Report of:

FALL 2002-WELL INSTALLATION AND GEOTECHNICAL TESTING WEST JEFFERSON NORTH SITE

Prepared For:
Battelle Memorial Institute
505 King Ave.
Columbus, Ohio 43201

DLZ Ohio, Inc.
6121 Huntley Road
Columbus, Ohio 43229

March 17 2003

DLZ Job No. 0221-4016.00

DLZ

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ENGINEERS • ARCHITECTS • SCIENTISTS
PLANNERS • SURVEYORS

March 17, 2003

Dr. Thomas G. Naymik
Environmental Restoration Department
Battelle Memorial Institute
505 King Ave.
Columbus, Ohio 43201

Re: Data Report
Fall 2002-Well Installation and Geotechnical Testing
West Jefferson North Site
DLZ Job No. 0221-4016.00

Dear Mr. Naymik,

Please find enclosed the data developed for the well installation and geotechnical testing at the West Jefferson North Site. Please do not hesitate to call if you should have any questions, or if we may be of further assistance.

We wish to take this opportunity to thank all concerned with utilizing our services.

Sincerely

DLZ Ohio, Inc.

Paul de Verteuil, MSCE, P.E.
Field Services Division Manager

PDV/asg

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DATA REPORT
FALL 2002-WELL INSTALLATION AND GEOTECHNICAL TESTING
WEST JEFFERSON NORTH SITE

For

Battelle Memorial Institute
505 King Ave.
Columbus, Ohio 43201

By

DLZ Ohio, Inc.
6121 Huntley Road
Columbus, Ohio 43229

March 17, 2003
DLZ Job No. 0221-4016-00

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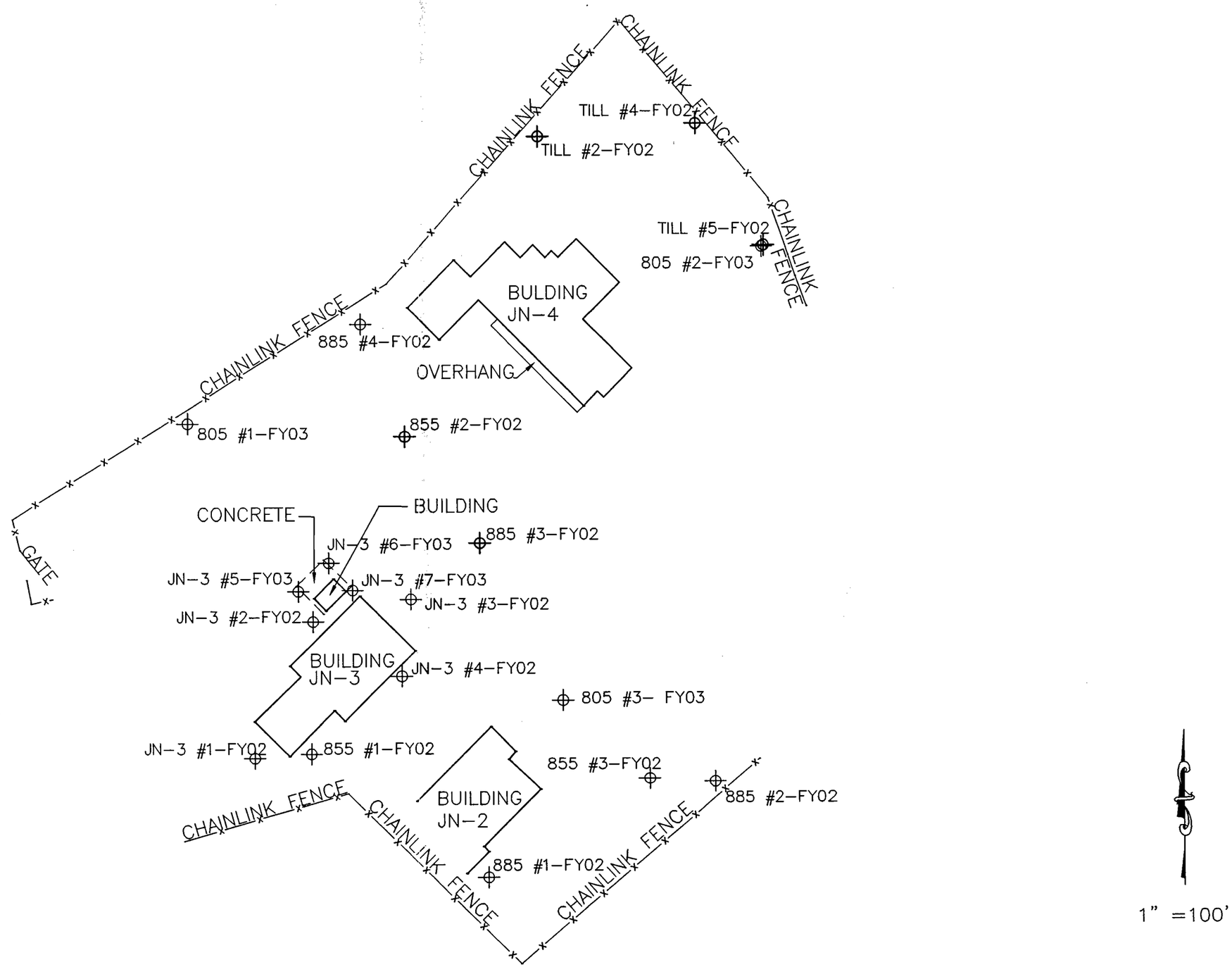
MONITORING WELL LOCATION PLAN
SURVEY DATA



