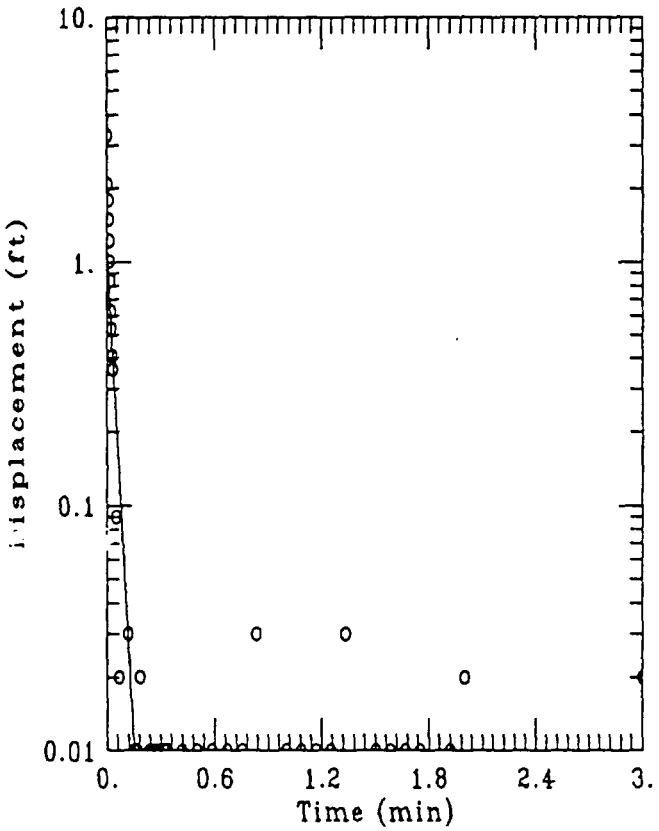
<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>

TYPE CURVE DATA

K = 4.53312E-002
y0 = 1.16866E+000

Time	Drawdown	Time	Drawdown	Time	Drawdown
0.000E+000	1.169E+000	3.000E+000	1.067E-041		

HODUS4S



DATA SET:
hodus4s.dat
07/23/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

ESTIMATED PARAMETERS:
K = 0.04533 ft/min
y0 = 1.169 ft

TEST DATA:
H0 = 3.3 ft
rc = 0.083 ft
rw = 0.42 ft
L = 5.7 ft
b = 13. ft
H = 14.05 ft

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A Q T E S O L V   R E S U L T S

Version 1.10

07/23/93   12:29:48

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TEST DESCRIPTION

Data set........... hodus6s.dat
Data set title..... HODUS6S

Knowns and Constants:
  No. of data points.................. 53
  Radius of well casing............... 0.083
  Radius of well...................... 0.42
  Aquifer saturated thickness......... 36
  Well screen length.................. 5.7
  Static height of water in well...... 37.31
  Log(Re/Rw).......................... 2.843
  A, B, C............................. 0.000, 0.000, 1.446

==

ANALYTICAL METHOD

Bouwer-Rice (Unconfined Aquifer Slug Test)

==

RESULTS FROM STATISTICAL CURVE MATCHING

STATISTICAL MATCH PARAMETER ESTIMATES

	Estimate		Std. Error
K =	1.0188E-001	+/-	1.2365E-002
y0 =	2.5321E+000	+/-	1.9691E-001

ANALYSIS OF MODEL RESIDUALS

residual = calculated - observed
weighted residual = residual * weight

Weighted Residual Statistics:
  Number of residuals............... 14
  Number of estimated parameters.... 2
  Degrees of freedom................ 12
  Residual mean..................... 0.04055
  Residual standard deviation....... 0.1558
  Residual variance................. 0.02429

Model Residuals:

Time	Observed	Calculated	Residual	Weight

0.0033	1.91	2.0821	-0.17215	1
0.0066	1.75	1.7121	0.037861	1
0.0099	1.6	1.4079	0.19212	1
0.0133	1.3	1.1509	0.14915	1
0.0166	1.03	0.94634	0.083661	1
0.02	0.75	0.77357	-0.02357	1
0.0233	0.52	0.6361	-0.1161	1
0.0266	0.26	0.52306	-0.26306	1
0.1	0.21	0.0067385	0.20326	1
0.1166	0.23	0.0025184	0.22748	1
0.1333	0.1	0.00093565	0.099064	1
0.2166	0.06	6.702E-006	0.059993	1
0.2333	0.06	2.49E-006	0.059998	1
0.25	0.03	9.2508E-007	0.029999	1

==

RESULTS FROM VISUAL CURVE MATCHING

VISUAL MATCH PARAMETER ESTIMATES

	Estimate
K =	1.0188E-001
y0 =	2.5321E+000

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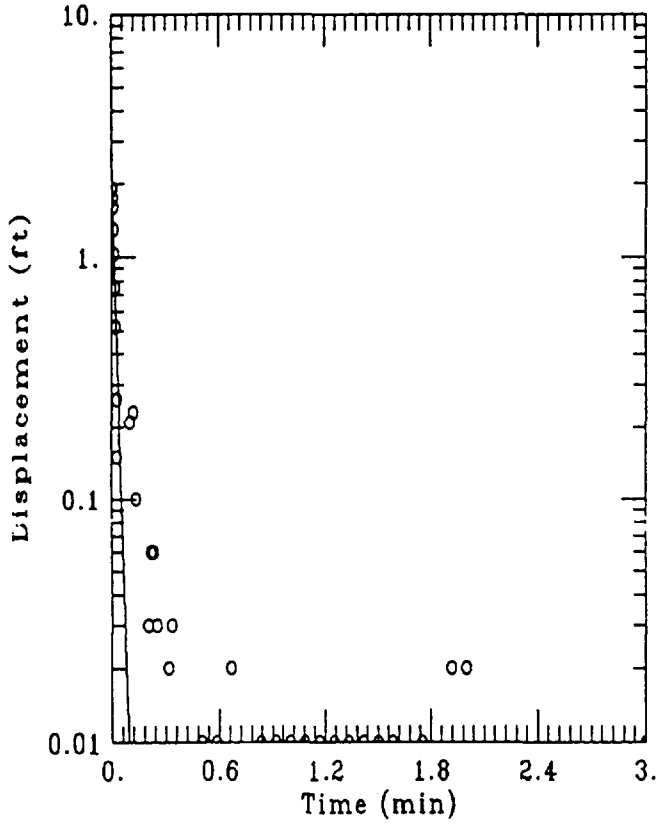
TYPE CURVE DATA

K = 1.01876E-001
y0 = 2.53212E+000

Time	Drawdown	Time	Drawdown	Time	Drawdown
0.000E+000	2.532E+000	3.000E+000	1.432E-077		

HODUS6S



DATA SET:
hodus6s.dat
07/23/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

ESTIMATED PARAMETERS:
K = 0.1019 ft/min
y0 = 2.532 ft

TEST DATA:
H0 = 1.91 ft
rc = 0.083 ft
rw = 0.42 ft
L = 5.7 ft
b = 36. ft
H = 37.31 ft

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A Q T E S O L V   R E S U L T S
Version 1.10

07/23/93 09:17:40

==

TEST DESCRIPTION

Data set........... hodus6d.dat
Data set title..... HODUS6D

Knowns and Constants:
- No. of data points.................. 60
- Radius of well casing............... 0.083
- Radius of well...................... 0.33
- Aquifer saturated thickness......... 9.17
- Well screen length.................. 5.7
- Static height of water in well...... 45.64
- Log(Re/Rw).......................... 3.181
- A, B, C............................. 0.000, 0.000, 1.575

==

ANALYTICAL METHOD

Bouwer-Rice (Unconfined Aquifer Slug Test)

==

RESULTS FROM STATISTICAL CURVE MATCHING

STATISTICAL MATCH PARAMETER ESTIMATES

	Estimate		Std. Error
K =	1.5072E-003	+/-	1.1139E-004
y0 =	2.0692E+001	+/-	8.8470E-001

ANALYSIS OF MODEL RESIDUALS

residual = calculated - observed
weighted residual = residual * weight

Weighted Residual Statistics:
- Number of residuals............... 28
- Number of estimated parameters.... 2
- Degrees of freedom................ 26
- Residual mean..................... -0.235
- Residual standard deviation....... 1.786
- Residual variance................. 3.189

Model Residuals:

Time	Observed	Calculated	Residual	Weight

0.0033	18.83	20.639	-1.8089	1
0.0133	18.4	20.478	-2.0777	1
0.0166	18.16	20.425	-2.2648	1
0.15	17.94	18.397	-0.45663	1
0.5	17.91	13.982	3.9279	1
0.5833	16.63	13.098	3.5319	1
0.6667	15.24	12.269	2.9709	1
0.75	13.85	11.493	2.3565	1
0.8333	12.51	10.767	1.7431	1
0.9167	11.42	10.085	1.3346	1
1	10.37	9.4479	0.92215	1
1.0833	9.15	8.8506	0.29943	1
1.1667	8.3	8.2904	0.0095951	1
1.25	7.46	7.7663	-0.3063	1
1.3333	6.51	7.2753	-0.76532	1
1.4166	5.98	6.8154	-0.83539	1
1.5	5.41	6.384	-0.97403	1
1.5833	4.79	5.9804	-1.1904	1
1.6667	4.26	5.6019	-1.3419	1
1.75	3.86	5.2478	-1.3878	1
1.8333	3.45	4.916	-1.466	1
1.9167	2.95	4.6049	-1.6549	1
2	2.69	4.3138	-1.6238	1
2.5	1.18	2.9149	-1.7349	1
3	0.61	1.9696	-1.3596	1
3.5	0.26	1.3309	-1.0709	1
4	0.09	0.8993	-0.8093	1
4.5	0.06	0.60767	-0.54767	1

==

RESULTS FROM VISUAL CURVE MATCHING

VISUAL MATCH PARAMETER ESTIMATES

	Estimate
K =	1.5072E-003
y0 =	2.0692E+001

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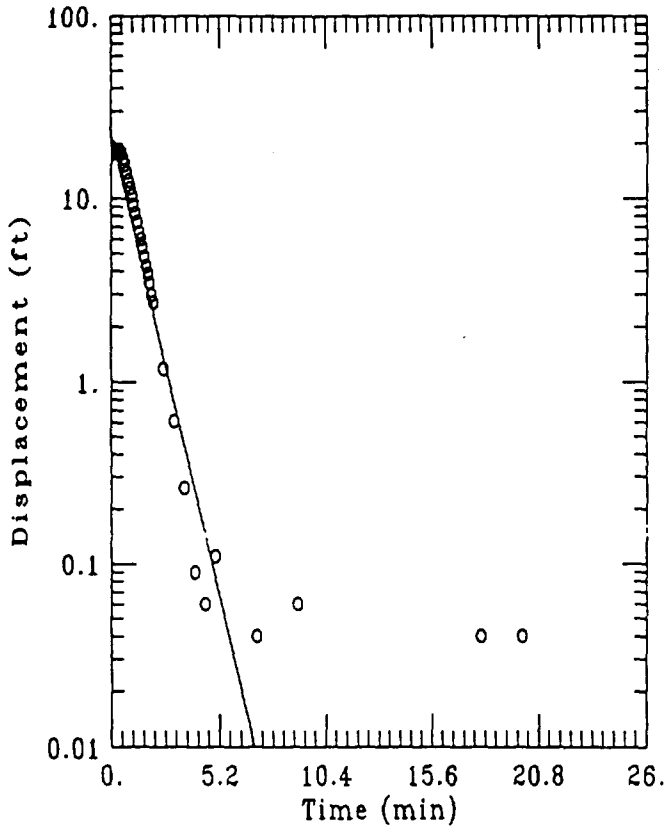
TYPE CURVE DATA

K = 2.14444E-003
y0 = 2.21310E+001

Time	Drawdown	Time	Drawdown	Time	Drawdown
0.000E+000	2.213E+001	2.600E+001	5.621E-012		

HODUS6D



DATA SET:
hodus6d.dat
07/23/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

ESTIMATED PARAMETERS:
K = 0.002144 ft/min
y0 = 22.13 ft

TEST DATA:
H0 = 19.14 ft
rc = 0.083 ft
rw = 0.33 ft
L = 5.7 ft
b = 9.17 ft
H = 45.64 ft

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A Q T E S O L V   R E S U L T S
Version 1.10

07/21/93 09:53:58

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TEST DESCRIPTION

Data set........... a:hodw3sb.dat
Data set title..... HODW3SB

Knowns and Constants:
No. of data points.................. 20
Radius of well casing............... 0.083
Radius of well...................... 0.33
Aquifer saturated thickness......... 27.85
Well screen length.................. 4.3
Static height of water in well...... 27.85
Log(Re/Rw).......................... 2.799
A, B, C............................. 0.000, 0.000, 1.424

==

ANALYTICAL METHOD

Bouwer Rice (Unconfined Aquifer Slug Test)

==

RESULTS FROM STATISTICAL CURVE MATCHING

STATISTICAL MATCH PARAMETER ESTIMATES

	Estimate		Std. Error
K =	1.4052E-001	+/-	9.7995E-003
y0 =	7.5571E+000	+/-	3.7373E-001

ANALYSIS OF MODEL RESIDUALS

residual = calculated - observed
weighted residual = residual * weight

Weighted Residual Statistics:
Number of residuals............... 17
Number of estimated parameters.... 2
Degrees of freedom................ 15
Residual mean..................... 0.01731
Residual standard deviation....... 0.304
Residual variance................. 0.09241

Model Residuals:

Time	Observed	Calculated	Residual	Weight

0.0033	5.61	6.1451	-0.53506	1
0.0066	5.2	4.9968	0.20316	1
0.0099	4.45	4.0632	0.38684	1
0.0133	3.69	3.2833	0.40669	1
0.0166	2.96	2.6698	0.29019	1
0.02	2.22	2.1574	0.062616	1
0.0233	1.62	1.7543	-0.13427	1
0.0266	1.15	1.4265	-0.27648	1
0.03	0.78	1.1527	-0.37269	1
0.0333	0.41	0.93731	-0.52731	1
0.1	0.31	0.014329	0.29567	1
0.1166	0.2	0.0050621	0.19494	1
0.1833	0.07	7.7386E-005	0.069923	1
0.2	0.07	2.7168E-005	0.069973	1
0.2166	0.06	9.5981E-006	0.05999	1
0.2333	0.06	3.3697E-006	0.059997	1
0.25	0.04	1.183E-006	0.039999	1

==

RESULTS FROM VISUAL CURVE MATCHING

VISUAL MATCH PARAMETER ESTIMATES

	Estimate
K =	1.4052E-001
y0 =	7.5571E+000

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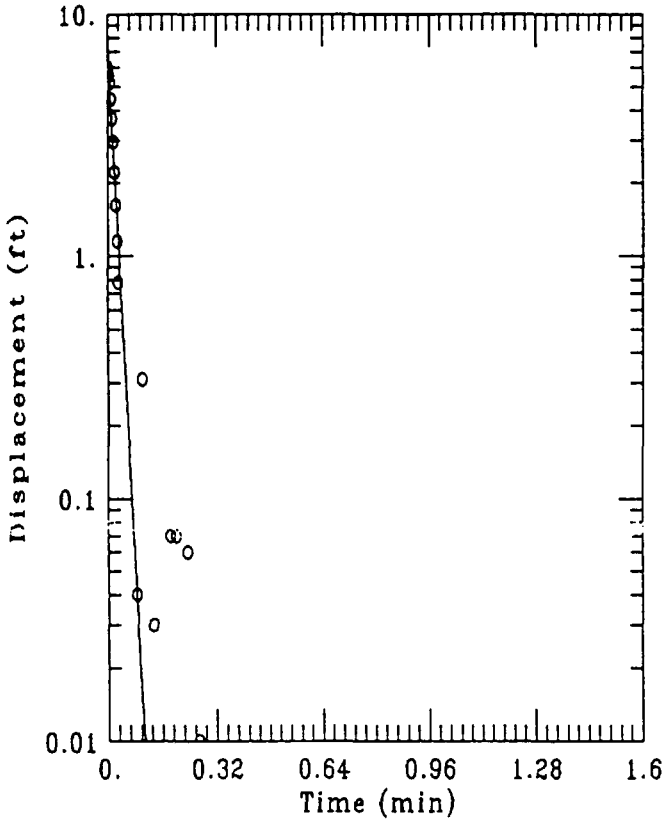
TYPE CURVE DATA

K = 1.40521E-001
y0 = 7.55713E+000

Time	Drawdown	Time	Drawdown	Time	Drawdown
0.000E+000	7.557E+000	1.600E+000	2.109E-043		

HODW3SB



DATA SET:
a:hodw3sb.dat
07/21/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

ESTIMATED PARAMETERS:
K = 0.1405 ft/min
y0 = 7.557 ft

TEST DATA:
H0 = 6.02 ft
rc = 0.083 ft
rw = 0.33 ft
L = 4.3 ft
b = 27.85 ft
H = 27.05 ft

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AQTESOLV RESULTS
Version 1.10

07/23/93 08:56:05

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TEST DESCRIPTION

Data set........... hodw3d.dat
Data set title..... HODW3D

Knowns and Constants:
No. of data points.................. 68
Radius of well casing............... 0.083
Radius of well...................... 0.33
Aquifer saturated thickness......... 45
Well screen length.................. 4.3
Static height of water in well...... 43.53
Log(Re/Rw).......................... 2.442
A, B, C............................. 1.973, 0.286, 0.000

==

ANALYTICAL METHOD

Bouwer-Rice (Unconfined Aquifer Slug Test)

==

RESULTS FROM STATISTICAL CURVE MATCHING

STATISTICAL MATCH PARAMETER ESTIMATES

	Estimate		Std. Error
K =	7.3898E-004	+/-	4.0658E-006
y0 =	8.7817E+000	+/-	1.4418E-002

ANALYSIS OF MODEL RESIDUALS

residual = calculated - observed
weighted residual = residual * weight

Weighted Residual Statistics:
Number of residuals............... 61
Number of estimated parameters.... 2
Degrees of freedom................ 59
Residual mean..................... -0.008165
Residual standard deviation....... 0.06369
Residual variance................. 0.004056

Model Residuals:

Time	Observed	Calculated	Residual	Weight

0.02	8.91	8.7156	0.19444	1
0.0233	8.85	8.7047	0.1453	1
0.0266	8.85	8.6939	0.15614	1
0.03	8.76	8.6827	0.0773	1
0.0333	8.74	8.6719	0.068118	1
0.05	8.6	8.6173	-0.017343	1
0.0666	8.53	8.5635	-0.033471	1
0.0833	8.46	8.5096	-0.049614	1
0.1	8.42	8.4561	-0.036096	1
0.1166	8.36	8.4032	-0.043231	1
0.1333	8.3	8.3504	-0.050382	1
0.15	8.25	8.2979	-0.047865	1
0.1666	8.19	8.246	-0.05599	1
0.1833	8.14	8.1941	-0.05413	1
0.2	8.14	8.1426	-0.0025958	1
0.2166	8.01	8.0917	-0.081691	1
0.2333	7.92	8.0408	-0.1208	1
0.25	7.95	7.9902	-0.040232	1
0.2666	7.89	7.9403	-0.05028	1
0.2833	7.84	7.8903	-0.050342	1
0.3	7.78	7.8407	-0.060719	1
0.3166	7.75	7.7917	-0.041702	1
0.3333	7.71	7.7427	-0.032698	1
0.4167	7.45	7.5025	-0.05255	1
0.5	7.22	7.2701	-0.050125	1
0.5833	7	7.0449	-0.0449	1
0.6667	6.83	6.8264	0.0036055	1
0.75	6.62	6.6149	0.0050838	1
0.8333	6.42	6.41	0.010011	1
0.9167	6.25	6.2112	0.038824	1
1	6.07	6.0188	0.051243	1
1.0833	5.85	5.8323	0.017701	1
1.1667	5.66	5.6514	0.008596	1
1.25	5.5	5.4763	0.023674	1
1.3333	5.35	5.3067	0.043328	1
1.4166	5.16	5.1423	0.017726	1
1.5	5.03	4.9828	0.047219	1
1.5833	4.84	4.8284	0.011583	1
1.6667	4.73	4.6787	0.051342	1
1.75	4.59	4.5337	0.056284	1
1.8333	4.43	4.3933	0.036736	1
1.9167	4.34	4.257	0.082998	1
2	4.21	4.1251	0.084878	1
2.5	3.45	3.4151	0.034913	1
3	2.8	2.8273	-0.027266	1
3.5	2.35	2.3406	0.0093758	1
4	1.94	1.9377	0.0022548	1
4.5	1.51	1.6042	-0.094212	1
5	1.34	1.3281	0.011913	1
5.5	1.04	1.0995	-0.059491	1
6	0.89	0.91024	-0.020241	1
6.5	0.71	0.75357	-0.043566	1
7	0.56	0.62386	-0.063859	1
7.5	0.47	0.51648	-0.046478	1
8	0.31	0.42758	-0.11758	1
8.5	0.29	0.35398	-0.063982	1
9	0.26	0.29305	-0.033053	1
9.5	0.22	0.24261	-0.022611	1
10	0.14	0.20085	-0.060852	1

12	0.01	0.094349	-0.084349	1
14	0.01	0.04432	-0.03432	1

==

RESULTS FROM VISUAL CURVE MATCHING

VISUAL MATCH PARAMETER ESTIMATES

	Estimate
K =	7.3898E-004
y0 =	8.7817E+000

<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>

TYPE CURVE DATA

K = 7.38976E-004
y0 = 8.78167E+000

Time	Drawdown	Time	Drawdown	Time	Drawdown
0.000E+000	8.782E+000	2.200E+001	2.158E-003		

TYPE CURVE DATA

K = 7.38976E-004
y0 = 8.78167E+000

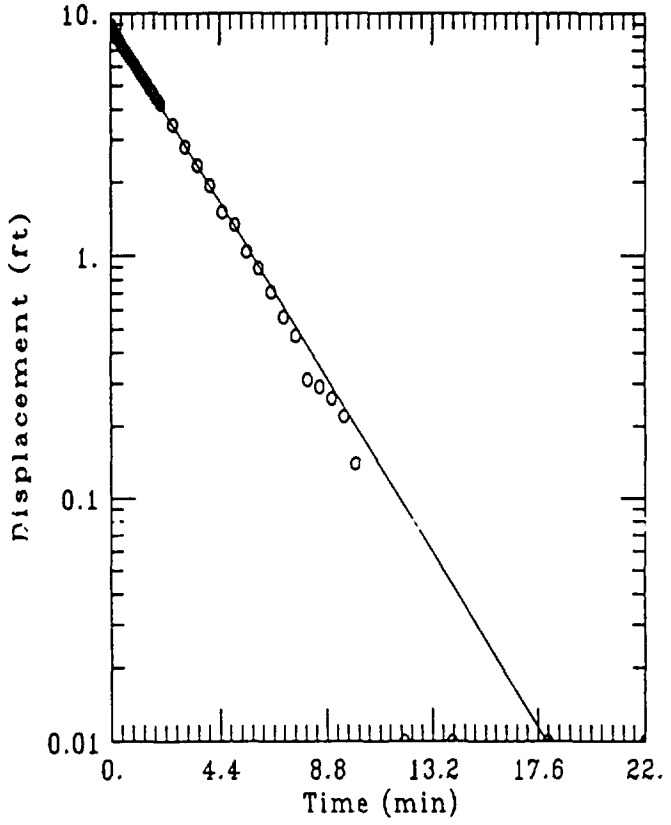
Time	Drawdown	Time	Drawdown	Time	Drawdown
0.000E+000	8.782E+000	2.200E+001	2.158E-003		

TYPE CURVE DATA

K = 7.38976E-004
y0 = 8.78167E+000

Time	Drawdown	Time	Drawdown	Time	Drawdown
0.000E+000	8.782E+000	2.200E+001	2.158E-003		

HODW3D



DATA SET:
hodw3d.dat
07/23/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

ESTIMATED PARAMETERS:
K = 0.000739 ft/min
y0 = 8.782 ft

TEST DATA:
H0 = 12.99 ft
rc = 0.083 ft
rw = 0.33 ft
L = 4.3 ft
b = 45. ft
H = 47.53 ft

<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>

A Q T E S O L V   R E S U L T S

Version 1.10

07/20/93 14:33:22

==

TEST DESCRIPTION

Data set........... HODW4S.DAT
Data set title..... HODW4S

Knowns and Constants:
No. of data points.................. 12
Radius of well casing............... 0.037
Radius of well....................... 0.33
Aquifer saturated thickness......... 9.36
Well screen length.................. 9.25
Static height of water in well...... 9.36
Log(Re/Rw).......................... 2.52
A, B, C............................. 0.000, 0.000, 1.907

==

ANALYTICAL METHOD

Bouwer-Rice (Unconfined Aquifer Slug Test)

==

RESULTS FROM STATISTICAL CURVE MATCHING

STATISTICAL MATCH PARAMETER ESTIMATES

	Estimate		Std. Error
K =	1.8523E-002	+/-	1.6301E-003
y0 =	7.9727E+000	+/-	7.6883E-001

ANALYSIS OF MODEL RESIDUALS

residual = calculated - observed
weighted residual = residual * weight

Weighted Residual Statistics:
Number of residuals............... 11
Number of estimated parameters.... 2
Degrees of freedom................ 9
Residual mean..................... -0.01285
Residual standard deviation....... 0.2414
Residual variance................. 0.05828

Model Residuals:

Time	Observed	Calculated	Residual	Weight

0.0066	3.81	4.1386	-0.32863	1
0.0099	3.58	2.9818	0.59818	1
0.0133	2.16	2.1271	0.032879	1
0.0166	1.4	1.5326	-0.13256	1
0.02	0.93	1.0933	-0.16327	1
0.0233	0.68	0.78768	-0.10768	1
0.0266	0.53	0.56751	-0.037514	1
0.03	0.39	0.40484	-0.014844	1
0.0333	0.29	0.29168	-0.0016836	1
0.05	0.07	0.055515	0.014485	1
0.0666	0.01	0.010671	-0.00067128	1