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BORING/MONITORING WELL LOCATION PLAN
WEST JEFFERSON NORTH SITE

DRAWN	JMD
CHK'D.	
APPRV'D	
DATE	2/28/03
PROJECT NUMBER	0221-4009.00

NO.	REVISION	BY	DATE

REFERENCE SHEET:

DRAWING NUMBER

1

BATTELLE BORING LOCATIONS

BORING NAME/#	NORTHING	EASTING	ELEVATION	DESCRIPTION
805 #1-FY03	717560.17	1757893.93	914.86	GROUND
			917.02	TOP OF CASING
			916.98	TOP HIGH SIDE OF RISER
805 #2-FY03	717723.79	1758430.22	910.16	GROUND
			912.16	TOP OF CASING
			912.11	TOP HIGH SIDE OF RISER
805 #3-FY03	717301.05	1758242.79	914.68	GROUND
			916.68	TOP OF CASING
			916.64	TOP HIGH SIDE OF RISER
JN-3 #5-FY03	717402.82	1757996.49	914.54	GROUND
			916.57	TOP OF CASING
			916.26	TOP OF WELL CAP
JN-3 #6-FY03	717429.54	1758024.81	914.56	GROUND
			917.04	TOP OF CASING
			916.74	TOP OF WELL CAP
JN-3 #7-FY03	717403.99	1758047.01	914.61	GROUND
			917.08	TOP OF CASING
			916.66	TOP OF WELL CAP

LEGEND - BORING LOG TERMINOLOGY
BORING LOGS - 6 BORINGS

LEGEND – BORING LOG TERMINOLOGY

Explanation of each column, progressing from left to right

1. Depth (in feet) – refers to distance below the ground surface.

2. Elevation (in feet) – is referenced to mean sea level, unless otherwise noted.

3. Standard Penetration (N) – the number of blows required to drive a 2-inch O.D., 1-3/8 inch I.D., split-barrel sampler, using a 140-pound hammer with a 30-inch free fall. The blows are recorded in 6-inch drive increments. Standard penetration resistance is determined from the total number of blows required for one foot of penetration by summing the second and third 6-inch increments of an 18-inch drive.

   50/n – indicates number of blows (50) to drive a split-barrel sampler a certain number of inches (n) other than the normal 6-inch increment.