==

RESULTS FROM VISUAL CURVE MATCHING

VISUAL MATCH PARAMETER ESTIMATES

	Estimate
K =	1.8523E-002
y0 =	7.9727E+000

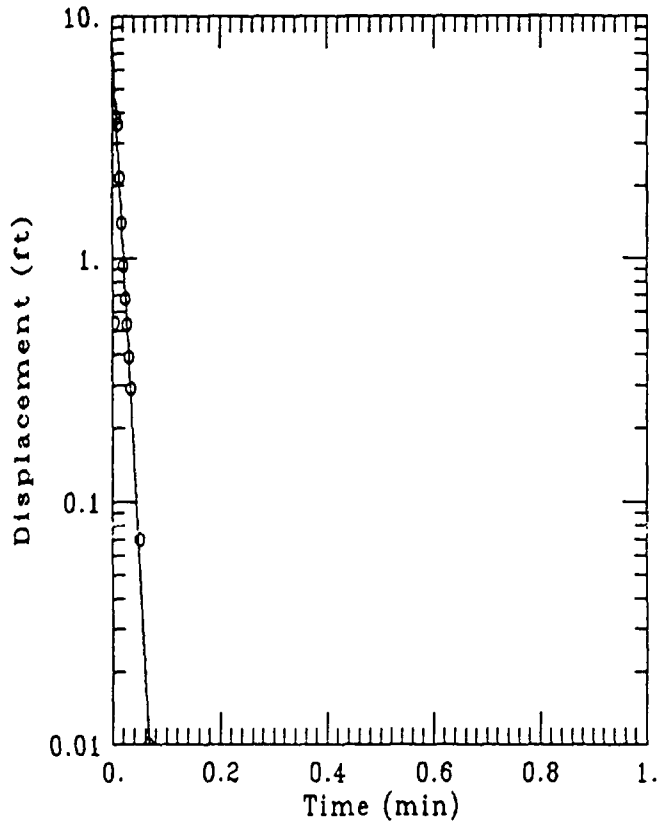
<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>

TYPE CURVE DATA

K = 1.85233E-002
y0 = 7.97274E+000

Time	Drawdown	Time	Drawdown	Time	Drawdown
0.000E+000	7.973E+000	1.000E+000	5.723E-043		

HODW4S



DATA SET:
HODW4S.DAT
07/20/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

ESTIMATED PARAMETERS:
K = 0.01852 ft/min
y0 = 7.973 ft

TEST DATA:
H0 = 4.27 ft
rc = 0.037 ft
rw = 0.33 ft
L = 9.25 ft
b = 9.36 ft
H = 9.35 ft

<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>

A Q T E S O L V   R E S U L T S
Version 1.10

07/21/93   10:12:13

==

TEST DESCRIPTION

Data set........... a:hodw5s.dat
Data set title..... HODW5S

Knowns and Constants:
- No. of data points.................. 37
- Radius of well casing............... 0.037
- Radius of well...................... 0.33
- Aquifer saturated thickness......... 6.53
- Well screen length.................. 9.12
- Static height of water in well...... 6.53
- Log(Re/Rw).......................... 2.288
- A, B, C............................. 0.000, 0.000, 1.895

==

ANALYTICAL METHOD

Bouwer-Rice (Unconfined Aquifer Slug Test)

==

RESULTS FROM STATISTICAL CURVE MATCHING

STATISTICAL MATCH PARAMETER ESTIMATES

	Estimate		Std. Error
K =	5.6307E-003	+/-	2.2088E-004
y0 =	1.5763E+000	+/-	3.4140E-002

ANALYSIS OF MODEL RESIDUALS

residual = calculated - observed
weighted residual = residual * weight

Weighted Residual Statistics:
- Number of residuals............... 34
- Number of estimated parameters.... 2
- Degrees of freedom................ 32
- Residual mean..................... 0.01546
- Residual standard deviation....... 0.04
- Residual variance................. 0.0016

Model Residuals:

Time	Observed	Calculated	Residual	Weight

0.0033	1.42	1.4146	0.0053646	1
0.0066	1.26	1.2696	-0.0095595	1
0.0099	1.28	1.1394	0.14064	1
0.0133	0.91	1.0192	-0.10917	1
0.0166	0.85	0.91465	-0.064649	1
0.02	0.82	0.81816	0.0018383	1
0.0233	0.72	0.73426	-0.014256	1
0.0266	0.66	0.65896	0.0010444	1
0.03	0.62	0.58944	0.030558	1
0.0333	0.53	0.52899	0.0010078	1
0.05	0.3	0.30595	-0.0059453	1
0.0666	0.18	0.17753	0.0024738	1
0.0833	0.12	0.10267	0.017327	1
0.1	0.09	0.059382	0.030618	1
0.1166	0.06	0.034456	0.025544	1
0.1333	0.05	0.019928	0.030072	1
0.15	0.04	0.011525	0.028475	1
0.1666	0.03	0.0066877	0.023312	1
0.1833	0.03	0.0038679	0.026132	1
0.2	0.03	0.002237	0.027763	1
0.2166	0.03	0.001298	0.028702	1
0.2333	0.03	0.00075072	0.029249	1
0.25	0.03	0.00043419	0.029566	1
0.2666	0.03	0.00025194	0.029748	1
0.2833	0.03	0.00014571	0.029854	1
0.3	0.03	8.4272E-005	0.029916	1
0.3166	0.02	4.8899E-005	0.019951	1
0.3333	0.02	2.8281E-005	0.019972	1
0.4167	0.02	1.8361E-006	0.019998	1
0.5	0.02	1.196E-007	0.02	1
0.5833	0.02	7.79E-009	0.02	1
0.6667	0.02	5.0575E-010	0.02	1
0.75	0.02	3.2942E-011	0.02	1
0.8333	0.02	2.1457E-012	0.02	1

==

RESULTS FROM VISUAL CURVE MATCHING

VISUAL MATCH PARAMETER ESTIMATES

	Estimate
K =	5.6307E-003
y0 =	1.5763E+000

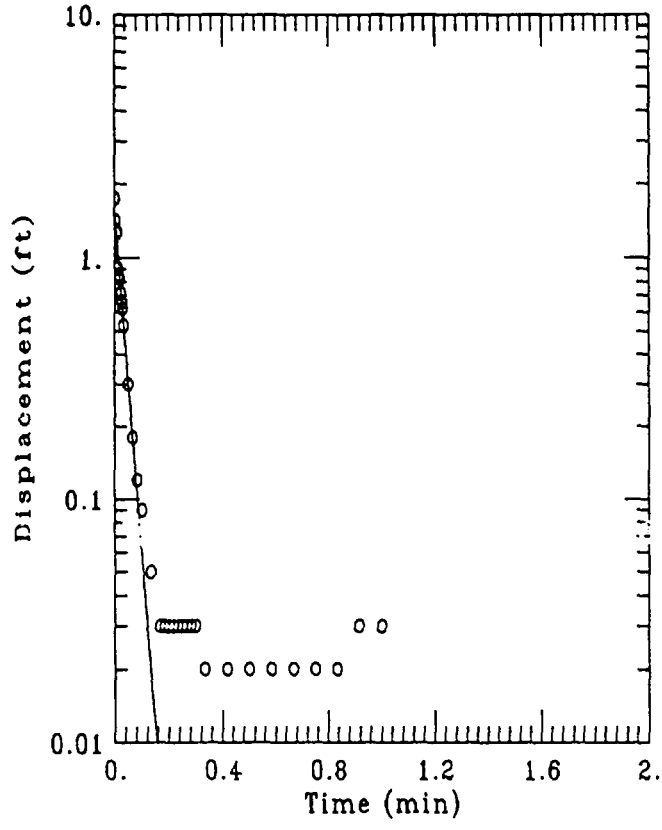
<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>

TYPE CURVE DATA

K = 5.63067E-003
y0 = 1.57629E+000

Time	Drawdown	Time	Drawdown	Time	Drawdown
0.000E+000	1.576E+000	2.000E+000	5.223E-029		

HODW5S



DATA SET:
a:hodw5s.dat
07/21/93

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

ESTIMATED PARAMETERS:
K = 0.005631 ft/min
y0 = 1.576 ft

TEST DATA:
H0 = 1.75 ft
rc = 0.037 ft
rw = 0.33 ft
L = 9.12 ft
b = 6.53 ft
H = 6.53 ft

L

APPENDIX L

DAILY PUMPING RATES, VILLAGE OF ANTIOCH WELLS VW3 AND VW4

Report on Well No 3 Antioch Water Supply North Encino Dec 1995

Date	Meter Reading	Water Treated	CL2 Reading	CL2 Total	CL2 Resd.	Hr. Meter Reading	Hr. Meter Total	PO4 Reading	PO4 Total	REMARKS
x	564804		231			10625.5		120		
1	565495	691	231	—		10628.0		118	2	
2	565495	—	—			—		—		
3	566564	1069	229	2		10632.2		113	5	48' STATIC
4	566564	—	229			10632.2		113	—	
5	567280	716	226	1		10634.9		113	3	H.P = 58
6	567341	61	228	—	1.0	10635.5		110	—	56' PUMPING
7	570416	3075	225	3		10647.0		100/171	10	
8	571139	723	224	1		10649.7		168	3	
9	573468	2329	221	3		10658.7		158	10	
10	574572	1104	220	1		10662.9		155	3	
11	575542	968	218	2		10666.7		151	4	
12	576153	623	218	0		10669.1		147	4	
13	576153	—	218	—		10669.1		147	—	
14	576958	825	218	—		10672.2		147	—	
15	579054	2096	215	3		10680.3		137	10	
16	579542	758	213	2		10683.4		136	3	FE.54 Cl.79 FL.9
17	579542	—	—			—		—		
1143 18	580985	—	213	—		10687.6		130	4	
626 19	581611	—	213			10690.0		128	2	
20	581611	—	—			—		—		H.P. 56#
21	583191	1580	211	2	1.0	10696.1		122	6	PUMPING 54'
22	585720	2529	208	3		10705.8		111	11	STATIC 48'
23	586367	647	207	1		10708.3		108	3	
24	586367	—	207	—	—	—		—	—	
1280 25	587647	380	206	1		10710.9		106	2	
26	587834	187	205	1		10714.5		103	3	
27	588053	219	205	—		10717.7		102	1	
28	591205	3152	202	3		10726.9		90/180	12	NEW ADJ # 180
29	591499	294	202	—		10728.1		179	1	
30	591499	—	202			10728.1		179	—	
31	592705	1206	201	1		10732.7		174	5	
TOTAL				30					26	
AVE.	2.7									
MAX.										
MIN.										

WARREN CELL
PROJECT # 10070201
NAME WQO
CATEGORY/DESCRIPTION F3
CROSS REFERENCE #
SUBMITTED BY

Report on Well No 3 Antioch Water Supply Month Ending Oct 1993

Date	Meter Reading	Water Treated	CL2 Reading	CL2 Total	CL2 Resd.	Hr. Meter Reading	Hr. Meter Total	PO4 Reading	PO4 Total	REMARKS
x	514128		142			104201		136		
1	514704	576	144	0		104320		133	3	
2	—	—	—	—		10482.6		—	—	
3	515373	669	142	2		10513.4		132	8	
4	515373	—	—			—		—		STATIC 50'
5	515905	532	142	—	1.0	104372		129	2	PUMPING 54'
6	519188	3283	139	3		104448		116/180	13	H.P 56#
7	519770	582	139	—		10452.1		178	2	
8	519770		—			—		—		
9	520393	623	138	1		104571		176	2	
10	520393	—	138	—		104595		176	—	
11	522838	2445	136	2		10463.9		166	10	FE .77 PO4 .50 FL .84
12	523435	597	135	1		10466.2		164	2	
13	523435	—	—			—		—		
948 14	524383	848	134	1		104698		160	4	
15	524383		134	0		104698		160	0	
16	525102	720	134	0		104726		157	3	
17	525131	522	133	1		104740		155	2	
18	527399	1768	130	3		104814		148	7	
19	526171	772	130		1.0	104844		147	1	STATIC 48'
20	528171	—	—			—		—		
1191 21	529362	1181	128			104940		141	6	
22	532309	1947	124	4		10507		130	11	
23	532322	13	124	—		10500		130		
24	534788	2466	123	1		10507		122	8	
25	534955	145	121	2		105104		119	3	
26	554933	—	—			—		—		
27	535652	719	121	—	1.0	10513.2		119	—	
28	537806	2154	118	3		10521.5		109/133	10	
29	538377	581	117	1		10523.7		131	2	
30	538377	10	117	—		10523.8		131	-8	
31	540503	2106	115	2		10531.9		123	8	
TOTAL										
AVE.	2.6			27					21	
MAX.										
MIN.										

Report on Well No 4 Antioch Water Supply Month Ending Oct 1993

Date	Meter Reading	Water Treated	CL2 Reading	CL2 Total	CL2 Resd.	Hr. Meter Reading	Hr. Meter Total	PO4 Reading	PO4 Total	REMARKS
*	136270		68			10344		144		
1	140717	4447	63	5		10146.0		131	13	
2	140999	282	63	0		10146.7		130	1	
3	145050	4051	59.1	4		10167.3		118	12	H.P. 58#
4	145735	685	58	1	.9	10154.0		117	1	PUMPING 68'
5	151252	5517	53	5		10173.4		101	16	STATIC 56'
6	151526	274	53	—		10174.1		99	2	
7	156239	4703	48	5		10186.4		95/178	14	NEW ADQ # 178
8	157145	906	47	1		10187.7		178	0	
9	16169.3	4548	43	4		10200.5		167	11	
10	162803	1110	41	2		102034		163	4	
11	163011	208	41	—		10203.9		163	—	
12	167892	4881	36	5		10216.6		150	13	FE 1.42 PO4 .66 FL .8
13	168757	865	36	—	.8	10218.8		148	2	
14	172257	3494	32	4		10227.9		137	9	
15	173078	[illegible]	31.5			102300		134	3	
16	17[illegible]	3782	27.9	3.6		10234.9		124	10	
17	178021	1161	[illegible]	[illegible]		10242.9		121	3	
18	178532	511	26.0	—		102442		118	3	
19	[illegible]	3796	22	4		10254.1		108	10	STATIC 56'
20	184051	1723	20	2		10258.3		103	5	PUMPING 68'
21	185511	1460	19	1		10262.4		99/167	4	H.P. 58#
22	186233	722	18	1		10264.4		164	3	
23	189042	2809	15	3		10271.		156	8	
24	189420	378	15	0		102726		156	—	
25	192977	3557	113	4		102812		144	12	
26	193389	412	10	1	.9	102828		143	1	
27	198627	5238	5	5		10296.5		128	15	
28	199253	626	4	1		10298.1		126	2	
29	203698	[illegible]	1/149	3		103097		113	13	
30	205141	1443	147	2		103134		109	4	
31	205304	168	147			10313.8		108	1	
TOTAL	69			65					46	
AVE.										
MAX.										
MIN.										

Report on Well No. 3 Antioch ___ Water Supply ___ Month Ending Sept 19 93

	Date	Meter Reading	Water Treated	CL2 Reading	CL2 Total	CL2 Resd.	Hr. Meter Reading	Hr. Meter Total	PO4 Reading	PO4 Total	REMARKS
	*	489546		170			10335.7		150		
	1	491494	1948	168	2		10343.2		143	7	
	2	492507	1013	167	1		10347.1		138	5	
	3	492507	—	167	—		10347.1		138	—	
	4	493515	1008	166	1		10351.0		135	3	
	5	494207	692	165	1		10353.7		132		
	6	494207		165			10353.7		132		
	7	496330	2123	163	2		10361.0		123	9	
	8	496330	0	163	0		10361.0		123	0	
	9	497649	1317	160	3		10366.9		118	.5	
	10	497649	0	160	0		10366.9		118	0	
732	11	499381	[illegible]	160	0		10373.6		111	7	
672	12	500053	—	159	1		10376.2		109	2	
	13	500053	—	159	—		10376.2		109	—	
	14	500053	—	—			—		—		
	15	500492	939	158	1	.9	10379.8		105	4	STATIC 48'
	16	501457	465	158	—		10381.6		102	3	PUMPING 54'
	17	503225	1748	156	2		10388.3		98	4	
	18	503575	350	156	1		10389.7		97	1	
545	19	504100	445	156	—		10391.3		94	3	
	20	504100	—	—			—		94/174	—	NEW AZQ #174
	21	504990	890	152	3		10395.2		171	5	FE.67 Pos.90 [illegible]
	22	504990	—	—			—		—		
	23	507585	2595	151	1	.9	10405.3		161	10	
	24	508176	591	150	1		10407.5		157	2	
	25	508252	76	150	—		10407.8		158	1	
	26	510026	1774	148	2		10414.6		151	7	
	27	510920	894	147	1		10418.0		148	3	
	28	510995	75	147	—		10418.3		148	—	
485	29	511480	1385	146	1		10420.9		147	1	
2648	30	514128	2648	144	2		10430.1		136	11	
	31										
	TOTAL	2.4			26					103/25.75	
	AVE.										
	MAX.										
	MIN.										

Report on Well No 4 Antioch Water Supply Month Ending Sept 1993

Date	Meter Reading	Water Treated	CL2 Reading	CL2 Total	CL2 Resd.	Hr. Meter Reading	Hr. Meter Total	PO4 Reading	PO4 Total	REMARKS
*	73720		130			9971.9		112		
1	75318	1598	128	2		9976.0		110/164	4	
2	78633	3315	125	3		9984.7		153	11	
3	79744	111	123	2		9987.6		151	2	
4	82202	2458	121	2		9994.1		143	8	
5	84885	2683	118	3		10001.1		135	8	
6	84885	—	118			[illegible]		135		
7	86630	1745	117	1		10005.6		130	5	
8	86630	0	117	0		10005.6		130	0	
9	89550	2920	114	3		10013.2		120	10	
10	92480	2930	111	3		10020.8		112	8	
11	92480		111	—		10020.8		112	0	
12	96567	5087	107	4		10031.9		100	12	
13	97370	803	106	1		10033.5		98	2	
14	99714	2344	104	2		10039.5		90	8	NEW ADD = 177
15	103015	3301	101	3	.9	10048.1		82/177	8	STATIC 58'
16	105268	2253	98	3		10053.9		171	6	H.P. 58F
17	106050	782	98	—		10055.6		168	3	PUMPING 68'
18	109410	2360	95	3		10062.1		160	8	
19	112434	4024	91	4		10072.6		150	10	
20	113324	890	91	—		10074.8		146	4	FE Ad Pod. 99 FE .86
21	116826	3502	87	4		10084.0		136	10	
22	118058	1232	86	1	.9	10087.2		135	1	
23	118586	528	86	—		10088.5		131	4	
24	122869	4283	81	5		10099.7		119	12	
25	123957	1088	80	1		10102.5		116	3	
26	124149	192	80	-		10103.0		115	1	
27	128773	4324	75	5		10115.0		102/166	13	
28	129861	1088	74	1		10117.8		161	7	
29	135909	7048	68	6		10133.5		145	16	
30	136270	362	68	—		10134.4		144	1	
31									185/46.25	
TOTAL	6.2			62						
AVE.										
MAX.										
MIN.										

4624
6048
361

Report on Well No. 3 Antioch Water Supply Month Ending JUNE 19 93

Date:	Meter Reading	Water Treated	CL2 Reading	CL2 Total	CL2 Resd.	Hr. Meter Reading	Hr. Meter Total	PO4 Reading	PO4 Total	REMARKS
¥	378529		152			9910.2		116		
1	379361	832	151	1		9913.4		113	3	
2	380675	1314	149	2		9918.4		108	5	STATIC 48'
3	381423	748	148	1		99213		104	3	
4	381423	—	148	—		9921.3		104	—	
5	382372	949	147	1		99251		101	3	PO4.42-FE.62-FE 1.1
* 6	383176	804	147	—		9928.1		98	3	
* 7	383176	—	—			—		—		H.P. 56#
* 8	383779	603	145	2	.9	9930.4		95	3	PUMPING 54'
* 9	385930	2151	142	3		9938.6		77/177	18	NEW ADD ≐177
10	386492	562	142	—		9940.8		175	2	
11	387160	668	141	1		9943.3		173	2	
12	387428	268	141	—		9944.4		172	1	
13	388876	1448	138	3		9949.9		166	6	
14	389532	656	138	—		9952.5		164	2	
15	389532	—	—			—		—		H.P. 56#
499 16	390031	489	137	1	.9	9954.4		162	2	PUMPING 51'
17	393114	3083	132	5		9969.2		146	16	STAT. C 34'
18	393914	—	132	—		9969.2		146	—	
19	394687	773	132	—		9972.2		143	3	
20	395045	358	131	1		9973.6		143	—	
21	398885	3840	126	5		9988.3		127/190	16	
22	398885	—	—			—		—		
362 23	399211	326	125	1		9989.6		188	2	
24	403033	3786	121	4		10041		173	15	
25	403033	—	—	—					—	
26	405807	2774	117	4		10014.8		162	11	
725 27	406732	925	116	1		10018.3		167		
28	406732	0	116	0		10018.3		167	0	
29	407452	720	116	—		10021.1		165	2	
30	407972	520	114	2		10023.1		163	2	
31										
TOTAL	29			38					30	
AVE.										
MAX.										
MIN.										

Report on Well No 4 Antioch Water Supply Month Ending June 1993

Date:	Meter Reading	Water Treated	CL2 Reading	CL2 Total	CL2 Resd.	Hr. Meter Reading	Hr. Meter Total	PO4 Reading	PO4 Total	REMARKS
✱	854078		19			9404.4		114		
1	859505	5427	15	4		9418.4		99/162	15	H.P. 53#
2	860547	42	14	1	.7	9421.1		160	2	pumping 68'
3	864473	3926	10	4		9431.3		148	12	
4	865196	723	9	1		9433.2		146	2	
5	868160	2964	7	2		9440.3		136	10	
6	870850	2690	5	2		9447.8		129	7	STATIC 54'
7	871688	838	4	1		9449.9		127	2	pod. 26-FE .20-FO/1.
8	876174	4486	3	1		9461.6		115	12	
9	876762	588	2	1		9463.1		111	4	
10	882789	6027	2	0		9428.6		93/177	8	NEW ADD #17
11	886475	3686	2	0		9488.2		167	10	
12	887631	1156	1	1		9491.2		163	4	
13	887879	248	1	—	.8	9491.7		162	1	NEW CL #150
14	892386	4507	146	4		9503.4		149	13	
15	892870	484	145	1		9504.8		148	1	
16	899128	6258	140	5		9520.8		129	19	STATIC 56'
17	899128	—	139	—		9520.8		129	—	
18	899557	429	139	—		9521.9		128	1	
19	902683	3126	136	3		9530.0		119	9	
20	904112	1329	134	2		9533.7		115	4	
21	904112	—	—			—		—		
22	904528	416	134	—	.8	9534.7		113	2	
23	910938	6410	128	6		9551.2		95/171	18	
24	910938	—	128			9551.2		171		
25	916770	5832	124	4		9566.3		154	17	
26	918057	2287	123	1		9569.6		150	4	
27	920056	999	121	2		9574.9		144	6	
28	920769	713	120	1		9576.6		142	2	
29	922260	2491	118	2		9580.5		138	4	
30	924365	2105	117	1		9585.9		131	7	
31										
TOTAL	n.o			50					49	
AVE.										
MAX.										
MIN.	-				-					

REPORT ON WELL NO 3 ANTIOCH WATER SUPPLY MONTH ENDING MAR 19 94

Date	Meter Reading	Water Treated	CL2 Reading	CL2 Total	CL2 Resd.	Hr. Meter Reading	Hr. Meter Total	PO4 Reading	PO4 Total	REMARKS
*	683852		106			11082.9		176		
1	689333	5481	101	5		11103.9		155	21	
2	689333	—	—			—		—		STATIC 50'
3	689898	565	100	1	.8			153/181	2	PUMPING 56'
4	695176	5278	95/244	5		11126.3		167	14	H.P. 56#
5	695176	—	—			—		—	—	NEW CL2 # [illegible]
6	695176	—	—			—		—	—	
7	695877	701	243	1		11129.0		164	3	
8	701319	5442	241	2		11141.8		143	20	
9	701319	—	—			—		—		
10	701790	471	241	—		11151.6		141	2	
11	706804	5644	235	6		11170.8		121	20	
12	706804	—	235	—		11170.8		121	—	
13	706804	—	235	—		11170.8		121	—	
14	707436	632	234	1	.8	11173.4		119	2	
15	712697	5461	228	6		11193.0		99/178	20	NEW ADD # 178
16	712697	—	—			—		—		STATIC 50'
17	713327	636	227	1		11195.8		176	2	PUMPING 56'
18	716802	3475	223	4		11207.1		161	15	
19	717042	240	—			11210.3		161	—	
20	719327	2230	221	2		11218.8		153	8	
21	720134	807	220	1		11221.9		149	4	
22	720134	—	—			—		—		
23	720705	571	219	1	.9	11224.1		147	2	
24	723725	3020	215	4		11235.7		135	12	
25	724710	1085	215	3		11235		130	5	
26	727183	2473	212	3		11249		122	8	
27	727916	733	210	2		11251.8		119	3	
28	728196	280	210			11252.9		117	2	
29	730867	2771	206	4		11263.1		106	9	
30	730867	—	—	—		—		—		
31	730867	—	—	—		—		—		
TOTAL				53					42	
AVE.	4.7									
MAX.										
MIN.										

Report on Well No 4 Antioch Water Supply Month ending MAR 1994

Date	Meter Reading	Water Treated	CL2 Reading	CL2 Total	CL2 Resd.	Hr. Meter Reading	Hr. Meter Total	PO4 Reading	PO4 Total	REMARKS
*	515177		47			11059.5		172		
1	—		—			—		—		H.P. 59#
2	515697	520	47	—	.5	11060.8		170	2	pumping 70'
3	522885	7188	37	10		11079.5		149	21	STATIC 56'
4	522885	—	37	—		11079.5		148	1	
5	522885									
6	523778	893	35	2		11074.1		146	2	
7	530052	6274	27	8		11079.5		127	19	
8	530052	—	—			—		—		
9	530052	—	—			—		—		
10	530752	699	26	1		BROKEN		125	2	
11	538374	7623	16	10		00000		102	23	NEW HR METER
12	538374	—	16	—		00000		102	—	
13	539250	876	15	1		2.4		100	2	
14	545425	6175	6	9	.8	18.3		58/178	42	NEW ADD # 178
15	545425	—	—			—		—		H.P. 58#
16	546488	1063	5	1		21.3		175	3	pumping 70'
17	552465	5977	149	6		36.6		168	7	STATIC 56'
18	553262	1797	147	2		38.7		154	18	
19	559985	6723	139	8		55.8		136	1-8	
20	559985	—	139	—		55.8		136	—	
21	563294	3309	135	4		64.4		126	10	
22	563790	496	134	1		65.7		125	1	
23	569399	5609	127	7		80.2		108/173	17	
24	569906	507	126	1	.9	81.5		172	1	
25	575057	5151	119	7		94.9		157	15	
26	575057	—	119	—		94.9		157	—	
27	578188	3137	116	3		103		148	9	
28	579379	1191	114	2		106.1		142	6	
29	580159	780	113	1		108.1		140	2	
30	584914	4755	106	7		120.0		128	12	
31	584914	—	—			—		—		
TOTAL	9			91					68	
AVE.	10									
MAX.										
MIN.										

M

APPENDIX M

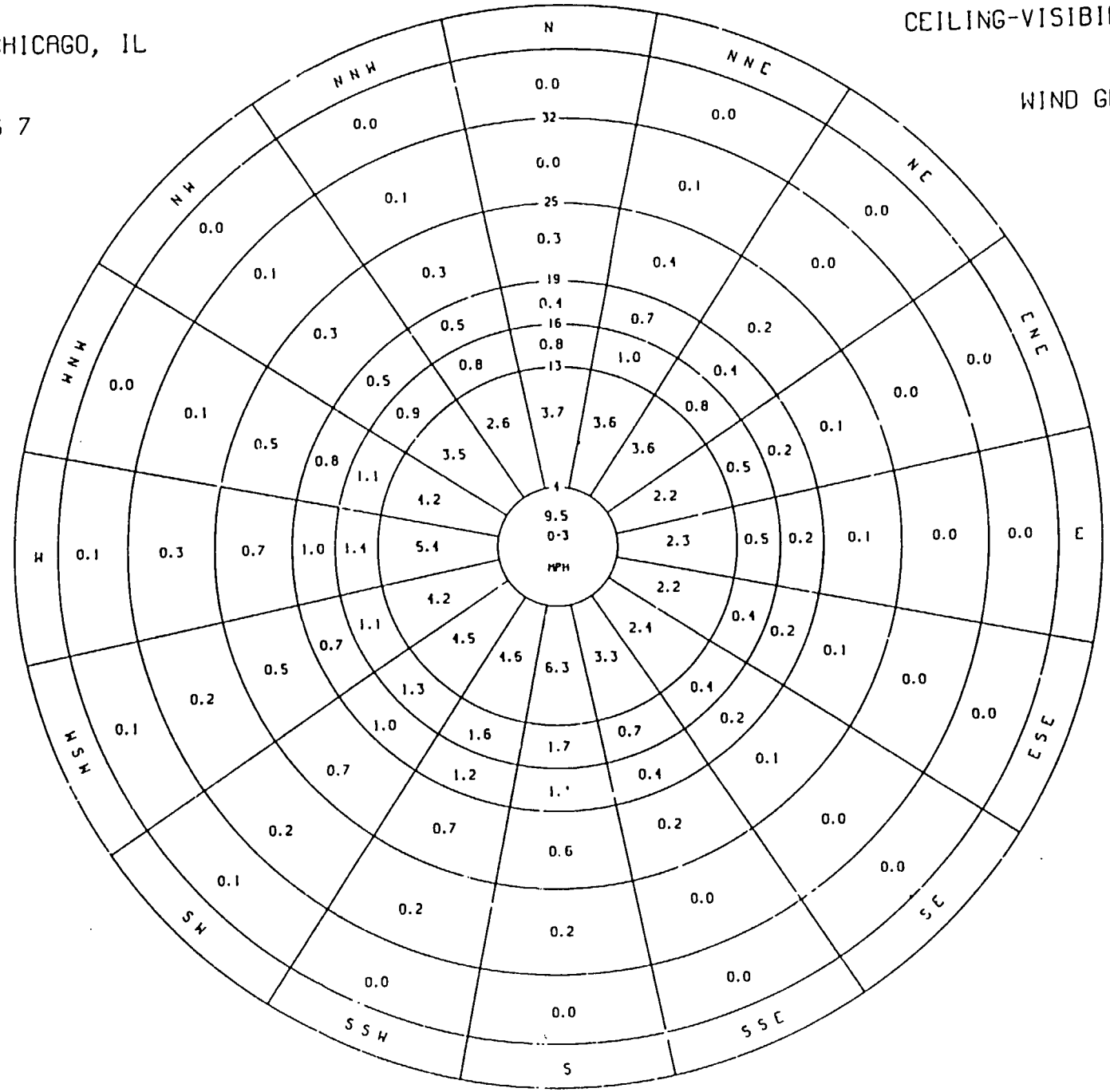
METEOROLOGICAL DATA

ORD CHICAGO, IL

CLASS 7

CEILING-VISIBILITY

WIND GRAPH



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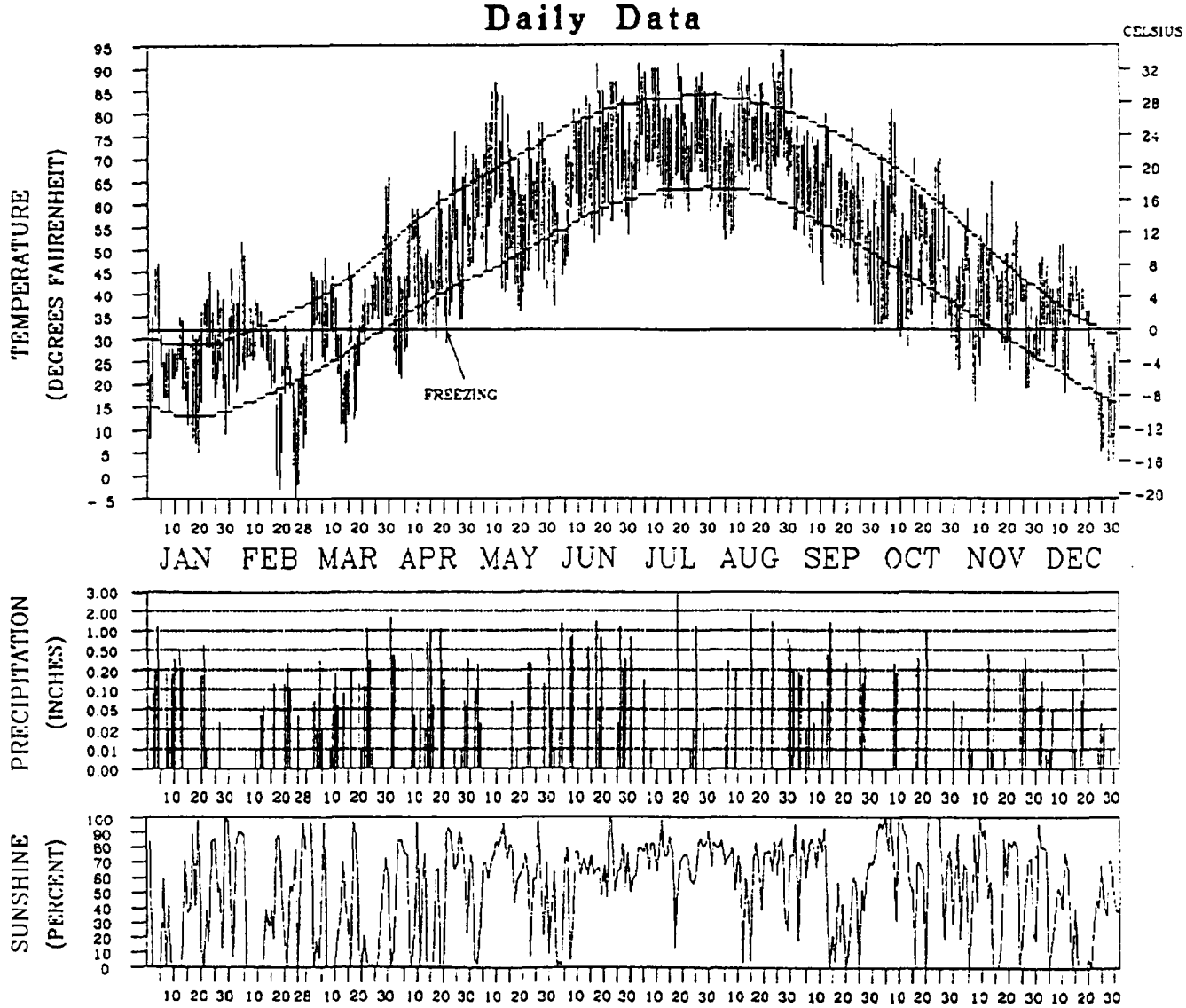
1993 LOCAL CLIMATOLOGICAL DATA
ANNUAL SUMMARY WITH COMPARATIVE DATA
CHICAGO, OHARE INTERNATIONAL AIRPORT, ILLINOIS

Daily Data



TEMPERATURE DEPICTS NORMAL MAXIMUM, NORMAL MINIMUM AND ACTUAL DAILY HIGH AND LOW VALUES (FAHRENHEIT)
PRECIPITATION IS MEASURED IN INCHES. SCALE IS NON-LINEAR
SUNSHINE IS PERCENT OF THE POSSIBLE SUNSHINE

I CERTIFY THAT THIS IS AN OFFICIAL PUBLICATION OF THE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, AND IS COMPILED FROM RECORDS ON FILE AT THE NATIONAL CLIMATIC DATA CENTER, ASHEVILLE, NORTH CAROLINA, 28801

Kenneth D. Hadley
DIRECTOR
NATIONAL CLIMATIC DATA CENTER

noaa
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL ENVIRONMENTAL SATELLITE, DATA AND INFORMATION SERVICE
NATIONAL CLIMATIC DATA CENTER ASHEVILLE NORTH CAROLINA

METEOROLOGICAL DATA FOR 1993

CHICAGO, OHARE INTERNATIONAL AIRPORT, ILLINOIS

LATITUDE: 42°00' N LONGITUDE: 87°53' W ELEVATION: FT. GRND 658 BARO 697 TIME ZONE: CENTRAL WBAN: 94846

	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	YEAR
TEMPERATURE °F:													
Averages													
-Daily Maximum	33.4	31.6	41.4	54.1	71.6	76.7	83.5	82.5	67.8	60.3	46.8	36.0	57.2
-Daily Minimum	19.0	16.9	26.9	35.9	47.8	56.0	65.1	64.0	50.6	38.6	30.6	23.6	39.6
-Monthly	26.2	24.4	34.2	45.0	59.7	66.4	74.3	73.3	59.2	49.5	38.7	29.8	48.4
-Monthly Dewpt.	21.0	18.2	27.8	36.0	47.6	58.6	65.8	65.1	52.3	39.8	31.3	22.7	40.5
Extremes													
-Highest	47	52	66	75	87	91	91	94	80	81	65	51	94
-Date	4	4	30	24	10	17	18	27	12	7	13	10	AUG 27
-Lowest	5	-5	7	21	36	37	58	52	31	25	16	3	-5
-Date	19	24	14	4	19	1	30	5	30	31	7	30	FEB 24
DEGREE DAYS BASE 65 °F:													
Heating	1156	1123	948	595	184	65	0	3	185	479	784	1084	6660
Cooling	0	0	0	0	28	118	294	266	19	5	0	0	730
% OF POSSIBLE SUNSHINE	37	41	29	51	58	58	72	65	52	73	51	39	54
AVG. SKY COVER (tenths)													
Sunrise - Sunset:	7.5	7.4	7.7	7.5	7.1	6.7	7.4	6.5	7.2	5.1	7.9	8.4	7.2
Midnight - Midnight	7.3	7.1	7.6	7.2	6.7	6.7	6.9	5.9	6.8	4.9	7.3	7.9	6.9
NUMBER OF DAYS:													
Sunrise to Sunset:													
-Clear	6	4	4	4	2	5	2	3	3	14	3	2	52
-Partly Cloudy	5	7	6	7	14	12	11	17	10	4	8	5	106
-Cloudy	20	17	21	19	15	13	18	11	17	13	19	24	207
Precipitation .01 inches or more	13	8	17	15	10	14	8	9	12	6	10	14	136
Snow, Ice pellets, hail 1.0 inches or more	5	4	6	1	0	0	0	0	0	0	0	0	16
Thunderstorms	0	0	0	4	2	13	3	6	1	0	0	0	29
Heavy Fog, visibility 1/4 mile or less	1	0	5	1	1	0	0	2	0	1	0	0	11
Temperature °F													
-Maximum													
90° and above	0	0	0	0	0	1	5	5	0	0	0	0	11
32° and below	15	16	6	0	0	0	0	0	0	0	2	10	49
-Minimum													
32° and below	29	27	20	9	0	0	0	0	1	8	17	21	132
0° and below	0	4	0	0	0	0	0	0	0	0	0	0	4
AVG. STATION PRESS. (mb)	997.3	996.4	993.9	989.2	990.5	990.9	990.9	992.6	992.2	992.4	993.9	992.6	992.7
RELATIVE HUMIDITY (%)													
Hour 00	82	83	84	80	77	86	86	88	88	78	80	77	82
Hour 06 (Local Time)	83	84	87	82	80	89	89	92	91	84	82	81	85
Hour 12	71	65	71	61	54	65	63	62	64	56	66	68	64
Hour 18	77	75	76	64	59	66	66	71	73	64	74	71	70
PRECIPITATION (inches):													
Water Equivalent													
-Total	3.83	0.82	4.52	4.57	1.83	9.96	4.65	5.74	4.47	2.19	1.52	1.00	44.90
-Greatest (24 hrs)	1.28	0.43	1.70	1.78	0.56	1.96	2.90	1.87	1.69	0.98	0.63	0.47	2.90
-Date	3- 4	20-21	30-31	14-15	30-31	18-19	18	15	13-14	20	25-26	17-18	JUL 18
Snow, Ice pellets, hail													
-Total	15.2	8.0	13.8	3.7	0.0	0.0	0.0	0.0	0.0	T	0.2	1.2	42.1
-Greatest (24 hrs)	6.5	4.6	4.4	3.7	0.0	0.0	0.0	0.0	0.0	T	0.1	0.7	6.5
-Date	9-10	20-21	21-22	1						31	26	24-25	JAN 9-10
WIND:													
Resultant													
-Direction (!!!)	269	334	002	032	178	217	205	222	259	255	220	255	254
-Speed (mph)	3.5	3.1	3.3	2.2	1.5	1.7	3.3	2.0	2.2	4.4	4.7	3.5	1.7
Average Speed (mph)	12.2	11.5	11.8	12.3	10.5	10.5	9.9	8.9	10.0	11.6	12.0	10.8	11.0
Fastest Obs. 1 Min													
-Direction (!!!)	26	02	04	03	03	19	19	17	18	21	22	29	17
-Speed (mph)	30	25	31	30	28	30	30	32	25	29	26	24	32
-Date	31	1	31	1	12	8	5	9	30	28	13	29	AUG 9
Peak Gust													
-Direction (!!!)	W	N	S	SW	NE	S	S	NW	S	SW	SW	W	S
-Speed (mph)	40	37	39	44	40	55	40	40	45	41	45	35	55
-Date	31	1	15	24	12	8	5	23	13	28	13	29	JUN 8

(!!!) See Reference Notes on Page 63

NORMALS, MEANS, AND EXTREMES

CHICAGO, OHARE INTERNATIONAL AIRPORT, ILLINOIS

LATITUDE: 42°00'N LONGITUDE: 87°53'W ELEVATION: FT. GRND 658 BARO 697 TIME ZONE: CENTRAL WBAN: 94846

	(a)	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	YEAR
TEMPERATURE °F:														
Normals														
-Daily Maximum		29.2	33.9	44.3	58.8	70.0	79.4	83.3	82.1	75.5	64.1	48.2	35.0	58.7
-Daily Minimum		13.6	18.1	27.6	38.8	48.1	57.7	62.7	61.7	53.9	42.9	31.4	20.3	39.7
-Monthly		21.4	26.0	36.0	48.8	59.1	68.6	73.0	71.9	64.7	53.5	39.8	27.7	49.2
Extremes														
-Record Highest	35	65	71	88	91	93	104	102	101	99	91	78	71	104
-Year		1985	1976	1986	1990	1977	1988	1988	1991	1985	1953	1978	1982	JUN 1988
-Record Lowest	35	-27	-17	-8	7	24	36	40	41	28	17	1	-25	-27
-Year		1985	1967	1962	1992	1966	1972	1965	1965	1974	1981	1976	1983	JAN 1985
NORMAL DEGREE DAYS:														
Heating (base 65°F)		1352	1092	899	496	224	38	0	9	75	368	756	1156	6455
Cooling (base 65°F)		0	0	0	0	41	146	252	223	66	12	0	0	740
% OF POSSIBLE SUNSHINE	13	46	47	50	50	57	67	65	63	58	56	39	44	54
MEAN SKY COVER (tenths)														
Sunrise - Sunset	35	6.9	6.9	7.2	6.9	6.2	5.9	5.7	5.7	5.8	6.0	7.3	7.2	6.5
MEAN NUMBER OF DAYS:														
Sunrise to Sunset														
-Clear	35	7.0	5.8	4.9	6.1	7.2	7.2	8.2	8.9	8.6	8.7	5.3	5.9	83.8
-Partly Cloudy	35	6.2	6.5	8.3	7.6	9.9	11.5	12.3	11.5	9.7	8.8	6.4	6.2	105.0
-Cloudy	35	17.8	15.9	17.7	16.3	13.9	11.2	10.5	10.7	11.6	13.5	18.3	18.9	176.4
Precipitation .01 inches or more	35	11.0	9.4	12.5	12.6	10.8	9.8	9.9	9.3	9.6	9.4	10.8	11.3	126.3
Snow, Ice pellets, hail 1.0 inches or more	35	3.3	2.6	2.1	0.4	0.0	0.0	0.0	0.0	0.0	0.1	0.6	2.4	11.5
Thunderstorms	35	0.3	0.4	2.1	4.0	4.9	6.4	6.0	5.8	4.6	1.8	1.1	0.6	37.9
Heavy Fog Visibility 1/4 mile or less	35	1.5	1.8	2.2	0.9	1.2	0.6	0.5	0.7	0.5	0.9	1.3	1.9	13.9
Temperature °F														
-Maximum														
90° and above	35	0.0	0.0	0.0	0.1	0.7	3.7	6.5	4.4	1.7	0.1	0.0	0.0	17.2
32° and below	35	17.7	12.7	4.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	2.0	11.6	48.3
-Minimum														
32° and below	35	28.7	25.3	21.3	7.7	0.9	0.0	0.0	0.0	0.2	5.2	16.7	26.5	132.4
0° and below	35	6.5	3.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.6	12.4
AVG. STATION PRESS. (mb)	21	993.5	993.9	991.2	990.4	990.4	990.3	991.6	992.8	993.3	993.4	992.5	993.5	992.2
RELATIVE HUMIDITY (%)														
Hour 00	35	76	76	76	72	74	75	79	81	81	77	77	78	77
Hour 06 (Local Time)	35	77	78	79	77	77	78	82	86	85	82	81	80	80
Hour 12	35	67	65	61	55	54	55	57	57	57	56	64	70	60
Hour 18	35	72	70	65	58	54	55	58	62	63	64	71	72	64
PRECIPITATION (inches):														
Water Equivalent														
-Normal		1.60	1.31	2.59	3.66	3.15	4.08	3.63	3.53	3.35	2.28	2.06	2.10	33.34
-Maximum Monthly	35	4.11	3.46	5.91	7.69	7.14	9.96	8.33	17.10	11.44	7.36	8.22	8.55	17.10
-Year		1965	1985	1976	1983	1970	1993	1992	1987	1961	1993	1985	1982	AUG 1987
-Minimum Monthly	35	0.10	0.12	0.63	0.97	0.30	0.95	1.18	0.51	0.02	0.16	0.65	0.23	0.02
-Year		1981	1969	1981	1971	1992	1991	1977	1959	1979	1964	1976	1962	SEP 1979
-Maximum in 24 hrs	35	2.00	1.90	2.39	2.78	3.45	3.09	2.90	9.35	3.00	4.62	2.99	4.53	9.35
-Year		1960	1965	1985	1983	1981	1967	1993	1987	1978	1969	1990	1982	AUG 1987
Snow, Ice pellets, hail														
-Maximum Monthly	35	34.3	21.5	23.7	11.1	1.6	T	T	T	T	6.6	10.4	35.3	35.3
-Year		1979	1967	1965	1975	1966	1992	1992	1939	1967	1967	1959	1978	DEC 1978
-Maximum in 24 hrs	35	18.1	9.7	10.6	10.9	1.6	T	T	T	T	6.6	5.8	11.0	18.1
-Year		1967	1990	1970	1975	1966	1992	1992	1939	1967	1967	1975	1969	JAN 1967
WIND:														
Mean Speed (mph)	35	11.7	11.5	12.0	12.0	10.5	9.3	8.3	8.2	8.9	10.0	11.1	11.0	10.4
Prevailing Direction														
Fastest Obs. 1 Min.														
-Direction (!!!)	35	28	25	01	24	34	24	36	32	23	20	23	25	23
-Speed (MPH)	35	47	45	54	54	52	41	55	46	58	48	51	46	55
-Year		1971	1967	1964	1965	1962	1970	1980	1960	1959	1971	1958	1970	SEP 1959
Peak Gust														
-Direction (!!!)	9	W	N	SW	S	S	S	W	W	N	SW	SW	SW	SW
-Speed (mph)	9	58	54	64	69	55	63	54	64	58	49	51	53	84
-Date		1989	1990	1991	1964	1988	1990	1992	1987	1989	1990	1991	1992	MAR 1991

(!!!) See Reference Notes on Page 5B.

PRECIPITATION (inches)

CHICAGO, OHARE INTERNATIONAL AIRPORT, ILLINOIS

YEAR	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL
1964	0.72	0.52	3.45	5.22	2.26	2.96	4.23	1.95	3.96	0.16	2.90	1.51	29.74
1965	4.11	1.18	3.06	3.49	2.36	3.44	3.66	6.40	5.03	1.57	1.47	3.32	39.08
1966	1.09	1.73	2.64	6.28	4.77	2.95	2.19	1.00	0.55	2.16	4.74	1.88	32.00
1967	2.22	1.82	2.30	3.97	1.61	7.94	1.87	2.60	2.45	3.89	2.19	2.41	35.27
1968	1.77	0.87	0.90	2.31	2.99	4.15	2.03	5.32	3.88	1.04	3.70	2.77	31.73
1969	1.62	0.12	1.93	4.02	3.17	7.76	3.43	0.51	3.01	6.55	1.11	1.18	34.41
1970	0.82	0.59	2.12	4.29	7.14	7.14	4.08	1.50	8.69	3.48	2.78	1.77	43.40
1971	0.93	1.94	1.54	0.97	2.23	2.62	3.57	3.97	2.39	0.72	1.32	5.37	27.57
1972	1.01	0.73	3.45	4.77	3.02	3.55	4.97	6.97	8.14	2.92	3.05	2.89	45.47
1973	1.24	1.38	3.91	4.99	3.69	2.87	5.27	0.67	6.01	2.86	1.50	3.71	38.10
1974	3.29	2.11	2.40	4.27	5.09	4.69	2.96	2.60	1.47	1.88	2.47	2.12	35.35
1975	3.69	2.48	2.02	5.50	3.02	5.07	2.19	7.37	0.80	1.90	2.53	3.05	39.62
1976	0.85	1.67	5.91	4.05	4.03	2.93	1.44	1.29	1.49	1.41	0.65	0.54	26.56
1977	0.55	0.71	3.67	2.62	1.88	5.12	1.19	5.39	6.07	1.36	2.05	1.96	32.56
1978	1.48	0.43	1.16	3.94	2.80	6.36	4.61	1.96	6.88	1.08	2.24	4.41	37.35
1979	2.81	1.02	4.49	4.92	2.58	4.63	2.19	7.57	0.02	1.49	2.80	2.58	37.10
1980	1.04	1.24	1.96	3.41	3.22	3.42	3.56	8.54	5.65	2.09	1.10	3.43	38.66
1981	0.10	2.35	0.63	6.14	5.85	4.46	4.50	6.60	3.25	1.80	2.46	1.05	39.19
1982	2.90	0.41	4.15	2.78	2.08	1.56	8.33	3.93	1.15	1.88	6.95	8.56	44.68
1983	0.66	2.06	3.56	7.69	6.26	4.11	4.25	2.08	5.41	4.41	5.87	2.99	49.35
1984	1.15	1.39	3.00	4.11	4.49	2.02	3.19	2.10	3.84	3.15	2.64	2.92	34.00
1985	1.48	3.46	4.73	1.48	2.79	1.97	3.75	3.90	1.82	4.98	8.22	1.49	40.07
1986	0.39	2.58	1.49	1.85	3.11	3.49	4.30	1.15	7.12	3.75	1.41	1.09	31.73
1987	1.67	0.99	1.59	2.34	2.21	2.19	4.19	17.10	0.94	1.59	2.77	3.77	41.35
1988	1.88	1.29	2.15	2.08	1.19	1.05	2.74	3.29	3.79	5.05	6.45	2.40	33.35
1989	0.82	0.77	1.67	1.37	1.59	2.01	5.89	7.31	3.91	1.49	2.16	0.46	29.45
1990	1.97	2.25	3.09	1.79	6.85	4.50	2.25	7.75	1.03	4.10	5.60	1.94	43.12
1991	1.41	0.62	3.54	4.00	5.20	0.95	1.32	2.81	2.51	7.36	3.59	1.71	35.02
1992	0.97	1.39	2.67	2.21	0.30	1.35	3.77	3.56	4.31	1.79	5.41	2.49	30.12
1993	3.83	0.82	4.52	4.57	1.83	9.96	4.45	5.74	4.47	2.19	1.52	1.00	44.90
Record Mean	1.62	1.37	2.74	3.58	3.22	3.76	3.68	4.12	3.69	2.54	2.87	2.29	35.49

See Reference Notes on Page 6B.

AVERAGE TEMPERATURE (deg. F)

CHICAGO, OHARE INTERNATIONAL AIRPORT, ILLINOIS

YEAR	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	ANNUAL
1964	27.7	35.5	33.7	49.1	62.7	69.0	72.1	67.7	63.3	48.0	41.4	24.7	48.9
1965	21.4	24.3	26.6	46.6	61.7	64.9	69.4	68.0	63.8	53.2	40.3	35.3	47.9
1966	16.3	26.1	39.6	45.2	53.4	68.5	74.5	69.6	62.5	51.4	42.5	27.1	48.1
1967	27.7	19.8	36.5	48.4	53.8	69.8	68.4	66.2	61.7	52.9	37.3	30.3	47.7
1968	23.8	23.6	42.7	52.3	57.0	70.2	72.0	73.7	65.5	54.7	40.0	27.8	50.3
1969	21.1	29.9	34.4	50.8	60.4	64.3	73.0	73.9	65.3	51.8	38.3	28.0	49.3
1970	16.3	26.1	34.8	51.7	61.9	69.4	74.7	72.9	65.2	55.4	40.7	30.8	50.0
1971	18.9	28.2	35.0	48.6	57.2	73.5	71.5	72.0	69.7	61.7	41.7	34.2	51.0
1972	19.6	23.6	34.0	44.8	61.0	65.7	73.6	73.8	63.5	49.3	37.7	23.9	47.5
1973	28.2	28.7	44.0	48.1	54.8	71.1	74.7	74.6	66.0	57.9	41.9	28.1	51.5
1974	24.8	27.4	38.6	52.3	56.8	65.5	73.6	70.0	60.5	52.8	40.6	30.2	49.4
1975	27.3	26.2	34.1	43.3	62.3	70.5	75.5	76.3	61.4	55.8	47.2	31.5	50.9
1976	19.9	35.2	42.8	52.3	55.9	70.1	74.0	70.6	62.7	48.3	32.4	19.4	49.6
1977	10.7	26.9	44.9	55.0	67.2	69.3	77.5	71.9	66.0	51.5	40.0	24.2	50.4
1978	15.7	16.8	31.9	47.5	58.3	67.6	72.0	72.4	68.8	51.4	40.8	25.8	47.4
1979	12.5	16.2	36.4	45.5	59.3	69.2	72.0	71.0	66.1	53.3	40.6	33.7	48.0
1980	23.4	21.5	32.6	46.3	59.7	65.3	75.7	75.7	66.0	48.4	39.9	28.0	48.6
1981	22.6	28.0	37.6	51.8	55.3	69.8	72.5	71.2	61.7	49.1	40.8	24.9	48.8
1982	12.2	21.5	35.1	44.5	64.3	62.1	74.1	68.8	62.1	53.2	39.1	36.0	47.8
1983	26.3	30.5	37.4	43.4	53.2	69.7	75.7	77.3	64.6	52.8	41.1	14.3	49.0
1984	17.1	33.9	29.5	45.8	55.5	70.3	70.3	72.8	61.1	54.7	37.9	31.0	48.3
1985	14.4	20.4	39.4	52.6	60.2	63.6	71.4	69.2	65.4	52.5	37.8	17.0	47.0
1986	22.8	24.0	40.4	51.5	59.5	66.3	74.9	68.5	66.8	53.7	36.0	30.6	49.5
1987	25.9	33.9	40.8	50.6	63.4	72.4	76.7	71.9	65.1	47.3	43.9	32.2	52.0
1988	19.8	22.7	38.1	46.2	61.0	71.7	76.8	76.8	65.9	46.1	41.7	27.7	49.7
1989	32.4	19.6	36.5	46.8	57.8	67.5	73.9	71.4	62.0	54.0	37.7	17.4	48.1
1990	33.9	31.3	41.3	49.9	56.2	69.6	71.7	71.9	65.9	51.6	44.7	28.6	51.4
1991	20.8	31.0	40.4	52.0	65.6	71.9	75.5	73.6	63.7	53.2	35.2	30.3	51.1
1992	28.1	33.3	37.5	46.1	56.9	64.9	69.3	67.0	62.7	50.4	38.3	28.6	48.6
1993	26.2	24.4	34.2	45.0	59.7	65.4	74.3	73.3	59.2	49.5	38.7	29.8	48.4
Record Mean	21.4	25.8	36.6	48.5	59.2	68.3	73.2	71.8	64.3	52.5	39.8	27.0	49.0
Max	29.3	33.7	45.2	58.5	70.3	79.5	83.6	82.0	74.7	63.0	48.0	34.4	58.5
Min	13.5	17.9	28.0	38.5	48.0	57.2	62.7	61.7	53.9	42.1	31.5	19.5	39.5

See Reference Notes on Page 6B.

SNOWFALL (inches)

CHICAGO, OHARE INTERNATIONAL AIRPORT, ILLINOIS

SEASON	JULY	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	TOTAL
1964-65	0.0	0.0	0.0	0.0	2.3	11.1	11.7	11.5	24.7	T	0.0	0.0	61.3
1965-66	0.0	0.0	0.0	T	0.2	6.6	15.5	4.3	0.7	T	1.6	0.0	28.9
1966-67	0.0	0.0	0.0	T	0.5	8.4	25.1	21.5	8.8	3.4	T	0.0	67.7
1967-68	0.0	0.0	T	6.5	2.4	2.9	10.4	3.8	1.5	0.1	0.0	0.0	27.7
1968-69	0.0	0.0	0.0	0.0	0.7	10.9	3.7	2.3	4.7	0.0	T	0.0	22.3
1969-70	0.0	0.0	0.0	0.0	2.0	19.3	9.5	6.3	11.8	7.2	0.0	0.0	56.1
1970-71	0.0	0.0	0.0	0.0	0.2	2.7	10.0	1.4	8.0	0.8	T	0.0	23.1
1971-72	0.0	0.0	0.0	0.0	1.3	0.2	7.6	7.7	16.8	3.3	0.0	0.0	36.9
1972-73	0.0	0.0	0.0	0.1	0.9	11.2	0.5	9.3	3.4	0.2	T	0.0	25.6
1973-74	0.0	0.0	0.0	0.0	T	18.2	7.4	9.6	1.4	T	0.0	0.0	37.2
1974-75	0.0	0.0	0.0	0.0	1.0	9.4	3.5	8.2	4.5	11.1	0.0	0.0	37.7
1975-76	0.0	0.0	0.0	0.0	6.4	6.8	10.0	1.6	1.9	0.8	T	0.0	27.5
1976-77	0.0	0.0	0.0	1.6	0.5	6.5	7.2	4.0	4.9	T	0.0	0.0	24.7
1977-78	0.0	0.0	0.0	0.0	5.2	12.7	21.9	7.9	4.5	0.2	0.0	0.0	52.4
1978-79	0.0	0.0	0.0	0.0	5.2	35.3	34.3	6.8	2.0	0.1	0.0	0.0	83.7
1979-80	0.0	0.0	0.0	0.0	4.0	0.9	6.2	14.7	11.6	4.2	0.0	0.0	41.6
1980-81	0.0	0.0	0.0	T	5.1	9.7	2.0	15.9	2.3	0.0	0.0	0.0	35.0
1981-82	0.0	0.0	0.0	T	3.6	4.9	21.1	4.8	14.3	10.6	0.0	0.0	59.3
1982-83	0.0	0.0	0.0	0.0	0.4	2.1	5.0	8.9	9.0	1.2	0.0	0.0	26.6
1983-84	0.0	0.0	0.0	0.0	1.0	16.5	17.2	1.9	9.7	2.7	0.0	0.0	49.0
1984-85	0.0	0.0	0.0	0.0	T	5.6	18.9	13.3	0.3	T	0.0	0.0	39.1
1985-86	0.0	0.0	0.0	0.0	1.1	5.2	6.9	10.9	4.1	0.8	0.0	0.0	29.0
1986-87	0.0	0.0	0.0	T	3.8	0.4	17.3	T	4.7	T	0.0	0.0	26.2
1987-88	0.0	0.0	0.0	0.1	1.0	18.7	5.4	15.5	1.9	T	0.0	0.0	42.6
1988-89	0.0	0.0	0.0	T	0.9	5.0	0.4	15.1	2.0	0.6	0.5	0.0	24.5
1989-90	0.0	T	0.0	5.3	3.9	5.4	3.2	13.6	1.3	0.1	T	0.0	33.8
1990-91	0.0	0.0	0.0	T	T	3.2	11.1	3.3	5.9	T	0.0	0.0	23.5
1991-92	0.0	0.0	0.0	T	1.2	7.6	5.6	1.3	11.6	1.1	0.0	T	28.4
1992-93	T	0.0	0.0	0.3	0.2	5.7	15.2	8.0	13.8	3.7	0.0	0.0	46.9
1993-94	0.0	0.0	0.0	T	0.2	1.2							
Record Mean	T	T	T	0.4	1.9	8.3	10.7	8.1	7.0	1.7	0.1	T	38.2

See Reference Notes on Page 68.

REFERENCE NOTES

CHICAGO, OHARE INTERNATIONAL AIRPORT, ILLINOIS

GENERAL
T - TRACE AMOUNT.
BLANK ENTRIES DENOTE MISSING/UNREPORTED DATA.
# INDICATES A STATION OR INSTRUMENT RELOCATION.
SEE STATION LOCATION TABLE ON PAGE 8.

SPECIFIC
PAGE 2
PM - INCLUDES LAST DAY OF PREVIOUS MONTH.
ASOS - AUTOMATED SURFACE OBSERVING SYSTEM IN OPERATION DURING THESE MONTHS.

PAGE 3
(#) - LENGTH OF RECORD IN YEARS. ALTHOUGH INDIVIDUAL MONTHS MAY BE MISSING.
0.# OR * - THE VALUE IS BETWEEN 0.0 AND 0.05
NORMALS - BASED ON THE 1951-1980 RECORD PERIOD.
EXTREMES - DATES ARE THE MOST RECENT OCCURRENCE.
WIND DIR.- NUMERALS SHOW TENS OF DEGRESS CLOCKWISE FROM TRUE NORTH. "00" INDICATES CALM
RESULTANT DIRECTIONS ARE GIVEN TO WHOLE DEGREES.
BOLD VALUES INDICATE EXTREME VALUES WHICH OCCURRED AFTER THE ASOS SYSTEM WAS COMMISSIONED.

PAGE 48
RECORD = PERIOD OF RECORD
RECORD MEAN PRECIPITATION IS THE MEAN OF ALL DAILY PRECIPITATION AMOUNTS DURING THE PERIOD OF RECORD.
RECORD MAXIMUM TEMPERATURE IS THE MEAN OF ALL DAILY MAXIMUM TEMPERATURES DURING THE PERIOD OF RECORD.
RECORD MEAN TEMPERATURE IS THE SUM OF THE RECORD MAX AND RECORD MIN DIVIDED BY 2.
AVERAGE TEMPERATURE IS THE SUM OF THE MEAN DAILY MAX AND MIN TEMPERATURE DIVIDED BY 2.

EXCEPTIONS

PAGES 48, 49, 64
RECORD MEANS ARE THROUGH THE CURRENT YEAR, BEGINNING IN 1958 FOR TEMPERATURE
1958 FOR PRECIPITATION
1958 FOR SNOWFALL

STATION LOCATION

CHICAGO, ILLINOIS
O'HARE INTERNATIONAL AIRPORT

LOCATION	OCCUPIED FROM	OCCUPIED TO	AIRLINE DISTANCES AND DIRECTIONS FROM PREVIOUS LOCATION	LATITUDE NORTH	LONGITUDE WEST	ELEVATION ABOVE SEA LEVEL: GROUND TEMPERATURE SITE	ELEVATION ABOVE GROUND: WIND INSTRUMENTS	EXTREME THERMOMETERS	PSYCHROMETER	SUNSHINE SWITCH	TIPPING BUCKET RAIN GAGE	WEIGHING RAIN GAGE	8 INCH RAIN GAGE	HYGROTHERMOMETER	AUTOMATIC OBSERVING EQUIPMENT *	REMARKS
CITY OFFICE LOCATIONS FROM 1870-1970 ARE AVAILABLE ON THE 1979 AND PREVIOUS LCD ANNUALS PUBLISHED FOR CHICAGO, MIDWAY AIRPORT.																
UNIVERSITY OF CHICAGO Rosenwald Hall 58th Street and University Avenue	1/01/16	3/31/62		41° 47'	87° 36'	594	131	7	7		3	3	3			Chicago Observatory 1/1/26 through 6/30/42, otherwise climatological observations.
5730 S Woodlawn Avenue	4/01/62	Present	825' NE	41° 47'	87° 36'	594		6				4	3			Climatological observations.
AIRPORT (MIDWAY) National Airtransport Hangar, 5940 South Cicero Avenue	2/13/28	11/03/32		41° 47'	87° 45'	610	54	43	43				41			
South Terminal Building Midway Airport 6200 South Cicero Ave.	11/03/32	1/16/80	5/16 mi. S	41° 47'	87° 45'	e607	b20	c6	c5	x27	a26	a26	26	d4	NA M	Chicago Observatory beginning 7/1/42, ending 1/16/80. a - Added 7/1/42. b - 36 feet to 7/20/49; 38 feet to 4/14/58; 48 feet to 4/24/62. c - 21 feet to 5/15/41. Standby status after 8/1/63. Discontinued 11/25/70. d - Commissioned 5000 feet WNW of station 8/1/63. e - 610 feet to 8/1/63. x - Commissioned 1967. M - Ramos 1/14/80 to Present.
AIRPORT (O'HARE) International Terminal Building	10/30/58	3/7/85	NA	41° 59'	87° 54'	656 f658	65 g20	41 i39 m39	40 i39	NA p63	NA p39	NA h38 i39 k39	36 i38 n39	NA f4 j4	NA	i - HYGR Commissioned 3300' SW of office 12/1/60. g - Effective 12/8/60. h - Commissioned 6/4/62. i - Moved 1200' E 4/12/63. j - Type change 8/24/65. k - Type change 12/5/69. m - Minor adjustment 9/15/71. n - Minor adjustment 7/1/80. p - Installed 7/1/80.
Hardstand Operational Bldg.	3/7/85	01/19/89	3/4 mi.ESE	41° 59'	87° 54'	658	q20	q39 r7	q39 r6	q53 r24	q39 t	q39 r4	q39 r4	q4 u4	NA	Chicago Observatory beginning 1/16/80. q - Instruments not moved 3/7/85. r - Instruments moved 3/11/85. t - Removed 3/11/85. u - Type change 4/7/86.
O'Hare Corporate Tower II, Rosemont, IL	01/19/89	Present	1.2 mi. NE	42° 00'	87° 53'	658	v20	5	5	v24 w90	NA	x4	4	v4	NA	WSO closed and consolidated with WSFO. v - Not moved 01/19/89. w - Moved 08/31/90. x - Shield added 02/07/92.

* Type
M = AMOS
T = AUTOB
S = ASOS
W = AWOS

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NORMALS, MEANS, AND EXTREMES

CHICAGO, OHARE INTERNATIONAL AIRPORT, ILLINOIS

LATITUDE: 42°00'N LONGITUDE: 87°53'W ELEVATION: FT. GRND 684 BARO 697 TIME ZONE: CENTRAL WBAN: 94846

	(a)	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	YEAR
TEMPERATURE °F:														
Normals														
-Daily Maximum		29.2	33.9	44.3	58.8	70.0	79.4	83.3	82.1	75.5	64.1	48.2	35.0	58.7
-Daily Minimum		13.6	18.1	27.6	38.8	48.1	57.7	62.7	61.7	53.9	42.9	31.4	20.3	39.7
-Monthly		21.4	26.0	36.0	48.8	59.1	68.6	73.0	71.9	64.7	53.5	39.8	27.7	49.2
Extremes														
-Record Highest	33	65	71	88	91	93	104	102	101	99	91	78	71	104
-Year		1989	1976	1986	1980	1977	1988	1988	1991	1995	1963	1979	1982	JUN 1988
-Record Lowest	33	-27	-17	-8	7	24	36	40	41	28	17	1	-25	-27
-Year		1985	1967	1962	1982	1966	1972	1965	1965	1974	1981	1976	1983	JAN 1985
NORMAL DEGREE DAYS:														
Heating (base 65°F)		1352	1092	899	486	224	38	0	9	75	369	756	1156	6455
Cooling (base 65°F)		0	0	0	0	41	146	252	223	66	12	0	0	740
% OF POSSIBLE SUNSHINE	11	48	48	51	51	57	68	67	63	58	53	40	46	54
MEAN SKY COVER (tenths)														
Sunrise - Sunset	33	6.8	6.8	7.2	6.8	6.3	5.9	5.6	5.7	5.8	6.0	7.2	7.1	6.5
MEAN NUMBER OF DAYS:														
Sunrise to Sunset														
-Clear	33	7.1	6.0	4.8	6.2	7.2	7.3	8.6	8.9	8.8	8.4	5.5	6.0	84.8
-Partly Cloudy	33	6.3	6.5	8.5	7.7	9.8	11.5	12.5	11.3	9.7	9.0	6.4	6.3	105.5
-Cloudy	33	17.6	15.8	17.7	16.1	14.1	11.2	9.9	10.8	11.5	13.5	18.0	18.7	174.9
Precipitation .01 inches or more	33	10.9	9.5	12.4	12.4	11.1	9.8	9.8	9.3	9.5	9.5	10.6	11.3	126.1
Snow, Ice pellets, hail 1.0 inches or more	33	3.3	2.6	2.0	0.4	0.0	0.0	0.0	0.0	0.0	0.2	0.7	2.5	11.6
Thunderstorms	33	0.3	0.4	2.1	4.1	5.7	6.3	6.0	5.9	4.7	1.8	1.2	0.6	38.3
Heavy Fog Visibility 1/4 mile or less	33	1.5	1.8	2.1	0.9	1.2	0.6	0.5	0.7	0.5	0.9	1.3	2.0	14.0
Temperature °F														
-Maximum														
90° and above	33	0.0	0.0	0.0	0.1	0.8	3.8	6.7	4.5	1.8	0.1	0.0	0.0	17.7
32° and below	33	18.1	12.9	4.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	2.1	11.7	49.0
-Minimum														
32° and below	33	28.8	25.3	21.3	7.6	0.8	0.0	0.0	0.0	0.2	5.1	16.7	25.6	132.5
0° and below	33	6.8	3.1	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.8	12.9
AVG. STATION PRESS. (mb)	19	993.4	993.9	991.1	990.4	990.1	990.3	991.7	992.7	993.3	993.5	992.5	993.5	992.2
RELATIVE HUMIDITY (%)														
Hour 00 (Local Time)	33	75	76	76	72	74	75	79	81	81	76	77	78	77
Hour 06 (Local Time)	33	77	78	79	77	77	78	82	85	85	82	81	80	80
Hour 12 (Local Time)	33	67	65	61	55	54	55	55	57	57	56	64	70	60
Hour 18 (Local Time)	33	72	69	65	57	54	55	58	61	63	64	70	71	63
PRECIPITATION (inches):														
Water Equivalent														
-Normal		1.60	1.31	2.59	3.66	3.15	4.08	3.63	3.53	3.35	2.28	2.06	2.10	32.34
-Maximum Monthly	33	4.11	3.46	5.91	7.69	7.14	7.94	8.33	17.10	11.44	7.36	8.22	8.56	17.10
-Year		1965	1985	1976	1983	1970	1967	1982	1987	1961	1991	1985	1982	AUG 1987
-Minimum Monthly	33	0.10	0.12	0.63	0.97	1.19	0.95	1.18	0.51	0.02	0.16	0.65	0.23	0.02
-Year		1981	1969	1981	1971	1988	1991	1977	1969	1979	1964	1976	1962	SEP 1979
-Maximum in 24 hrs	33	2.00	1.90	2.39	2.78	3.45	3.09	2.89	9.35	3.00	4.62	2.99	4.53	9.35
-Year		1960	1985	1985	1983	1981	1957	1962	1987	1978	1969	1990	1982	AUG 1987
Snow, Ice pellets, hail														
-Maximum Monthly	33	34.3	21.5	24.7	11.1	1.6	0.0	0.0	T	T	6.6	10.4	35.3	35.3
-Year		1979	1967	1965	1975	1966			1989	1967	1967	1959	1978	DEC 1979
-Maximum in 24 hrs	33	18.1	9.7	10.6	10.9	1.6	0.0	0.0	T	T	6.6	5.6	11.0	18.1
-Year		1967	1990	1970	1975	1966			1989	1967	1967	1975	1969	JAN 1967
WIND:														
Mean Speed (mph)	33	11.7	11.5	12.0	12.0	10.6	9.3	8.2	8.2	8.8	10.0	11.1	11.0	10.4
Prevailing Direction														
Fastest Obs. 1 Min.														
-Direction (!!!)	33	28	25	01	24	34	24	36	32	23	20	23	26	23
-Speed (MPH)	33	47	45	54	54	52	41	55	46	58	49	51	46	58
-Year		1971	1967	1964	1965	1962	1970	1980	1960	1959	1977	1958	1970	SEP 1959
Peak Gust														
-Direction (!!!)	7	W	N	SW	S	S	S	NE	W	N	SW	SW	W	SW
-Speed (mph)	7	58	54	84	69	55	63	54	64	58	49	51	52	84
-Date		1989	1990	1991	1984	1988	1990	1984	1987	1989	1990	1991	1984	MAR 1991

(!!!) See Reference Notes on Page 6B.

METEOROLOGICAL DATA FOR 1991

CHICAGO, OHARE INTERNATIONAL AIRPORT, ILLINOIS

LATITUDE: 42°00' N LONGITUDE: 87°53' W ELEVATION: FT. GRND 684 BARO 697 TIME ZONE: CENTRAL WBAN: 94846

	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	YEAR
TEMPERATURE °F:													
Averages													
-Daily Maximum	28.4	39.0	50.0	61.5	76.0	83.7	87.2	84.4	74.9	63.0	44.1	38.0	60.8
-Daily Minimum	13.1	23.0	30.7	42.5	55.1	60.1	63.7	62.6	52.6	43.4	26.2	22.5	41.3
-Monthly	20.8	31.0	40.4	52.0	65.6	71.9	75.5	73.6	63.7	53.2	35.2	30.3	51.1
-Monthly Dewpt.	15.0	22.5	31.2	40.2	55.4	58.9	60.5	59.7	50.7	42.9	28.1	25.0	40.8
Extremes													
-Highest	44	58	75	83	91	96	101	101	94	80	70	60	101
-Date	19	21	26	6	29	29	22	2	9	2	19	12	AUG 2
-Lowest	-3	1	19	26	40	50	53	53	34	29	3	3	-3
-Date	22	16	8	2	3	6	26	21	27	16	26	4	JAN 22
DEGREE DAYS BASE 65 °F:													
Heating	1365	945	756	393	142	13	0	0	163	367	897	1066	6097
Cooling	0	0	0	11	167	326	334	273	132	10	0	0	1253
% OF POSSIBLE SUNSHINE	41	60	54	48	38	65	62	42	55	44	40	51	50
AVG. SKY COVER (tenths)													
Sunrise - Sunset	6.9	6.9	7.1	7.1	6.8	5.1	5.4	5.7	6.0	6.8	7.8	6.6	6.5
Midnight - Midnight	6.7	6.3	6.6	6.9	6.6	4.9	4.9	5.3	5.7	6.6	7.5	6.5	6.2
NUMBER OF DAYS:													
Sunrise to Sunset													
-Clear	7	5	6	7	5	9	7	9	7	5	3	8	78
-Partly Cloudy	7	9	8	6	11	14	18	11	13	10	9	7	120
-Cloudy	17	14	17	17	15	7	6	11	10	16	19	16	165
Precipitation .01 inches or more	9	5	13	10	13	3	6	7	11	17	14	8	115
Snow, Ice pellets, hail 1.0 inches or more	3	1	1	0	0	0	0	0	0	0	0	1	6
Thunderstorms	0	0	4	5	8	2	3	5	6	4	2	1	40
Heavy Fog, visibility 1/4 mile or less	5	4	0	1	0	1	0	1	1	0	1	0	14
Temperature °F													
-Maximum													
90° and above	0	0	0	0	1	6	12	7	4	0	0	0	30
32° and below	25	7	1	0	0	0	0	0	0	0	7	8	40
-Minimum													
32° and below	31	24	21	4	0	0	0	0	0	4	19	27	130
0° and below	3	0	0	0	0	0	0	0	0	0	0	0	3
AVG. STATION PRESS. (mb)	996.3	993.2	986.8	990.9	992.2	993.2	991.2	993.9	995.3	991.9	994.2	996.3	992.9
RELATIVE HUMIDITY (%)													
Hour 00	77	77	73	71	82	78	77	75	73	76	81	84	77
Hour 06 (Local Time)	82	82	83	79	83	79	75	83	83	82	84	83	82
Hour 12	68	61	52	57	60	50	45	48	50	53	67	72	58
Hour 18	76	68	64	60	65	53	51	54	56	66	74	80	64
PRECIPITATION (inches):													
Water Equivalent													
-Total	1.41	0.62	3.54	4.00	5.20	0.95	1.32	2.81	2.51	7.36	3.59	1.71	35.02
-Greatest (24 hrs)	0.58	0.39	1.06	1.34	1.63	0.55	0.43	1.86	0.81	2.64	0.86	0.55	2.64
-Date	10-11	18	26-27	8-9	24-25	10-11	22	7-8	11-12	3-4	14-15	2-3	OCT 3-4
Snow, Ice pellets, hail													
-Total	11.1	3.3	5.9	T	0.0	0.0	0.0	0.0	0.0	T	1.2	7.6	29.1
-Greatest (24 hrs)	5.8	2.6	5.3	T	0.0	0.0	0.0	0.0	0.0	T	0.8	6.0	6.0
-Date	10-11	13-14	12-13	12						18	23	2-3	DEC 2-3
WIND:													
Resultant													
-Direction (!!!)	272	268	252	121	184	068	249	044	227	218	225	245	242
-Speed (mph)	5.7	4.5	1.7	1.2	1.9	2.2	1.5	2.1	2.4	2.5	5.3	4.8	1.9
Average Speed (mph)	13.2	12.7	15.1	13.4	10.6	9.5	8.3	8.9	9.3	10.9	11.4	11.1	11.2
Fastest Obs. 1 Min.													
-Direction (!!!)	28	34	20	27	26	20	29	02	25	36	24	26	20
-Speed (mph)	30	25	39	35	32	23	25	24	30	26	32	32	39
-Date	23	14	27	23	30	14	22	31	30	4	30	14	MAR 27
Peak Gust													
-Direction (!!!)	W	N	SW	W	N	N	W	SW	W	NW	SW	NW	SW
-Speed (mph)	45	44	84	48	47	35	46	39	46	37	51	44	84
-Date	23	14	27	23	30	14	22	8	15	6	30	14	MAR 27

(!!!) See Reference Notes on Page 68

METEOROLOGICAL DATA FOR 1992

CHICAGO, OHARE INTERNATIONAL AIRPORT, ILLINOIS

LATITUDE: 42°00' N LONGITUDE: 87°53' W ELEVATION: FT. GRND 658 BARO 697 TIME ZONE: CENTRAL WBAN: 94846

	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	YEAR
TEMPERATURE °F:													
Averages													
-Daily Maximum	34.5	39.6	46.4	55.0	70.2	77.5	78.3	77.3	72.7	60.6	49.7	35.2	57.6
-Daily Minimum	21.7	27.0	29.5	37.2	43.5	52.2	60.3	56.7	52.7	40.0	32.8	21.9	39.5
-Monthly	28.1	33.3	37.5	46.1	56.9	64.9	69.3	67.0	62.7	50.4	39.3	28.6	48.6
-Monthly Dewpt.	24.3	28.1	30.0	36.2	42.1	50.5	61.1	57.2	53.6	40.9	33.0	23.2	40.0
Extremes													
-Highest	45	59	71	71	88	91	91	93	85	82	63	56	93
-Date	11	3	1	20	16	14	1	5	15	3	20	15	AUG 5
-Lowest	-12	6	11	24	30	38	51	49	36	21	20	-3	-12
-Date	16	9	11	3	6	21	6	21	29	19	14	24	JAN 16
DEGREE DAYS BASE 65 °F:													
Heating	1137	913	847	560	284	77	9	37	136	449	795	1122	6366
Cooling	0	0	0	1	40	79	152	105	75	4	0	0	457
% OF POSSIBLE SUNSHINE	33	40	51	37	55	60	38	65	65	70	20	27	48
AVG. SKY COVER (tenths)													
Sunrise - Sunset	7.9	7.9	6.5	6.2	4.3	5.8	8.0	4.6	5.4	5.2	9.0	7.9	6.7
Midnight - Midnight	7.6	7.7	6.3	7.8	3.7	5.3	7.4	4.0	5.1	5.1	8.8	7.5	6.4
NUMBER OF DAYS:													
Sunrise to Sunset													
-Clear	4	3	8	2	14	8	1	14	10	11	2	4	81
-Partly Cloudy	5	7	7	6	9	13	8	10	10	7	2	5	88
-Cloudy	22	19	16	22	5	9	22	7	10	13	26	22	197
Precipitation .01 inches or more	11	9	14	16	2	5	15	9	12	8	17	7	125
Snow, Ice pellets, hail 1.0 inches or more	2	0	2	T	0	0	0	0	0	0	0	2	7
Thunderstorms	0	1	7	2	1	2	7	2	6	4	0	0	32
Heavy Fog, visibility 1/4 mile or less	1	3	4	3	0	0	1	0	0	0	1	2	15
Temperature °F													
-Maximum													
90° and above	0	0	0	0	0	2	2	2	0	0	0	0	6
32° and below	6	3	2	1	0	0	0	0	0	0	0	10	24
-Minimum													
32° and below	26	23	22	7	3	0	0	0	0	5	15	28	129
0° and below	4	0	0	0	0	0	0	0	0	0	0	1	5
AVG. STATION PRESS. (mb)	992.2	992.6	991.2	991.7	994.9	999.8	990.0	994.9	994.2	993.6	992.2	994.9	992.6
RELATIVE HUMIDITY (%)													
Hour 00	85	86	82	74	71	75	83	84	83	80	85	81	81
Hour 06	91	88	83	79	76	78	86	90	88	84	86	84	84
Hour 12 (Local Time)	77	75	68	61	44	46	66	57	58	55	75	73	63
Hour 18	84	80	70	66	46	53	69	61	63	65	80	79	68
PRECIPITATION (inches):													
Water Equivalent													
-Total	0.87	1.39	2.67	2.21	0.30	1.35	3.77	3.56	4.31	1.79	5.41	2.49	30.12
-Greatest (24 hrs)	0.23	0.59	0.96	0.78	0.28	1.22	0.91	0.60	1.25	1.22	1.82	0.92	1.82
-Date	8	14-15	21-22	15-16	23	17-18	13-14	26-27	15	14-15	1-2	30	NOV 1-2
Snow, Ice pellets, hail													
-Total	5.6	1.3	11.6	1.1	0.0	T	T	0.0	0.0	0.3	0.2	5.7	25.8
-Greatest (24 hrs)	2.6	0.7	8.8	1.1	0.0	T	T	0.0	0.0	0.3	0.2	5.0	8.8
-Date	25	24	21-22	1		17	18			20	13	9-10	MAR 21-22
WIND:													
Resultant													
-Direction (!!!)	255	313	003	061	050	056	295	284	207	246	247	236	256
-Speed (mph)	4.6	2.1	2.6	1.4	2.6	3.1	0.8	1.7	4.1	1.9	2.0	5.6	1.0
Average Speed (mph)	11.2	10.4	10.7	10.4	10.0	8.5	8.9	9.3	9.5	10.0	12.0	11.7	10.2
Fastest Obs. 1 Min.													
-Direction (!!!)	33	02	35	18	21	25	25	28	31	06	24	20	25
-Speed (mph)	28	26	28	24	31	37	41	26	21	25	28	37	41
-Date	15	28	10	19	1	17	2	25	18	4	21	15	JUL 2
Peak Gust													
-Direction (!!!)	NW	NE	NW	S	SW	W	W	W	NW	SW	SW	SW	W
-Speed (mph)	39	39	36	38	41	58	54	46	35	35	39	53	58
-Date	14	28	27	19	1	17	2	25	14	8	21	15	JUN 17

(!!!) See Reference Notes on Page 68

METEOROLOGICAL DATA FOR 1993

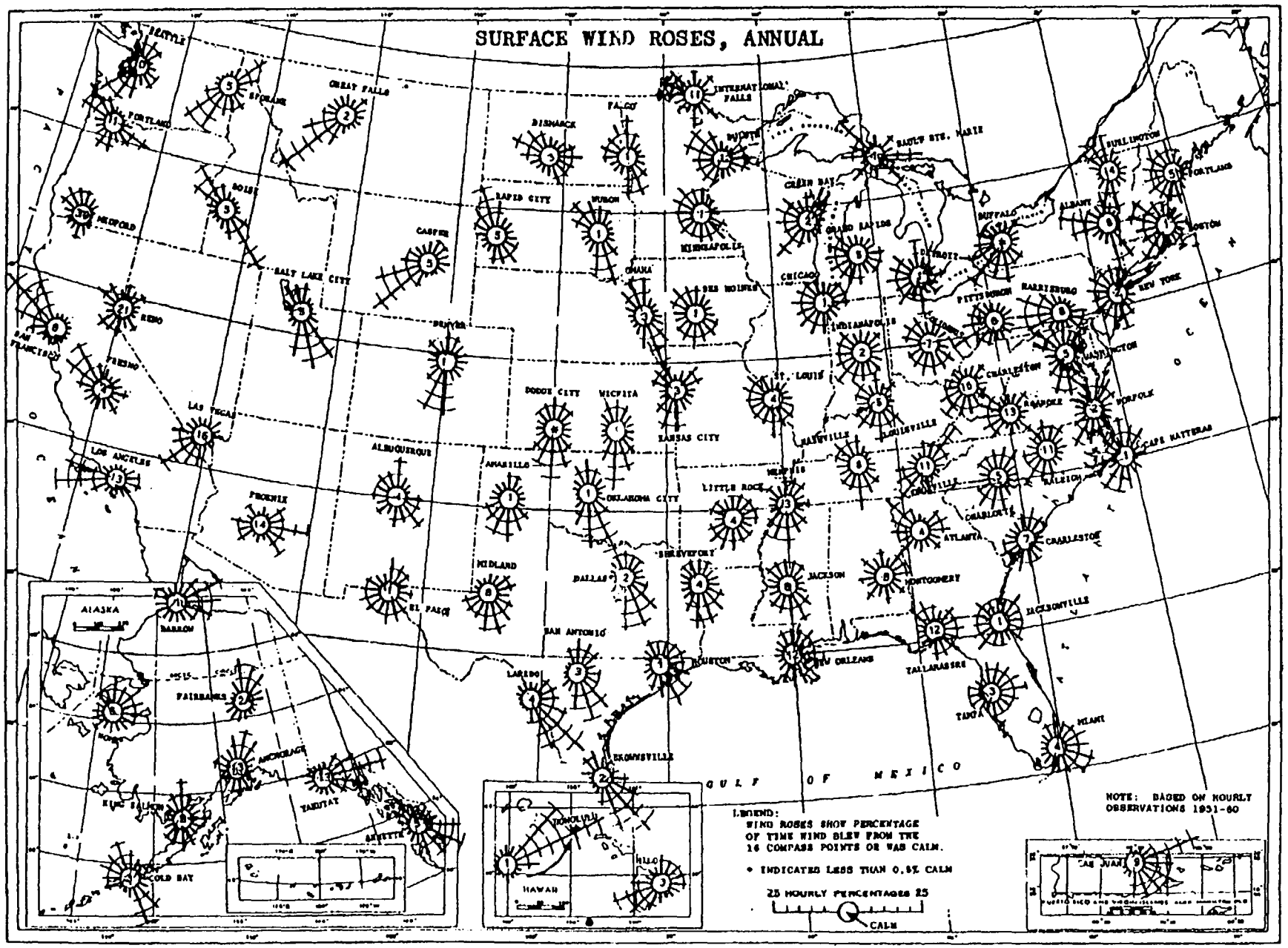
CHICAGO, OHARE INTERNATIONAL AIRPORT, ILLINOIS

LATITUDE: 42°00' N LONGITUDE: 87°53' W ELEVATION: FT. GRND 658 BARO 697 TIME ZONE: CENTRAL WBAN: 94846

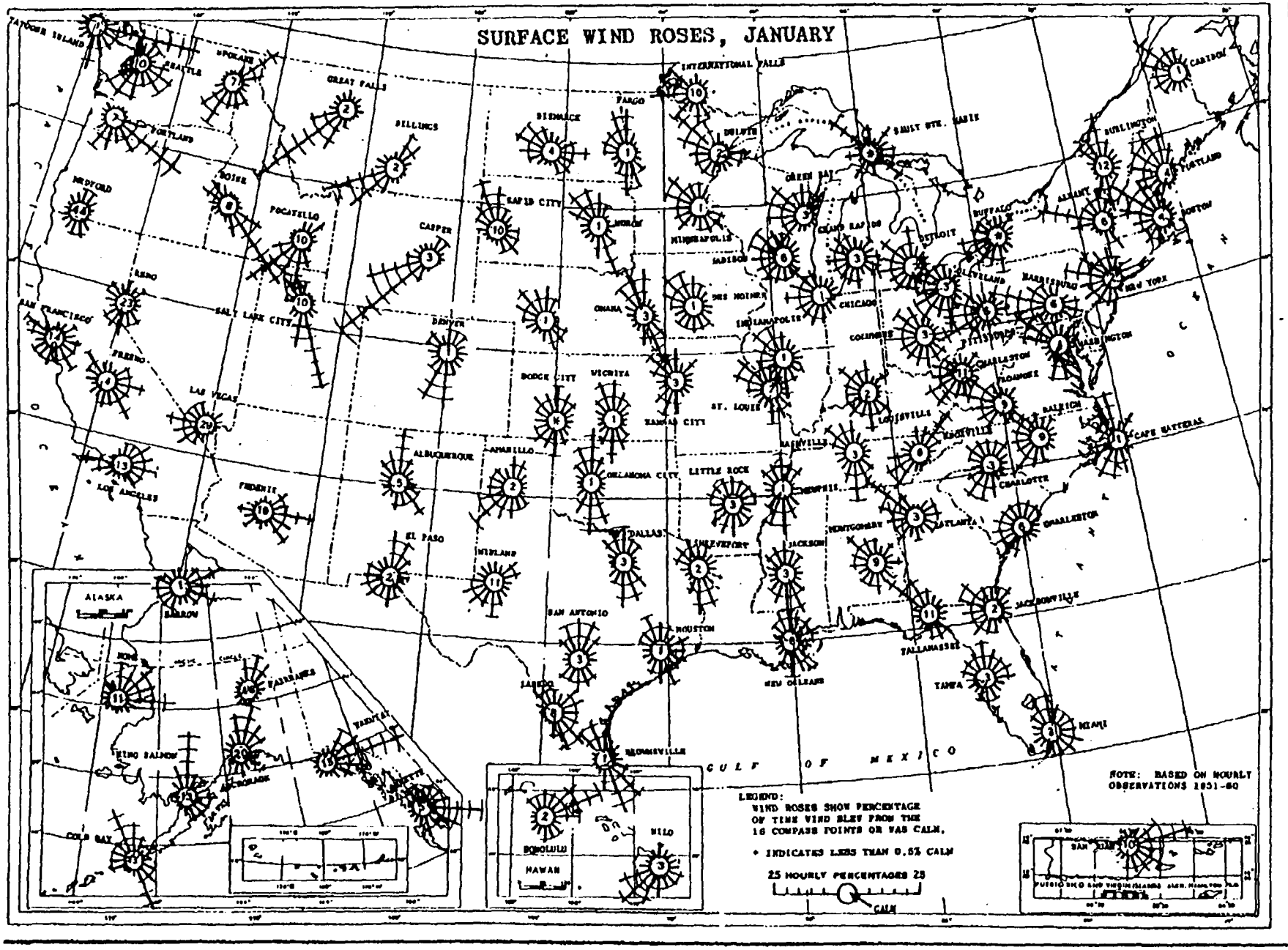
	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	YEAR
TEMPERATURE °F:													
Averages													
-Daily Maximum	33.4	31.8	41.4	54.1	71.6	76.7	83.5	82.5	67.8	60.3	46.9	36.0	57.2
-Daily Minimum	19.0	16.9	26.9	35.9	47.8	56.0	65.1	64.0	50.6	38.6	30.6	23.6	39.6
-Monthly	26.2	24.4	34.2	45.0	59.7	66.4	74.3	73.3	59.2	49.5	38.7	29.8	48.4
-Monthly Dewpt.	21.0	18.2	27.8	36.0	47.6	58.6	65.8	65.1	52.3	39.8	31.3	22.7	40.5
Extremes													
-Highest	47	52	66	76	87	91	91	94	80	81	65	51	94
-Date	4	4	30	24	10	17	18	27	12	7	13	10	AUG 27
-Lowest	5	-5	7	21	36	37	58	52	31	25	16	3	-5
-Date	19	24	14	4	19	1	30	5	30	31	7	30	FEB 24
DEGREE DAYS BASE 65 °F:													
Heating	1196	1133	948	595	184	69	0	3	185	479	784	1084	6660
Cooling	0	0	0	0	28	118	294	266	19	5	0	0	730
% OF POSSIBLE SUNSHINE	37	41	29	51	58	58	72	65	52	73	51	39	54
AVG. SKY COVER (tenths)													
Sunrise - Sunset	7.5	7.4	7.7	7.5	7.1	6.7	7.4	6.5	7.2	5.1	7.9	8.4	7.2
Midnight - Midnight	7.3	7.1	7.6	7.2	6.7	6.7	6.9	5.9	6.8	4.8	7.3	7.9	6.9
NUMBER OF DAYS:													
Sunrise to Sunset:													
-Clear	6	4	4	4	2	5	2	3	3	14	3	2	52
-Partly Cloudy	5	7	6	7	14	12	11	17	10	4	8	5	106
-Cloudy	20	17	21	19	15	13	18	11	17	13	19	24	207
Precipitation .01 inches or more	13	8	17	15	10	14	8	9	12	6	10	14	136
Snow, Ice pellets, hail 1.0 inches or more	5	4	6	1	0	0	0	0	0	0	0	0	16
Thunderstorms	0	0	0	4	2	13	3	6	1	0	0	0	29
Heavy Fog, visibility 1/4 mile or less	1	0	5	1	1	0	0	2	0	1	0	0	11
Temperature °F													
-Maximum													
90° and above	0	0	0	0	0	1	5	5	0	0	0	0	11
32° and below	15	16	6	0	0	0	0	0	0	0	2	10	49
-Minimum													
32° and below	29	27	20	3	0	0	0	0	1	8	17	21	132
0° and below	0	4	0	0	0	0	0	0	0	0	0	0	4
AVG. STATION PRESS. (mb)	997.3	996.4	993.5	989.2	990.5	990.9	990.9	992.6	992.2	992.4	993.9	992.6	992.7
RELATIVE HUMIDITY (%)													
Hour 00	82	83	84	80	77	85	86	88	88	78	80	77	82
Hour 06	83	84	87	82	80	89	89	92	91	84	82	81	85
Hour 12 (Local Time)	71	65	71	61	54	65	63	62	64	56	66	68	64
Hour 18	77	75	75	64	59	66	66	71	73	64	74	71	70
PRECIPITATION (inches):													
Water Equivalent													
-Total	3.83	0.82	4.52	4.57	1.83	9.96	4.45	5.74	4.47	2.19	1.52	1.00	44.90
-Greatest (24 hrs)	1.28	0.43	1.70	1.78	0.56	1.96	2.90	1.87	1.69	0.98	0.63	0.47	2.90
-Date	3-4	20-21	30-31	14-15	30-31	18-19	18	15	13-14	20	25-26	17-18	JUL 18
Snow, Ice pellets, hail													
-Total	15.2	8.0	13.8	3.7	0.0	0.0	0.0	0.0	0.0	T	0.2	1.2	42.1
-Greatest (24 hrs)	6.5	4.6	4.4	3.7	0.0	0.0	0.0	0.0	0.0	T	0.1	0.7	6.5
-Date	9-10	20-21	21-22	1						31	26	24-25	JAN 9-10
WIND:													
Resultant													
-Direction (!!!)	269	334	002	032	178	217	205	222	259	255	220	255	254
-Speed (mph)	3.5	3.1	3.3	2.2	1.5	1.7	3.3	2.0	2.2	4.4	4.7	3.5	1.7
Average Speed (mph)	12.2	11.5	11.8	12.3	10.5	10.5	9.9	8.9	10.0	11.6	12.0	10.8	11.0
Fastest Obs. 1 Min.													
-Direction (!!!)	26	02	04	03	03	19	19	17	18	21	22	29	17
-Speed (mph)	30	26	31	30	28	30	30	32	25	29	26	24	32
-Date	31	1	31	1	12	8	5	9	30	28	13	29	AUG 9
Peak Gust													
-Direction (!!!)	W	N	S	SW	NE	S	S	NW	S	SW	SW	W	S
-Speed (mph)	40	37	39	44	40	55	40	40	45	41	45	35	55
-Date	31	1	15	24	12	8	5	23	13	28	13	29	JUN 8

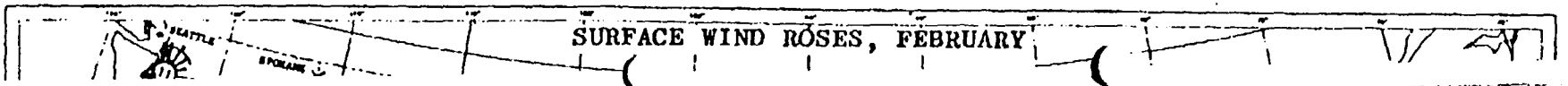
(!!!) See Reference Notes on Page 68

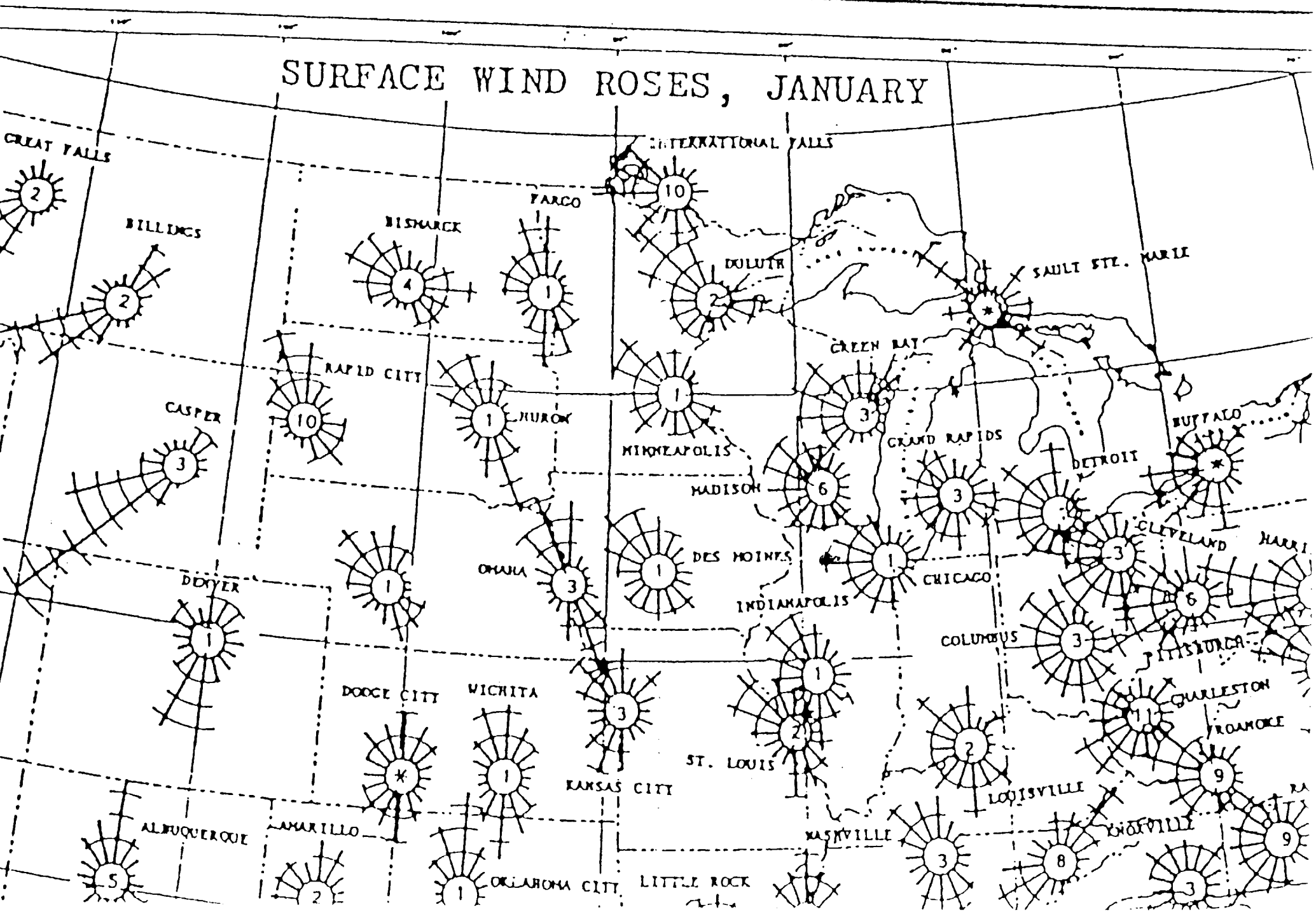
SURFACE WIND ROSES, MONTHLY AND ANNUAL; RESI



SURFACE WIND ROSES, MONTHLY AND ANNUAL; RESI

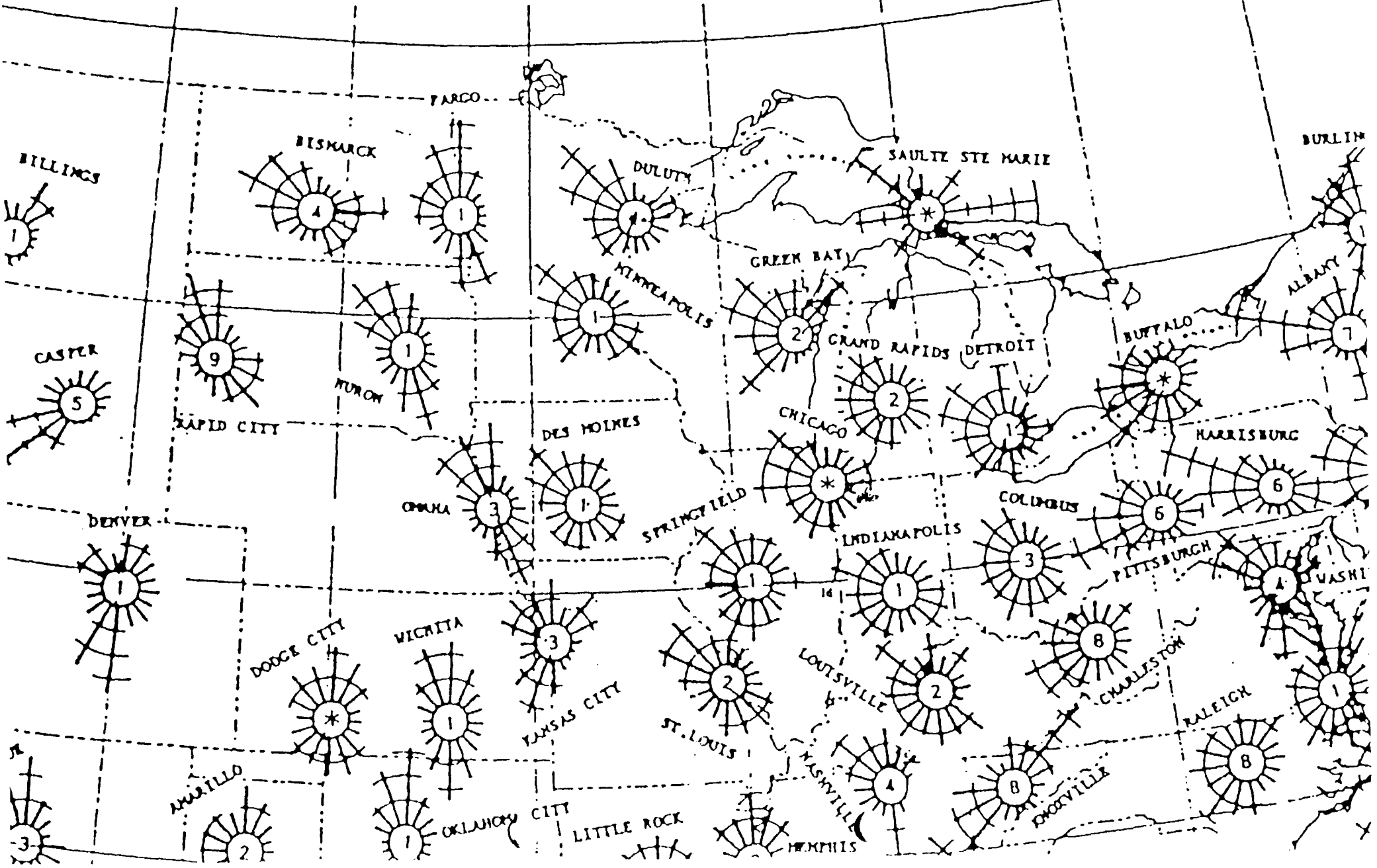




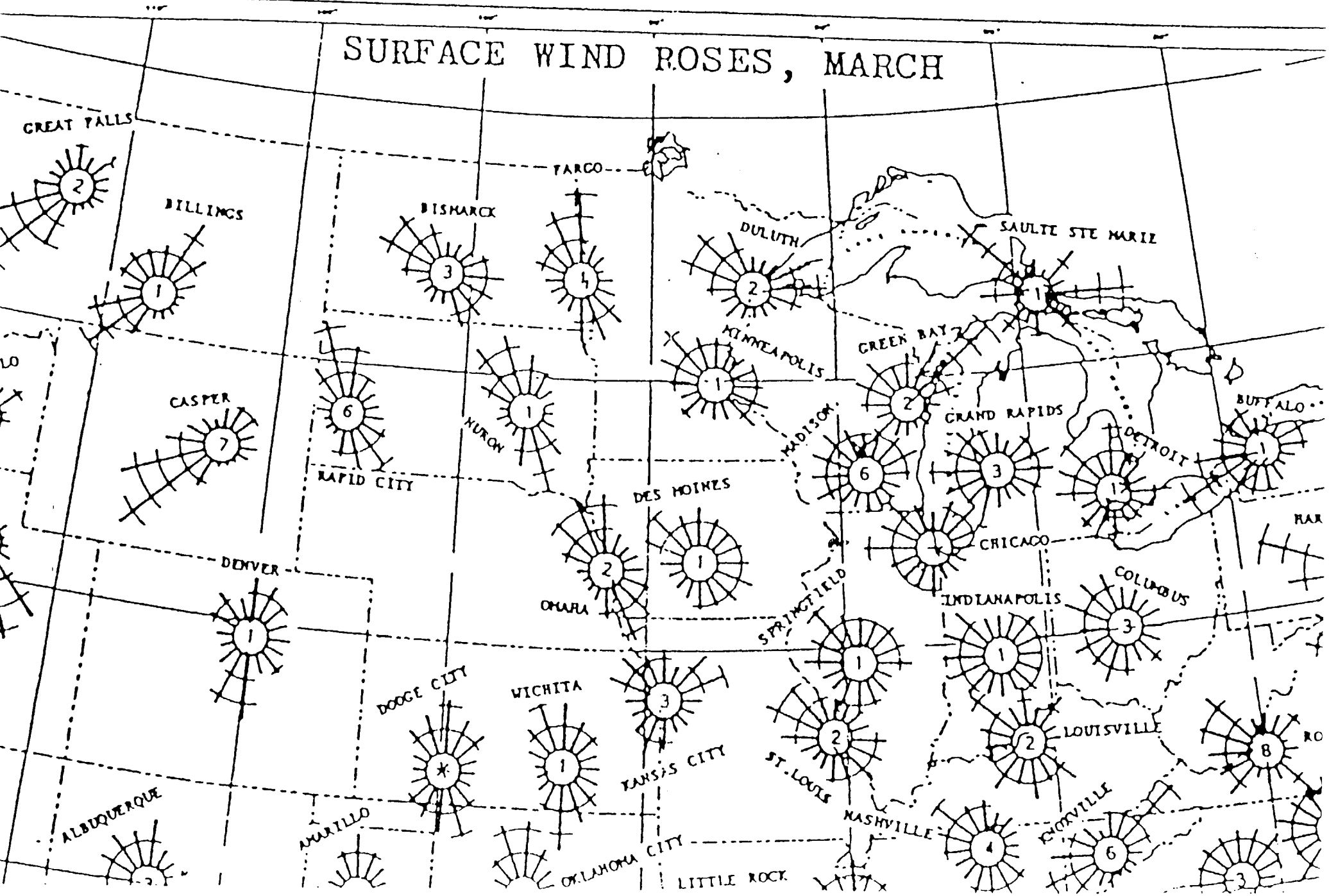

SURFACE WIND ROSES, JANUARY
GREAT FALLS
BILLINGS
BISMARCK
FARGO
INTERNATIONAL FALLS
DULUTH
SAULT STE. MARIE
GREEN BAY
RAPID CITY
CASPER
HURON
MINNEAPOLIS
GRAND RAPIDS
DETROIT
BUFFALO
MADISON
CLEVELAND
DES MOINES
OMAHA
CHICAGO
DENVER
INDIANAPOLIS
COLUMBUS
PITTSBURGH
DODGE CITY
WICHITA
CHARLESTON
ROANOKE
ST. LOUIS
KANSAS CITY
LOUISVILLE
KNOXVILLE
ALBUQUERQUE
AMARILLO
NASHVILLE
OKLAHOMA CITY
LITTLE ROCK

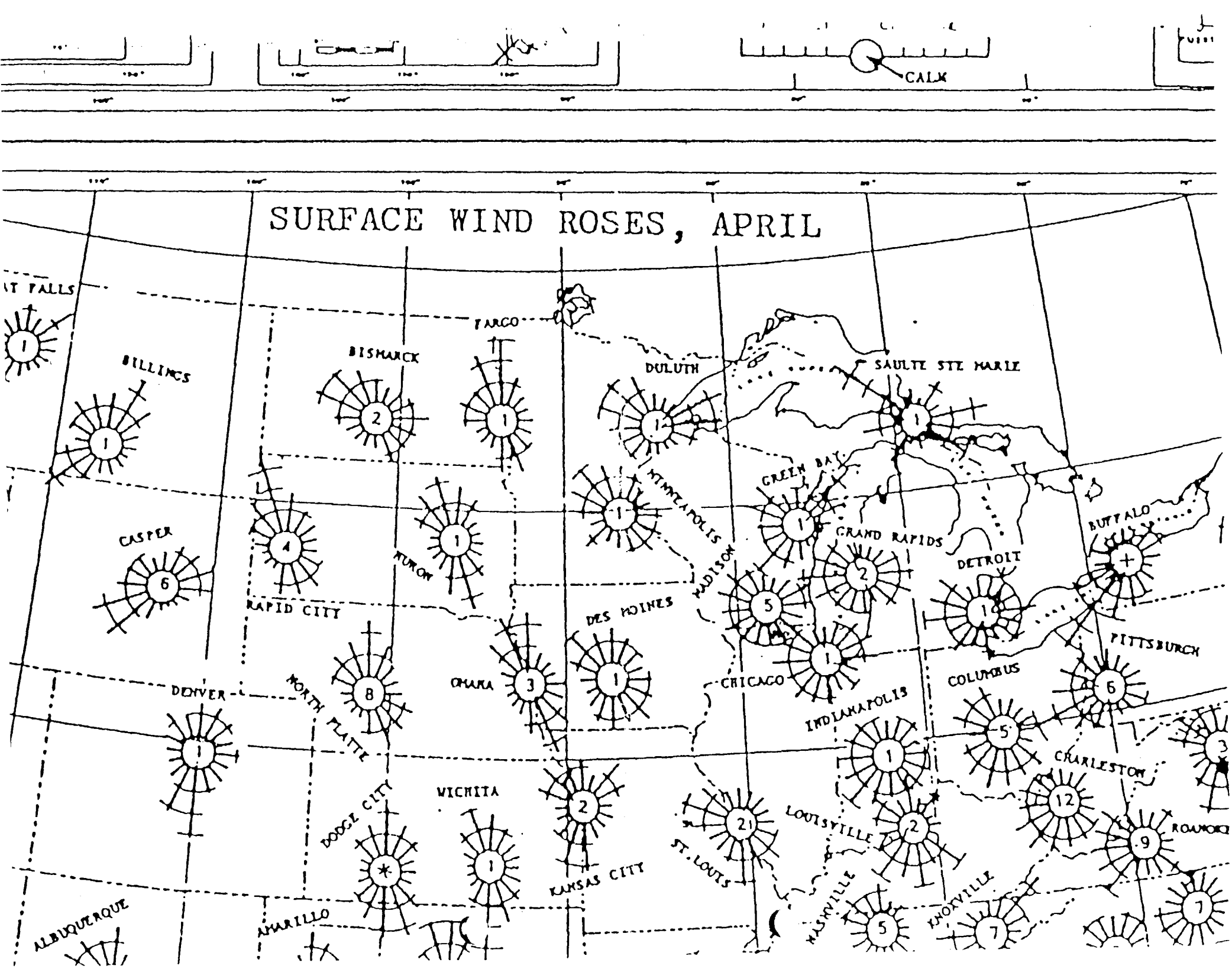
CALM

SURFACE WIND ROSES, FEBRUARY

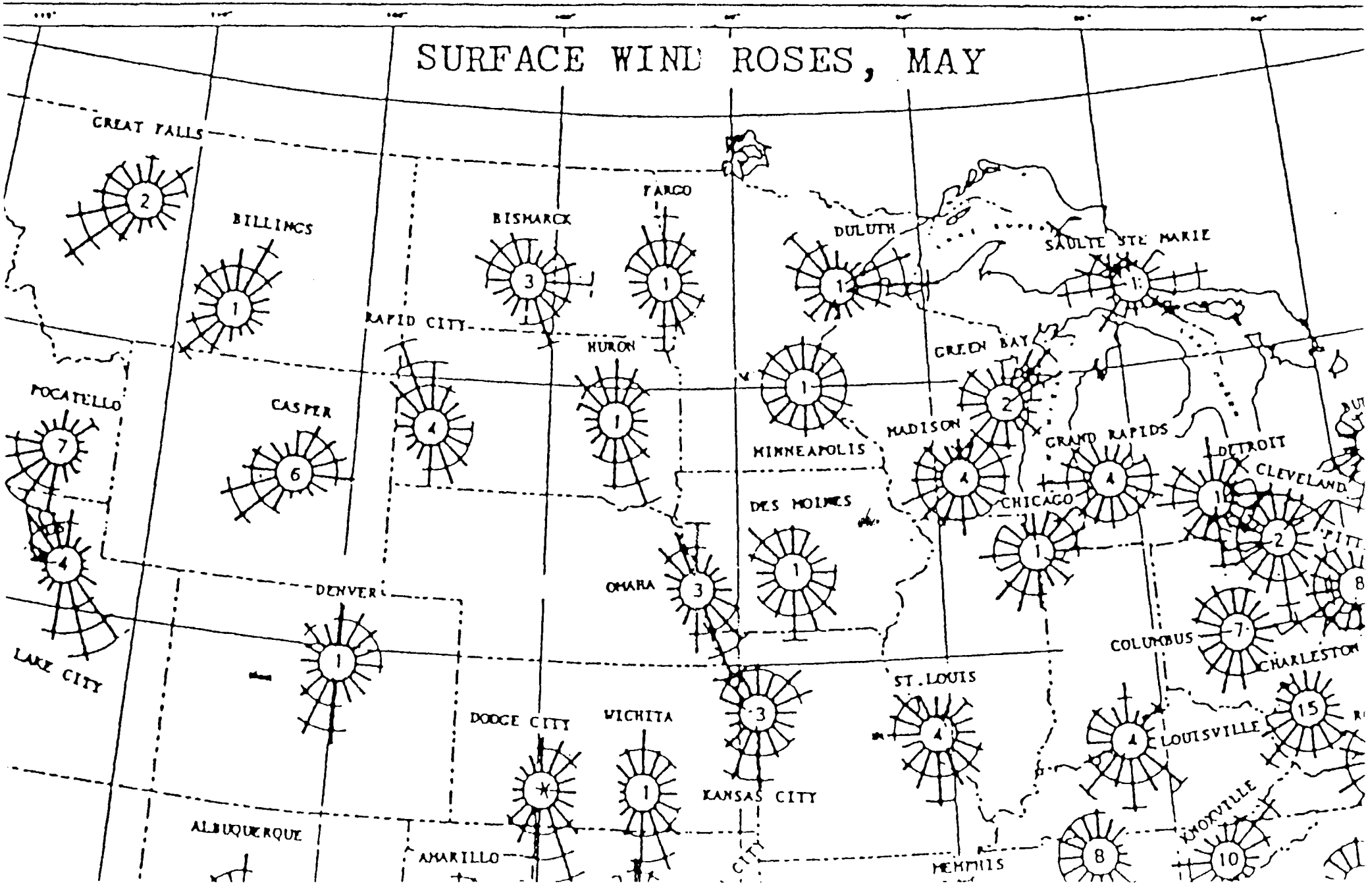


FACE WINDS, MIDSEASONAL

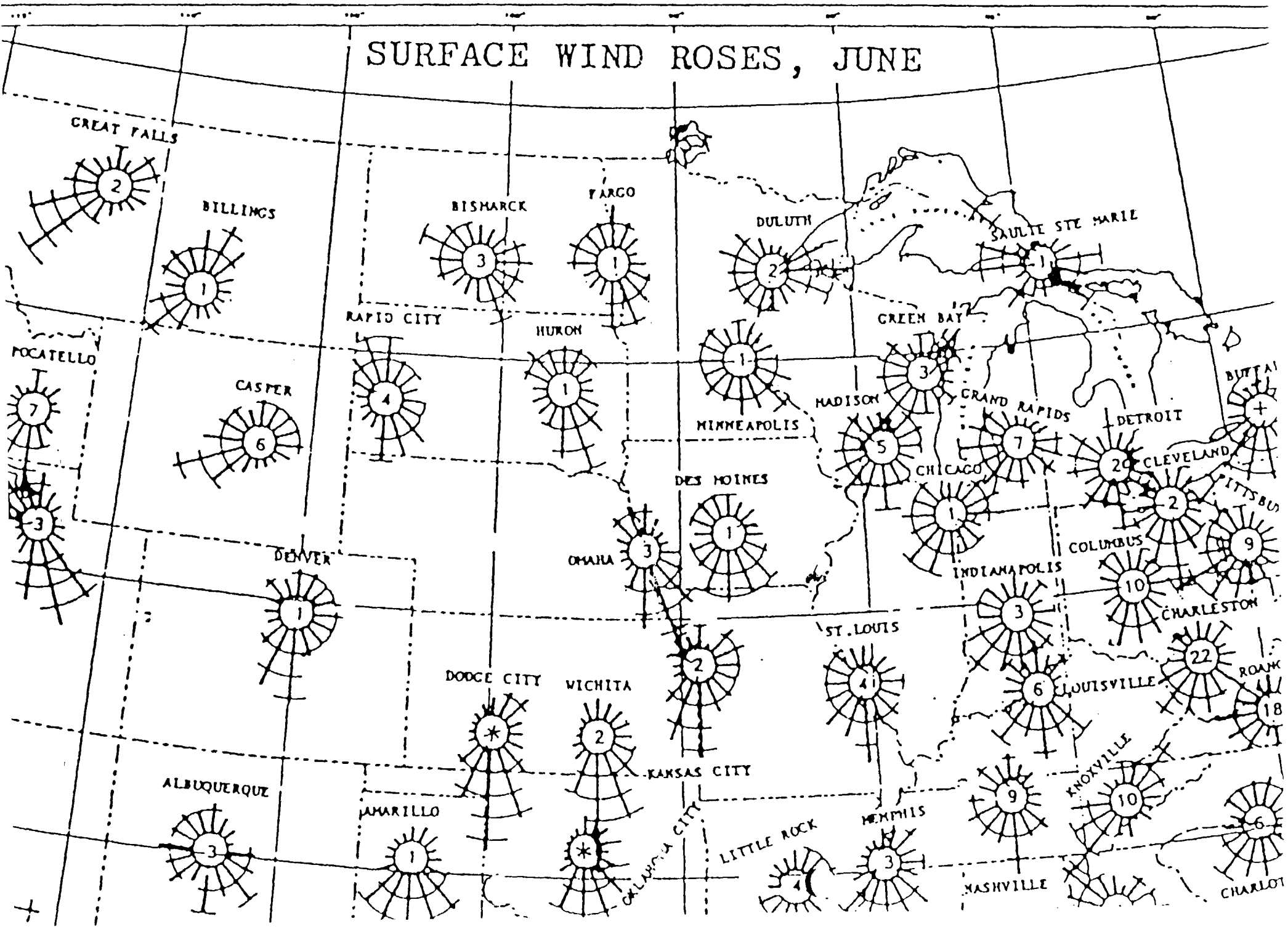



SURFACE WIND ROSES, APRIL
CALM
BILLINGS
BISMARCK
FARGO
DULUTH
SAULTE STE MARIE
CASPER
RAPID CITY
HURON
MINNEAPOLIS
MADISON
GREEN BAY
GRAND RAPIDS
DETROIT
BUFFALO
PITTSBURGH
DES MOINES
OMAHA
CHICAGO
COLUMBUS
DENVER
NORTH PLATTE
INDIANAPOLIS
CHARLESTON
WICHITA
DODGE CITY
LOUISVILLE
ST. LOUIS
KANSAS CITY
NASHVILLE
KNOXVILLE
ALBUQUERQUE
AMARILLO

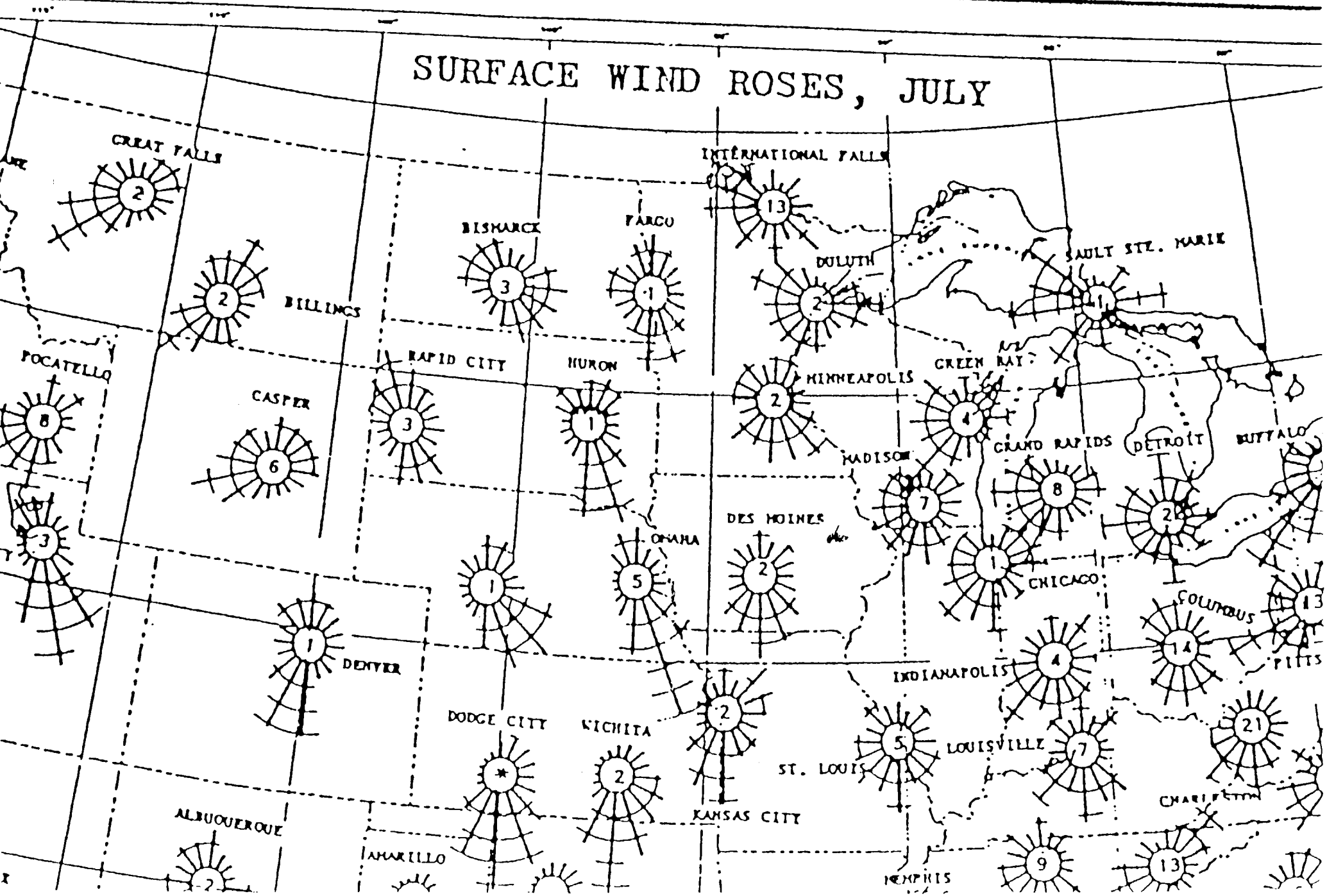
SURFACE WIND ROSES, MONTHLY

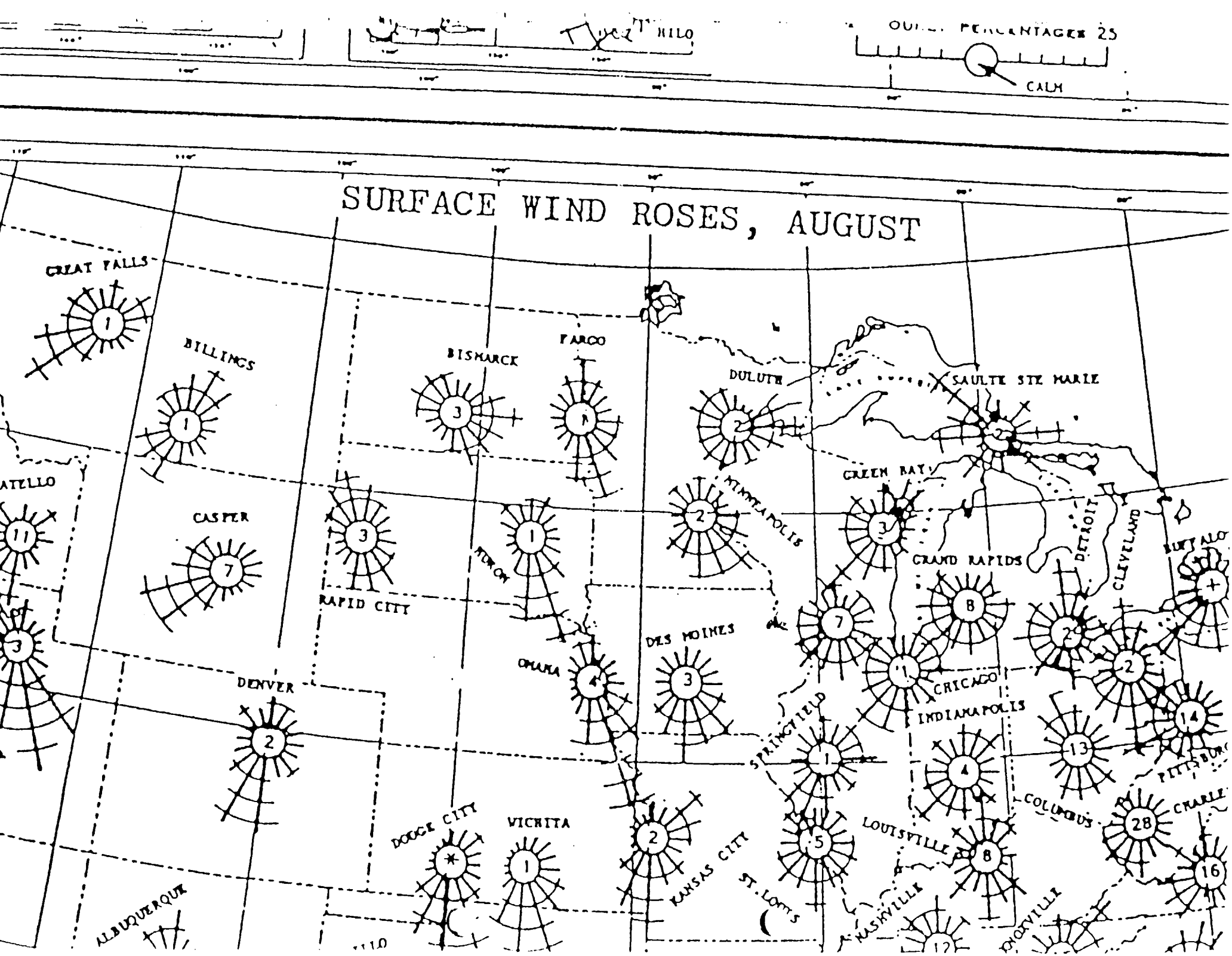


SURFACE WIND ROSES, JUNE

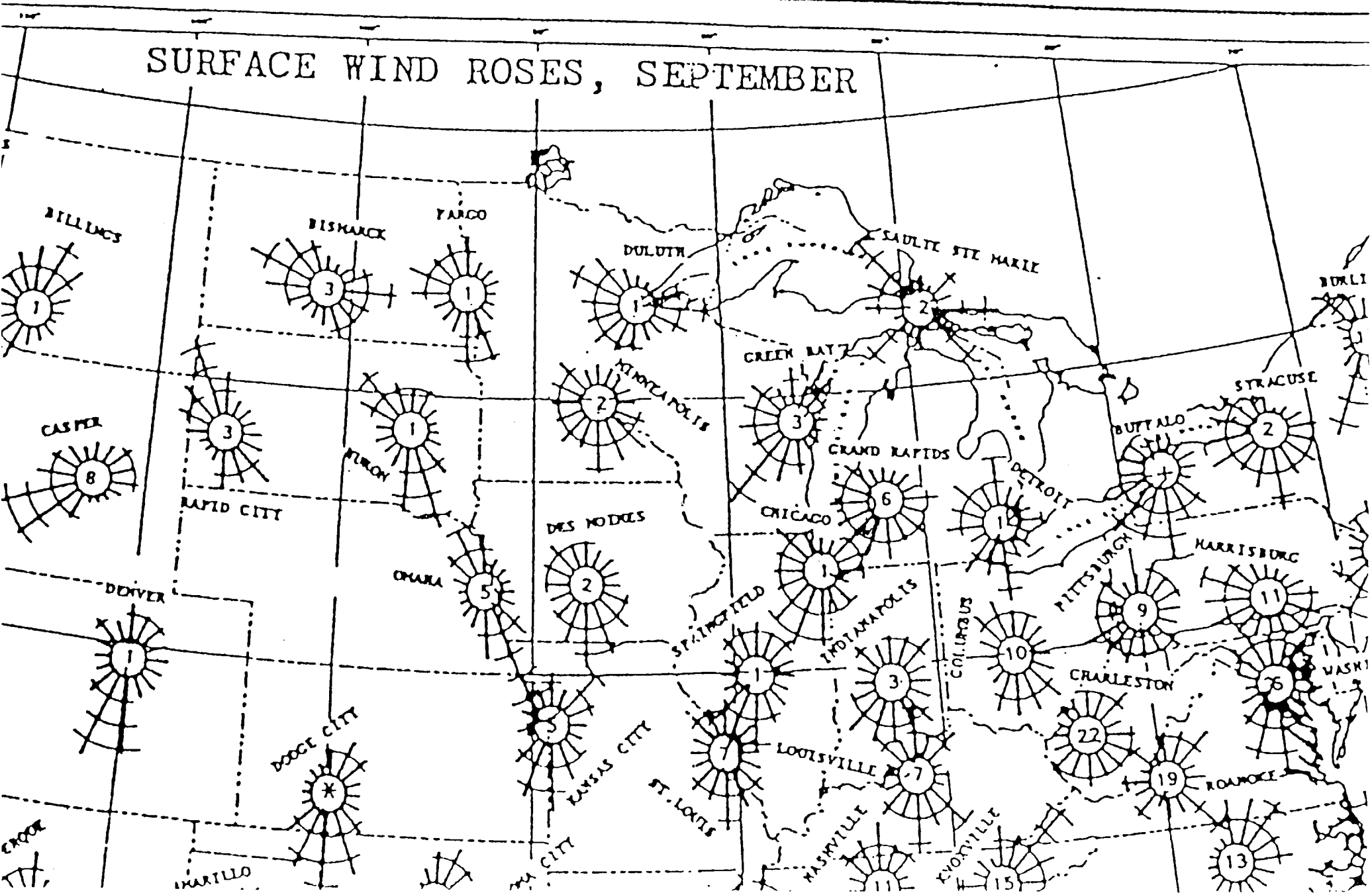


WINDS, MIDSEASONAL - Continued

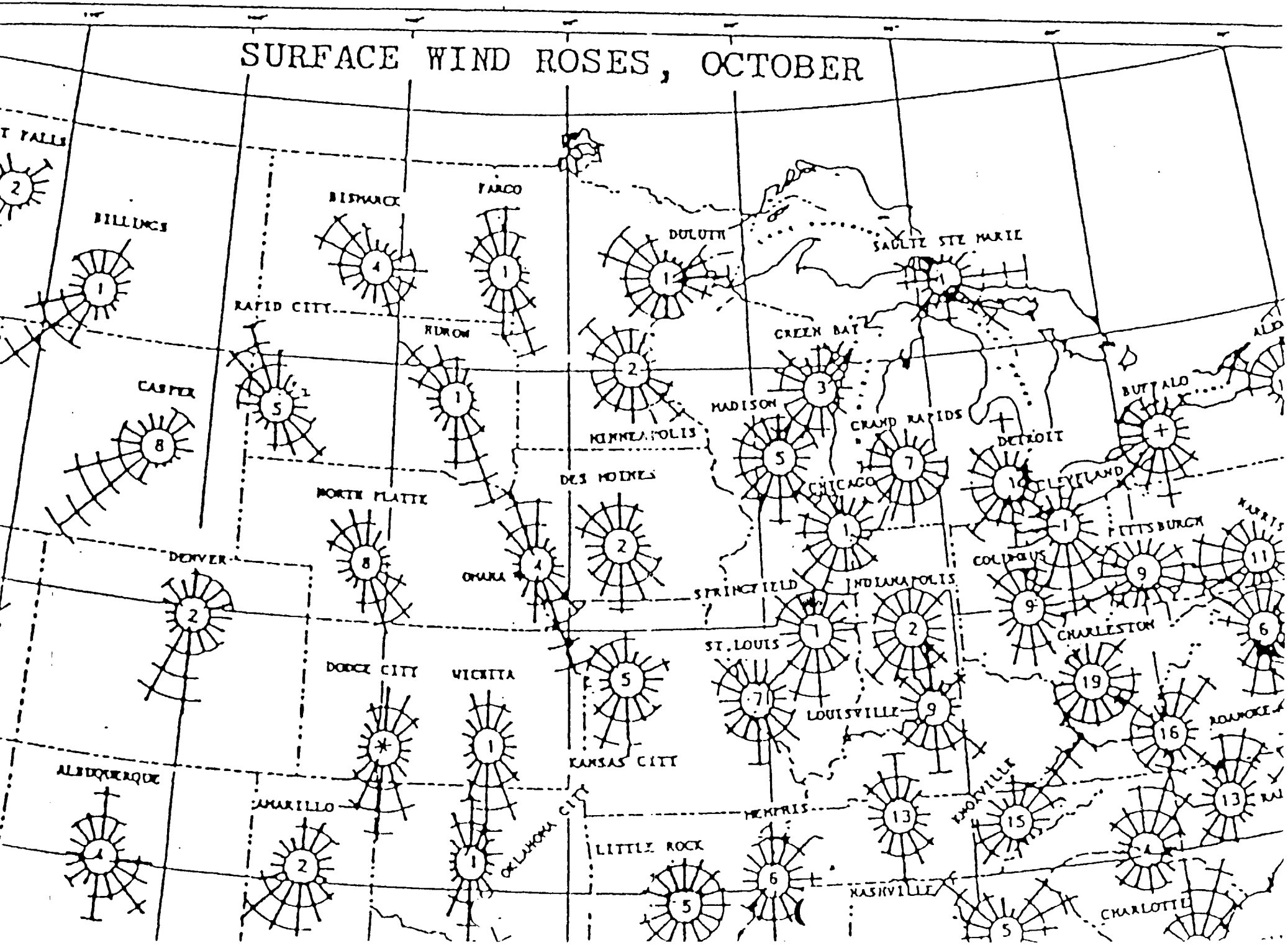



HILO
PERCENTAGES 25
CALM
SURFACE WIND ROSES, AUGUST
GREAT FALLS
BILLINGS
BISMARCK
FARGO
DULUTH
SAULTE STE MARIE
GREEN BAY
MINNEAPOLIS
CASPER
RAPID CITY
YUMA
DES MOINES
OMAHA
DENVER
GRAND RAPIDS
DETROIT
CLEVELAND
BUFFALO
CHICAGO
INDIANAPOLIS
SPRINGFIELD
COLUMBUS
LOUISVILLE
NASHVILLE
KNOXVILLE
DODGE CITY
WICHITA
KANSAS CITY
ST. LOUIS
ALBUQUERQUE

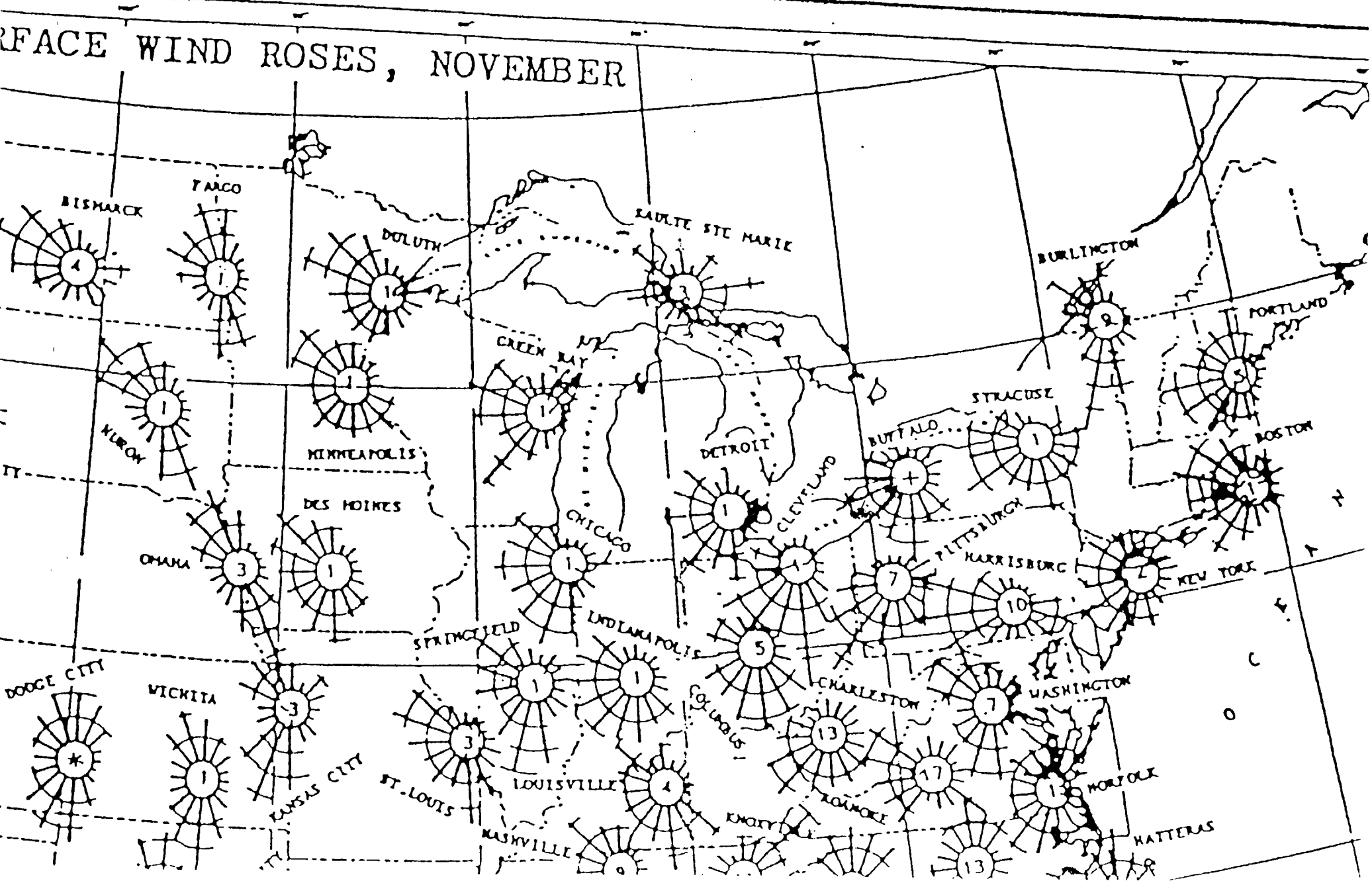
SURFACE WIND ROSES, MONTHLY AND A



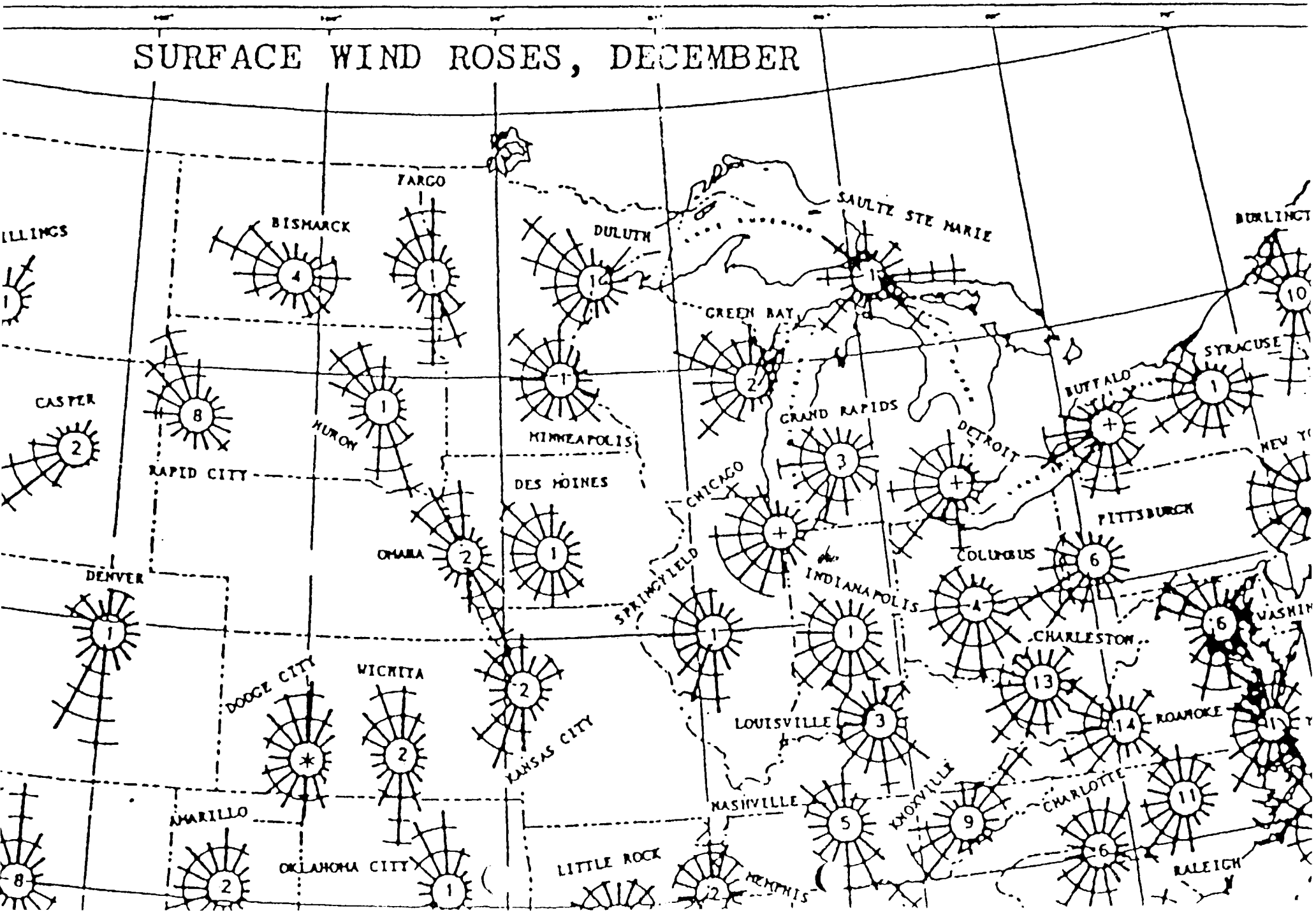
SURFACE WIND ROSES, OCTOBER



IDSEASONAL - Continued



SURFACE WIND ROSES, DECEMBER



N

APPENDIX N

WMII PUMP TEST DATA

Log 7 [illegible] copy

Page 1 of ___

AQUIFER TEST DATA

Owner WM II - HCD Address McMillen Road Antioch County Lake State IL

Date 10/5/92 Company performing test WM II Measured by Mark Smith + Tom [illegible]

Well No. PZ-1 Distance from pumping well ___ Type of test LCS - pump test Test No 1

Measuring equipment Electric Measuring tape Elev 796.08

Time Data	Water Level Data	Discharge Data	Comments on factors affecting test data
Pump on: Date ___ Time ___ (t)	Static water level ___	How Q measured ___	
Pump off: Date ___ Time ___ (t')	Measuring point ___	Depth of pump/air line ___	
Duration of aquifer test.	Elevation of measuring point ___	Previous pumping? Yes ___ No ___	
Pumping ___ Recovery ___		Duration ___ End ___	

Date	Clock time	Time since pump started t	Time since pump stopped t'	t/t'		Water level measurement	Correction or Conversion	Leaching Elev. Water level	Water level change s or s'		Discharge measurement	Rate		
10/5	0					33.92								
	5					33.92								
	10					33.92								
	15					33.92								
	20					"								
	25					"								
	30					"								
	35					"								
	40					"								
	45					"								
	50					"								
	55					"								
	60					"								
	65					"								
	70					"								
	75					"								
	80					"								
	85					"								
	90					"								
	95					"								
	100					"								
	105					"								
	110					"								
	115					"								
	120					"								
	130					"								Pump [illegible]
	140					"								[illegible]
	150					"								

AQUIFER TEST DATA

Owner WMII - HCD Address McMillen Road Antioch IL County Lake State IL

Date 10/5/92 Company performing test WMII Measured by Mark Smith

Well No. East MH Distance from pumping well _____ Type of test LCS Test No 1

Measuring equipment Electric Measuring Tape

Time Data	Water Level Data	Discharge Data	Comments on factors affecting test data
Pump on: Date _____ Time _____ (t)	Static water level _____	How Q measured _____	
Pump off: Date _____ Time _____ (t')	Measuring point _____	Depth of pump/air line _____	
Duration of aquifer test:	Elevation of measuring point _____	Previous pumping? Yes ____ No ____	
Pumping _____ Recovery _____		Duration _____ End _____	

Date	Clock time	Time since pump started t	Time since pump stopped t'	t/t'		Water level measurement	Correction or Conversion	Water level	Water level change s or s'		Discharge measurement	Rate		
10/5	30					44.9								
	35													
	48					44.45								
	45													
0:55	69					43.65								
	90													
	120													
	150													
	180													
	210													
	240													
	270													
	300													
	330													
	360													
	390													
	420													
	450													

Recovery Test

~~AQUIFER~~ TEST DATA

Owner WMII - HOD Address Mc Miller RD Antioch County Lake State IL

Date 10/5/92 Company performing test WMII Measured by Marck Smith

Well No. East MH Distance from pumping well pumping well Type of test pump test of LCS Test No 1

Measuring equipment Eletric Measuring tape

Time Data	Water Level Data	Discharge Data	Comments on factors affecting test data
Pump on: Date ____ Time ____ (t)	Static water level ____	How Q measured ____	
Pump off: Date ____ Time ____ (t')	Measuring point ____	Depth of pump/air line ____	
Duration of aquifer test:	Elevation of measuring point ____	Previous pumping? Yes ____ No ____	
Pumping ____ Recovery ____		Duration ____ End ____	

Date	Clock time	Time since pump started t	Time since pump stopped t'	t/t'		Water level measurement (Initial level)	Correction or Conversion	Water level	Water level change s or s'		Discharge measurement	Rate		
10/5	0					45.75								
	.5					45.78								
	1					45.78								
	1.5					45.78								
	2					45.75								
	2.5					45.70								
	3													
	3.5													
	4													
	4.5													
	5.					45.75								
	5.5													
	6													
	6.5													
	7													
	7.5													
	8													
	8.5													
	9													
	9.5													
	10													
	11					45.65								
	12													
	13													
	14													
	15													
	20					45.55								
	25													

AQUIFER TEST DATA

Owner: WMII - HCD Address: McMillen Road Antioch 1 County: Lake State: IL

Date: 10/5/92 Company performing test: WMII Measured by: Mark Smith

Well No: East MH Distance from pumping well: Type of test: LCS Test No: 1

Measuring equipment: Electric Measuring Tape Elev 793.51

Time Data
Pump on: Date ____ Time ____ (t)
Pump off: Date ____ Time ____ (t')
Duration of aquifer test:
Pumping ____ Recovery ____

Water Level Data
Static water level ____
Measuring point ____
Elevation of measuring point ____

Discharge Data
How Q measured ____
Depth of pump/air line ____
Previous pumping? Yes ____ No ____
Duration ____ End ____

Date	Clock time	Time since pump started t	Time since pump stopped t'	t/t'		Depth to water level measurement	Correction or Conversion	Water level Elev.	Water level change s or s'		Discharge measurement	Rate		Comments on factors affecting test data
10/5	30					[illegible]								
	35					[illegible]								
	40													
	45					[illegible]								
	60					35.96								
	90					[illegible]								
	120					[illegible]								
	137 / 150					25.75								Test Terminated bec[illegible] power failure.
	180													
	210													
	240													
	270													
	300													
	330													
	360													
	390													
	420													

AQUIFER TEST DATA

ner WMII - HOD Address McMillan RD Antioch County Lake State IL

ate 10/5/92 Company performing test WMII Measured by Morch Smith

ll No. East MH Distance from pumping well pumping well Type of test pump test of LCS Test No. 1

leasuring equipment Eletric Measuring tape MSL Elevation 793.51

Time Data	Water Level Data	Discharge Data	Comments on factors affecting test data
Pump on: Date ____ Time ____ (t)	Static water level ____	How O measured ____	
Pump off: Date ____ Time ____ (t')	Measuring point ____	Depth of pump/air line ____	
Duration of aquifer test:	Elevation of measuring point ____	Previous pumping? Yes ____ No ____	
Pumping ____ Recovery ____		Duration ____ End ____	

Date	Clock time	Time since pump started t	Time since pump stopped t'	t/t'		Depth to Leachate Water level measurement	Correction or Conversion	Leachate Elevation Water level	Water level change s or s'		Discharge measurement	Rate		
5	0					33.65								
	.5					34.3								
	1					34.4								
	1.5					34.5								
	2					34.58								
	2.5					34.[illegible]								
	3					34.76								
	3.5					34.[illegible]								
	4					34.91								
	4.5					34.95								
	5.					35.00								
	5.5					35.05								
	6					35.07								
	6.5					35.1								
	7					35.[illegible]								
	7.5					35.1								
	8					[illegible]2								
	8.5					35.2								
	9					35.[illegible]								
	9.5					[illegible]								
	10					[illegible]								
	11					[illegible]								
	12					[illegible]								
	13					[illegible]								
	14					[illegible]								
	15					[illegible]								
	20					[illegible]								
	25					[illegible]								

LEACHATE COLLECTION SYSTEM TEST
HOD LANDFILL, ANTIOCH, ILLINOIS

EAST MANHOLE

DATE: 10/5/1992 ELEVATION 793.51 MSL

TIME (MINUTES)	LEACHATE (FEET)	HEAD ELEV. (FEET MSL)
0	33.65	759.86
0.5	34.30	759.21
1	34.40	759.11
1.5	34.50	759.01
2	34.58	758.93
2.5	34.68	758.83
3	34.76	758.75
3.5	34.85	758.66
4	34.91	758.60
4.5	34.95	758.56
5	35.00	758.51
5.5	35.05	758.46
6	35.08	758.43
6.5	35.10	758.41
7	35.10	758.31
7.5	35.10	758.31
8	35.20	758.21
8.5	35.20	758.15
9	35.30	758.11
9.5	35.36	757.96
10	35.40	757.96
11	35.55	757.91
12	35.55	757.84
13	35.60	757.79
14	35.67	757.51
15	35.72	757.06
20	36.00	756.76
25	36.45	756.51
30	36.75	756.76
35	37.00	756.51
40	37.44	756.07
45	37.84	755.67
60	38.96	754.55
90	41.55	751.96
120	44.50	748.99
150	45.75	747.76

RECOVERY TIME FOR EAST MANHOLE

TIME	LEACHATE	HEAD ELEV.

BY: MARCH SMITH
DATE RECEIVED/SENT _____
SITE HOD RI/FS
FILE SYSTEM: PROJECT/SITE
FILE CODE: 5.4 ✓ W/ATTACH
2.1 W/O ATTACH
CF: _____
CF: _____

LEACHATE LEVELS
HOD LANDFILL

WELLS	10/91	11/91	12/91	1/92	2/92	3/92	4/92	5/92	6/92	7/92	8/92	9/92
G11D	761.18	760.86	761.24	760.86	761	761.6	761.55	760.95	759.81	759.58	767.21	760.85
WMH	757.47	757.07	DRY	DRY	DRY	756.74	DRY	DRY	758.92	759.62	758.31	758.82
EMH	757.81	752.66	753.17	756.66	753.87	754.32	755.7	DRY	758.51	751.59	757.35	754.55
PZ-1	749.69	752.99	753	DRY	752.39	751.9	751.96	DRY	757.48	759.72	750.63	752.63
PZ-2A	734.46	736.55	736.7	737.02	737.08	737.21	735.08	736.3	736.68	735.99	736.64	737.35
PZ-3A	748.21	741.05	741.5	741.67	742.02	742.35	742.33	742.35	742.92	742.46	743.07	742.85
PZ-8	749.31	DRY	DRY	DRY	DRY	DRY	DRY	DRY	759.91	753.83	753.04	751.69
PZ-9	757.71	752.1	753.61	752.94	754.97	753.24	DRY	DRY	775.32	755.67	762.71	754.94
PZ-10	746.47	749.4	749.62	751.41	763.96	751.2	747.46	DRY	752.03	752.89	750.44	751.76

Area of new Landfill draining to EMH is 20 Ac = 871,200 sq ft x [illegible]

Average thickness of Leachate saturated waste is 15' = 13,068,000 cu ft x .38 saturated

effective porosity .38 = 4,965,840 cu ft

7.48 gal/cu ft = 37,144,483 gallons Leachate

BY: MARCH SMITH
DATE RECEIVED/SENT _____
SITE Hod Rd/Eg
FILE SYSTEM: PROJECT/SITE
FILE CODE: 5.5 W/ATTACH
2.1 W/O ATTACH
CF: _____

WMH = 24.2 Ac = 1054 [illegible] sq ft

[illegible] 12' = 13,649,[illegible] x .38 [illegible] x 7.48

= 35,95[illegible] gallon of land

LEACHATE COLLECTION SYSTEM TEST
HOD LANDFILL, ANTIOCH, ILLINOIS

EAST MANHOLE

DATE: 10/5/1992 793.51 MSL

TIME (MINUTES)	LEACHATE (FEET)	HEAD ELEV. (FEET MSL)
0	33.65	759.86
0.5	34.30	759.21
1	34.40	759.11
1.5	34.50	759.01
2	34.58	758.93
2.5	34.68	758.83
3	34.76	758.75
3.5	34.85	758.66
4	34.91	758.60
4.5	34.95	758.56
5	35.00	758.51
5.5	35.05	758.46
6	35.08	758.43
6.5	35.10	758.41
7	35.10	758.31
7.5	35.10	758.31
8	35.20	758.21
8.5	35.20	758.15
9	35.30	758.11
9.5	35.36	757.96
10	35.40	757.96
11	35.55	757.91
12	35.55	757.84
13	35.60	757.79
14	35.67	757.51
15	35.72	757.01
20	36.00	756.76
25	36.45	756.51
30	36.75	756.76
35	37.00	756.51
40	37.44	756.07
45	37.84	755.67
60	38.96	754.55
90	41.55	751.96
120	44.52	748.99
157	45.75	747.76

LEACHATE COLLECTION SYSTEM TEST
HOD LANDFILL, ANTIOCH, ILLINOIS

DATE: 10/5/1992

TIME (MINUTES)	LEACHATE (INCHES)	LEACHATE (GALLONS)	LEACHATE (GPM)
0	0	0	0
30	29	1287	42.9
47	38	1800	30.2
60	47	2263	35.6
67	53	2510	35.3
82	69	3078	37.9
94	76	3454	31.3
109	84	3912	30.5
121	90	4254	28.5

RECOVERY TIME FOR EAST MANHOLE

TIME (MINUTES)	LEACHATE (FEET)	HEAD ELEV. (FEET MSL)
0	45.75	747.76
2.5	45.78	747.73
5	45.75	747.76
11	45.65	747.86
20	45.35	748.16
30	44.90	748.61
42	44.45	749.06
69	43.65	749.86

Waste Management of North America, Inc.
Midwest Region
Two Westbrook Corporate Center • Suite 1000
P.O. Box 7070
Westchester, Illinois 60154
708/409-0700

TEMPORARY LEACHATE TANKER
HOD LANDFILL, ANTIOCH ILLINOIS
OCTOBER 5, 1992

TIME	LEACHATE IN INCHES F	R	CONVERSION FACTOR	CUMULATIVE GALLONS	GAL PER TIME PERIOD	GPM
0		0"		0	0	0
15				0	0	0
30		29"		0	0	0
~~45~~ 47.5		38"		0	0	0
60		47.5"		0	0	0
67 ~~75~~	0	53"		0	0	0
82 ~~90~~	15.5"			0	0	0
94 ~~105~~	23"			0	0	0
109 ~~120~~	30.5"			0	0	0
121 ~~135~~	37"			0	0	0
36 ~~150~~				0	0	0
151 ~~165~~				0	0	0
~~180~~				0	0	0

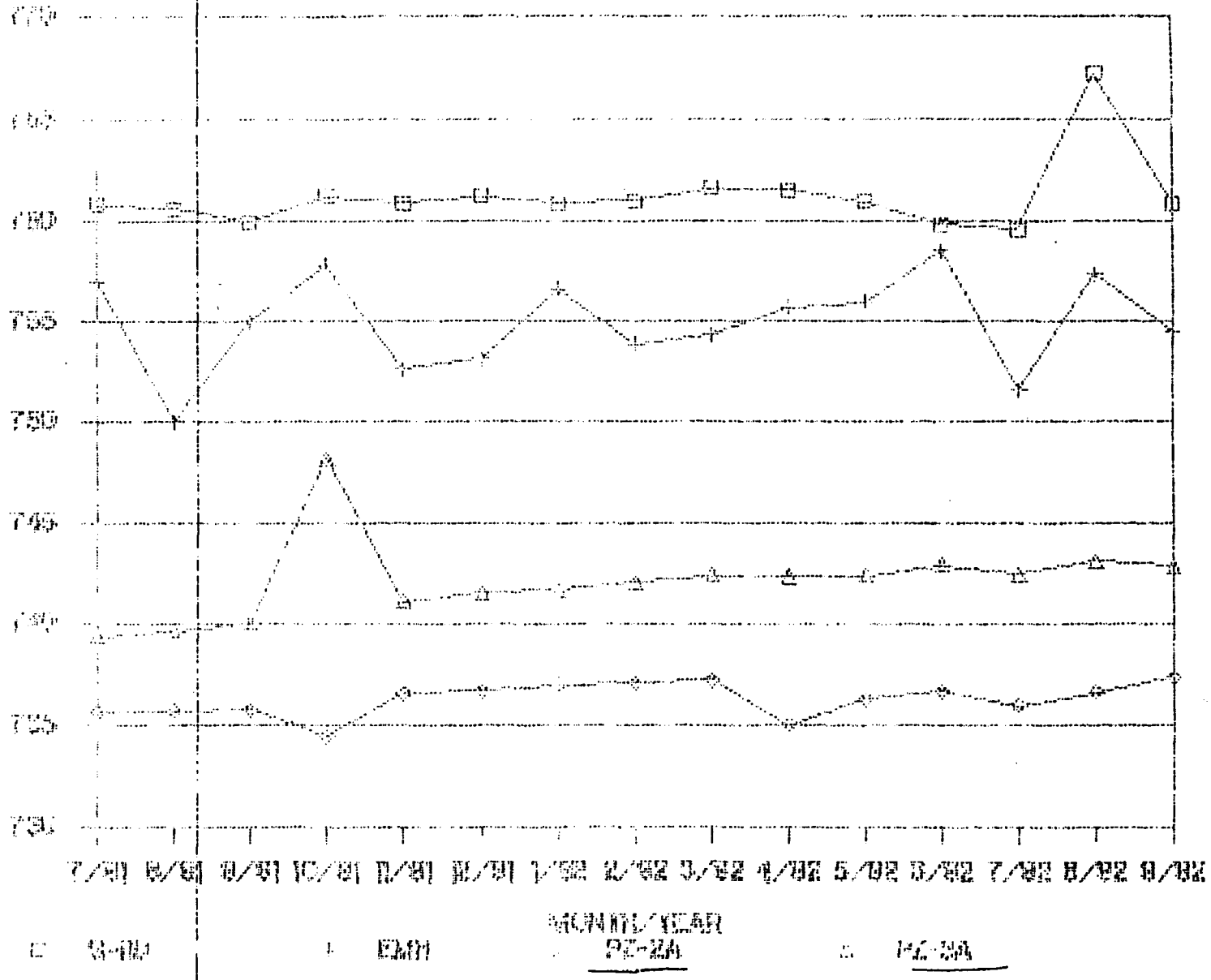
FILE: TANKER

PRESVAL [illegible] (Burlington Limited)
[illegible]
[illegible] 77-1672
Cyber ID = MC [illegible]
Tank Capacity 2550 gal

Phone ~~[illegible]~~ -
[illegible] -637-2353

1" 9.4

LEACHATE LEVELS



LEACHATE LEVELS
HOD LANDFILL

LS	7/91	8/91	9/91	10/91	11/91	12/91	1/92	2/92	3/92	4/92	5/92	6/92	7/92	8/92	9/92
11D	760.84	760.63	759.95	761.18	760.86	761.24	760.86	761	761.6	761.55	760.95	759.81	759.58	767.21	760.85
4	DRY	DRY	757.23	757.47	757.07	DRY	DRY	DRY	756.74	DRY	DRY	758.92	759.62	758.31	758.82
5	757	750.05	755	757.91	752.66	753.17	756.66	753.87	754.32	755.7	756	758.51	751.59	757.38	754.55
2-1	750.42	749.53	758.24	749.69	752.99	753	DRY	752.39	751.9	751.96	DRY	757.45	759.72	756.60	752.63
7-2A	735.69	735.74	735.8	734.46	736.55	736.7	737.02	737.08	737.21	735.08	736.3	736.65	735.99	736.64	737.35
-3A	739.4	739.65	740.02	748.21	741.05	741.5	741.67	742.02	742.35	742.33	742.35	742.92	742.46	743.07	742.85
1-8	755.37	DRY	757.31	749.31	DRY	DRY	DRY	DRY	DRY	DRY	DRY	759.91	753.63	753.04	751.69
2-9	758.77	758.83	DRY	757.71	752.1	753.61	752.94	754.97	753.24	DRY	DRY	775.32	755.87	762.71	754.94
-10	749.63	748.9	749.58	746.47	749.4	749.62	751.41	763.96	751.2	747.46	DRY	752.03	753.69	750.44	751.76

The HOD Landfill is divided into the OLD and NEW landfill. The NEW landfill's base grade divides leachate flow to the northwest to the east menacle and to the northeast to the deep clay borrow area in the refuse. The bottom of PZ-2A according to design plans is supposed to be at a MSL elevation of 748.5; however the leachate elevations are consistently in the 734-737 MSL reangs. It appears that the boundaries of the clay borrow area extends futher to the west than is depicted on the design drawing (no as-builts exist as far as I know).

Copy

AQUIFER TEST DATA

Owner WMII - HCD Address McMillan Road Antioch County Lake State IL

Date 10/5/92 Company performing test WMII Measured by Mark Smith + Tom

Well No. PZ-1 Distance from pumping well _____ Type of test LGS - pump test Test No 1

Measuring equipment Electric Measuring tape Elev 796.08

Time Data
Pump on: Date _____ Time _____ (t)
Pump off: Date _____ Time _____ (t')
Duration of aquifer test:
Pumping _____ Recovery _____

Water Level Data
Static water level _____
Measuring point _____
Elevation of measuring point _____

Discharge Data
How Q measured _____
Depth of pump/air line _____
Previous pumping? Yes ____ No ____
Duration _____ End _____

Comments on factors affecting test data

Date	Clock time	Time since pump started t	Time since pump stopped t'	t/t'		Water level measurement	Correction or Conversion	Leaded Flow ~~Water~~ level	Water level change s or s'		Discharge measurement	Rate		
10/5	0					33.92								
	5					33.92								
	10					33.92								
	15					33.92								
	20					"								
	25					"								
	30					"								
	35					"								
	40					"								
	45					"								
	50					"								
	55					"								
	60					"								
	65					"								
	70					"								
	75					"								
	80					"								
	85					"								
	90					"								
	95					"								
	100					"								
	105					"								
	110					"								
	115					"								
	120					"								
	130					"								
	140					"								
	150					"								

Pump No. [illegible]

AQUIFER TEST DATA

Owner WMII - HCD Address McMillen Road Antioch 1 County Lake State IL

Date 10/5/92 Company performing test WMII Measured by Mark Smith

Well No. East MH Distance from pumping well _____ Type of test LCS Test No. 1

Measuring equipment Electric Measuring Tape

Time Data
Pump on: Date _____ Time _____ (t)
Pump off: Date _____ Time _____ (t')
Duration of aquifer test:
Pumping _____ Recovery _____

Water Level Data
Static water level _____
Measuring point _____
Elevation of measuring point _____

Discharge Data
How Q measured _____
Depth of pump/air line _____
Previous pumping? Yes ____ No ____
Duration _____ End _____

Comments on factors affecting test data

Date	Clock time	Time since pump started t	Time since pump stopped t'	t/t'		Water level measurement	Correction or Conversion	Water level	Water level change s or s'		Discharge measurement	Rate		
10/5	30					44.9								
	35													
	40 35					44.05								
	45													
10:55	60					43.65								
	90													
	120													
	150													
	180													
	210													
	240													
	270													
	300													
	330													
	360													
	390													
	420													
	450													

Page 1 of

Rovery Test

~~AQUIFER~~ TEST DATA

Owner WMII - HOD Address McMillan RD Antioch County Lake State IL

Date 10/5/92 Company performing test WMII Measured by March Smith

Well No. East MH Distance from pumping well pumping well Type of test pump test of LCS Test No 1

Measuring equipment Eletric Measuring tape

Time Data		Water Level Data		Discharge Data	
Pump on: Date ____ Time ____ (t)		Static water level ____		How Q measured ____	Comments on factors affecting test data
Pump off: Date ____ Time ____ (t')		Measuring point ____		Depth of pump/air line ____	
Duration of aquifer test:		Elevation of measuring point ____		Previous pumping? Yes ____ No ____	
Pumping ____ Recovery ____				Duration ____ End ____	

Date	Clock time	Time since pump started t	Time since pump stopped t'	t/t'		Water level measurement	Correction or Conversion	Water level	Water level change s or s'		Discharge measurement	Rate	
10/5	0					45.75							
	.5					45.78							
	1					45.78							
	1.5					45.78							
	2					45.75							
	2.5					45.78							
	3												
	3.5												
	4												
	4.5												
	5.					45.75							
	5.5												
	6												
	6.5												
	7												
	7.5												
	8												
	8.5												
	9												
	9.5												
	10												
	11					45.65							
	12												
	13												
	14												
	15												
	20					45.35							
	25												

AQUIFER TEST DATA

Owner: WMII - HCD Address: McMillen Road Antioch 1 County: Lake State: IL

Date: 10/5/92 Company performing test: WMII Measured by: Mark Smith

Well No.: East MH Distance from pumping well: Type of test: LCS Test No: 1

Measuring equipment: Electric Measuring Tape Elev 793.51

Time Data
Pump on: Date ____ Time ____ (t)
Pump off: Date ____ Time ____ (t')
Duration of aquifer test.
Pumping ____ Recovery ____

Water Level Data
Static water level ____
Measuring point ____
Elevation of measuring point ____

Discharge Data
How Q measured ____
Depth of pump/air line ____
Previous pumping? Yes ____ No ____
Duration ____ End ____

Date	Clock time	Time since pump started t	Time since pump stopped t'	t/t'		Depth to Water level measurement	Correction or Conversion	Elev. Water level	Water level change s or s'		Discharge measurement	Rate		Comments on factors affecting test data
10/5	30					21.75								
	35					[illegible]								
	40													
—	45					[illegible]								
—	60					35.90								
—	90					[illegible]								
—	120					[illegible]								
	150					25.75								Test Terminated bec[illegible]
	180													[illegible]
	210													
	240													
	270													
	300													
	330													
	360													
	390													
	420													

AQUIFER TEST DATA

Owner WMII - HCD Address McMillan RD Antioch County Lake State IL

Date 10/5/02 Company performing test WMII Measured by Marck Smith

Well No. East MH Distance from pumping well pumping well Type of test pump test of LCS Test No 1

Measuring equipment Eletric Measuring tape MSL Elevation 793.51

Time Data	Water Level Data	Discharge Data	Comments on factors affecting test data
Pump on: Date ____ Time ____ (t) Pump off: Date ____ Time ____ (t') Duration of aquifer test: Pumping ____ Recovery ____	Static water level ____ Measuring point ____ Elevation of measuring point ____	How Q measured ____ Depth of pump/air line ____ Previous pumping? Yes ____ No ____ Duration ____ End ____	

Date	Clock time	Time since pump started t	Time since pump stopped t'	t/t'		Depth to Water level measurement	Correction or Conversion	Leachate Flowing Water level	Water level change s or s'		Discharge measurement	Rate	
9/5	0					33.65							
	.5					34.3							
	1					34.4							
	1.5					34.5							
	2					34.58							
	2.5					[illegible]							
	3					34.76							
	3.5					[illegible]							
	4					34.91							
	4.5					34.95							
	5.					35.00							
	5.5					35.05							
	6					[illegible]							
	6.5					[illegible]							
	7					[illegible]							
	7.5					[illegible]							
	8					[illegible]							
	8.5					35.2							
	9					[illegible]							
	9.5					[illegible]							
	10					[illegible]							
	11					[illegible]							
	12					[illegible]							
	13					[illegible]							
	14					[illegible]							
	15					[illegible]							
	20					[illegible]							
	25					[illegible]							

LEACHATE COLLECTION SYSTEM TEST
HOD LANDFILL, ANTIOCH, ILLINOIS

EAST MANHOLE

DATE: 10/5/1992 ELEVATION 793.51 MSL

TIME (MINUTES)	LEACHATE (FEET)	HEAD ELEV. (FEET MSL)
0	33.65	759.86
0.5	34.30	759.21
1	34.40	759.11
1.5	34.50	759.01
2	34.58	758.93
2.5	34.65	758.85
3	34.75	758.75
3.5	34.85	758.65
4	34.91	758.60
4.5	34.95	758.56
5	35.00	758.51
5.5	35.05	758.46
6	35.08	758.43
6.5	35.10	758.41
7	35.10	758.41
7.5	35.10	758.41
8	35.20	758.31
8.5	35.20	758.31
9	35.20	758.31
9.5	35.26	758.25
10	35.40	758.11
11	35.55	757.96
12	35.65	757.86
13	35.65	757.86
14	35.67	757.84
15	35.72	757.79
16	35.75	757.76
17	35.80	757.71
18	35.85	757.66
19	35.90	757.61
20	35.95	757.56
25	36.15	757.36
30	36.35	757.16
35	36.55	756.96
40	36.75	756.76
45	36.95	756.56
50	37.15	756.36
55	37.35	756.16
60	37.55	755.96
65	37.75	755.76

RECOVERY TIME FOR EAST MANHOLE

TIME	LEACHATE	HEAD ELEV.

BY: MARCH SMITH
DATE RECEIVED/SENT _____
SITE HOD RI/FS
FILE SYSTEM: PROJECT/SITE
FILE CODE: 3.4 W/ATTACH
2.1 W/O ATTACH
CF: _____
CF: _____

LEACHATE LEVELS
HOD LANDFILL

WELLS	10/91	11/91	12/91	1/92	2/92	3/92	4/92	5/92	6/92	7/92	8/92	9/92
G11D	761.18	760.86	761.24	760.86	761	761.6	761.55	760.95	759.81	759.58	767.21	760.85
WMH	757.47	757.07	DRY	DRY	DRY	756.74	DRY	DRY	758.92	759.62	758.31	758.82
EMH	757.81	752.66	753.17	756.66	753.87	754.32	755.7	DRY	758.51	751.59	757.35	754.55
PZ-1	749.69	752.99	753	DRY	752.39	751.9	751.96	DRY	757.48	759.72	750.63	752.63
PZ-2A	734.46	736.55	736.7	737.02	737.08	737.21	735.08	736.3	736.68	735.99	736.64	737.35
PZ-3A	748.21	741.05	741.5	741.67	742.02	742.35	742.33	742.35	742.92	742.46	743.07	742.85
PZ-8	749.31	DRY	DRY	DRY	DRY	DRY	DRY	DRY	759.91	753.83	753.04	751.69
PZ-9	757.71	752.1	753.61	752.94	754.97	753.24	DRY	DRY	775.32	755.67	762.71	754.94
PZ-10	746.47	749.4	749.62	751.41	763.96	751.2	747.46	DRY	752.03	752.89	750.44	751.76

Area of new landfill draining to EMH is 20 Ac = 871,200 sq ft x .38
Average thickness of leachate saturated waste is 15' = 13,068,000 x .38 cu ft saturated
effective porosity .38 = 4,965,840 cu ft
7.48 gal/cu ft = 37,144,483 gallons leachate

BY: MARCH SMITH
DATE RECEIVED/SENT _____
SITE HOD RI/FS
FILE SYSTEM: PROJECT/SITE
FILE CODE: 5.5 ✓ W/ATTACH
2.1 W/O ATTACH
CF: _____

WMH = 24.2 Ac = 1054 [illegible] sq ft
[illegible] 12' = 13,6[illegible] x .38 [illegible] x 7.48
= 35,95[illegible] gallons of leach

LEACHATE COLLECTION SYSTEM TEST
HOD LANDFILL, ANTIOCH, ILLINOIS

EAST MANHOLE

DATE: 10/5/1992 793.51 MSL

TIME (MINUTES)	LEACHATE (FEET)	HEAD ELEV. (FEET MSL)
0	33.65	759.86
0.5	34.30	759.21
1	34.40	759.11
1.5	34.50	759.01
2	34.58	758.93
2.5	34.68	758.83
3	34.76	758.75
3.5	34.85	758.66
4	34.91	758.60
4.5	34.95	758.56
5	35.00	758.51
5.5	35.05	758.46
6	35.08	758.43
6.5	35.10	758.41
7	35.10	758.41
7.5	35.10	758.41
8	35.20	758.21
8.5	35.20	758.15
9	35.30	758.11
9.5	35.36	757.96
10	35.40	757.96
11	35.55	757.81
12	35.55	757.84
13	35.60	757.79
14	35.67	757.81
15	35.72	757.86
20	36.00	756.76
25	36.45	756.51
30	36.75	756.76
35	37.00	756.51
40	37.44	756.07
45	37.84	755.67
60	38.96	754.55
90	41.55	751.96
120	44.52	748.99
137	45.75	747.76

LEACHATE COLLECTION SYSTEM TEST
HOD LANDFILL, ANTIOCH, ILLINOIS

DATE: 10/5/1992

TIME (MINUTES)	LEACHATE (INCHES)	LEACHATE (GALLONS)	LEACHATE (GPM)
0	0	0	0
30	29	1287	42.9
47	38	1800	30.2
60	47	2263	35.6
67	53	2510	35.3
82	69	3078	37.9
94	76	3454	31.3
109	84	3912	30.5
121	90	4254	28.5

RECOVERY TIME FOR EAST MANHOLE

TIME (MINUTES)	LEACHATE (FEET)	HEAD ELEV. (FEET MSL)
0	45.75	747.76
2.5	45.78	747.73
5	45.75	747.76
11	45.65	747.86
20	45.35	748.16
30	44.90	748.61
42	44.45	749.06
69	43.65	749.86

Waste Management of North America, Inc.
Midwest Region
Two Westbrook Corporate Center • Suite 1000
P.O. Box 7070
Westchester, Illinois 60154
708/409-0700

TEMPORARY LEACHATE TANKER
HOD LANDFILL, ANTIOCH ILLINOIS
OCTOBER 5, 1992

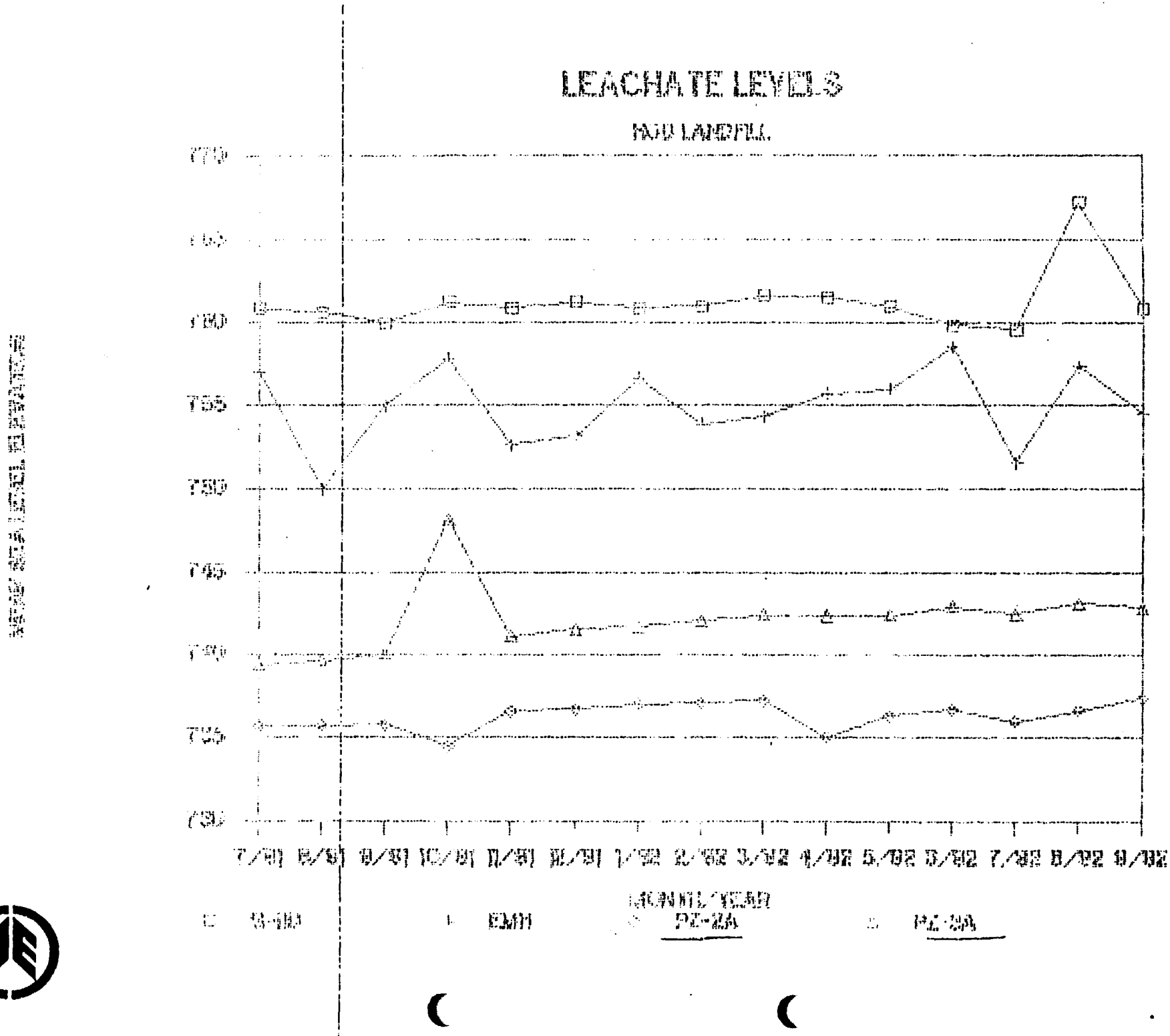
TIME	LEACHATE IN INCHES F	R	CONVERSION FACTOR	CUMULATIVE GALLONS	GAL PER TIME PERIOD	GPM
0		20"		0	0	0
15				0	0	0
30		29"		0	0	0
~~45~~ 47.5		38"		0	0	0
60		47.5"		0	0	0
67 ~~75~~	0	53"		0	0	0
82 ~~90~~	15.5"			0	0	0
94 ~~105~~	23"			0	0	0
109 ~~120~~	30.5"			0	0	0
121 ~~135~~	37"			0	0	0
136 ~~150~~				0	0	0
151 ~~165~~				0	0	0
~~180~~				0	0	0

FILE: TANKER

PRE-VAL [illegible] (Burlington Limited)
[illegible]
[illegible] 1672
Spec ID = MC [illegible]
Tank Capacity 2550 gal

Phone ~~[illegible]~~ -
1-416-637-2353

1" 94


LEACHATE LEVELS
HOD LANDFILL
770
765
760
755
750
745
740
735
730
7/91 8/91 9/91 10/91 11/91 12/91 1/92 2/92 3/92 4/92 5/92 6/92 7/92 8/92 9/92
MONTH/YEAR
EMH
PZ-2A
PZ-3A

LEACHATE LEVELS
HOD LANDFILL

.3	7/91	8/91	9/91	10/91	11/91	12/91	1/92	2/92	3/92	4/92	5/92	6/92	7/92	8/92	9/92
:1D	760.84	760.63	759.95	761.18	760.86	761.24	760.86	761	761.6	761.55	760.95	759.81	759.58	767.21	760.85
	DRY	DRY	757.23	757.47	757.07	DRY	DRY	DRY	756.74	DRY	DRY	758.92	759.62	758.31	758.82
..	757	750.05	755	757.51	752.66	753.17	756.66	753.87	754.32	755.7	756	758.51	751.59	757.35	754.55
2-1	750.42	749.53	758.24	749.69	752.99	753	DRY	752.39	751.9	751.96	DRY	757.48	759.72	750.63	752.63
2A	735.69	735.74	735.8	734.46	736.55	736.7	737.02	737.06	737.21	735.08	736.3	736.68	735.99	736.84	737.35
3A	739.4	739.65	740.02	748.21	741.05	741.5	741.67	742.02	742.35	742.33	742.35	742.92	743.46	743.07	743.85
:1-2	755.37	DRY	757.31	749.31	DRY	DRY	DRY	DRY	DRY	DRY	DRY	759.91	753.85	753.04	751.69
2-9	758.77	758.93	DRY	757.71	752.1	753.61	752.94	754.97	753.24	DRY	DRY	775.32	755.67	761.71	754.94
10	749.63	743.9	749.58	746.47	749.4	749.62	751.41	763.96	751.2	747.46	DRY	752.03	752.89	750.44	751.76

The HOD Landfill is divided into the OLD and NEW landfill. The NEW landfill's base grade divides leachate flow to the northwest to the east manhole and to the northeast to the deep clay borrow area in the refuse. The bottom of F2-2A according to design plans is supposed to be at a MSL elevation of 748.3; however the leachate elevations are consistently in the 734-737 MSL range. It appears that the boundaries of the clay borrow area extends futher to the west than is depicted on the design drawing (no as-builts exist as far as I know).