4. The length of the sampler drive is indicated graphically by horizontal lines across the "Standard Penetration" and "Recovery" columns.

5. Sample recovery from each drive is indicated numerically in the column headed "Recovery".

6. The drive sample location is designated by the heavy vertical bar in the "Sample No., Drive" column.

7. The length of hydraulically pressed "Undisturbed" samples is indicated graphically by horizontal lines across the "Press" column.

8. Sample numbers are designated consecutively, increasing in depth.

9. Soil Description

   a. The following terms are used to describe the relative compactness and consistency of soils:

   Granular Soils – Compactness

Term	Blows/Foot Standard Penetration
Very Loose	0 – 4
Loose	4 – 10
Medium Dense	10 – 30
Dense	30 – 50
Very Dense	over 50

   Cohesive Soils – Consistency

Term	Unconfined Compression tons/sq.ft.	Blows/Foot Standard Penetration	Hand Manipulation
Very Soft	less than 0.25	below 2	Easily penetrated by fist
Soft	0.25 – 0.50	2 – 4	Easily penetrated by thumb
Medium Stiff	0.50 – 1.0	4 – 8	Penetrated by thumb with moderate pressure
Stiff	1.0 – 2.0	8 – 15	Readily indented by thumb but not penetrated
Very Stiff	2.0 – 4.0	15 – 30	Readily indented by thumb nail
Hard	over 4.0	over 30	Indented with difficulty by thumb nail

   b. Color – If a soil is a uniform color throughout, the term is single, modified by such adjective as light and dark. If the predominant color is shaded by a secondary color, the secondary color precedes the primary color. If two major and distinct colors are swirled throughout the soil, the colors are modified by the term "mottled".

   c. Texture is based on the Unified Classification System. Soil particle size definitions are as follows:

Description		Size	Description		Size
Boulders		Larger than 8"	Sand	– Coarse	4.76 mm to 2.0 mm
Cobbles		8" to 3"		– Medium	2.0 mm to 0.42 mm
Gravel	– Coarse	3" to 0.75"		– Fine	0.42 mm to 0.074 mm
	– Fine	0.75" to 0.1875"	Silt		0.074 mm to 0.005 mm
			Clay		smaller than 0.005 mm

d. The main soil component is listed first. The minor components are listed in order of decreasing percentage of particle size.

e. Modifiers to main soil descriptions are indicated as a percentage by weight of particle sizes.

trace	0 to 10%
little	10 to 20%
some	20 to 35%
"and"	35 to 50%

f. Moisture content of **cohesionless soils** (sands and gravels) is described as follows:

Term	Relative Moisture or Appearance
Dry	No moisture present
Damp	Internal moisture, but none to little surface moisture
Moist	Free water on surface
Wet	Voids filled with free water

g. The moisture content of **cohesive soils** (silts and clays) is expressed relative to plastic properties.

Term	Relative Moisture or Appearance
Dry	Powdery
Damp	Moisture content slightly below plastic limit
Moist	Moisture content above plastic limit but below liquid limit
Wet	Moisture content above liquid limit

10. Rock Hardness and Rock Quality Designation

a. The following terms are used to describe the relative hardness of the **bedrock**.

Term	Description
Very Soft	Permits denting by moderate pressure of the fingers. Resembles hard soil but has rock structure. (Crushes under pressure of fingers and/or thumb)
Soft	Resists denting by fingers, but can be abraded and pierced to shallow depth by a pencil point. (Crushes under pressure of pressed hammer)
Medium Hard	Resists pencil point, but can be scratched with a knife blade. (Breaks easily under single hammer blow, but with crumbly edges.)
Hard	Can be deformed or broken by light to moderate hammer blows. (Breaks under one or two strong hammer blow, but with resistant sharp edges.)
Very Hard	Can be broken only by heavy and in some rocks repeated hammer blows.

b. Rock Quality Designation, RQD – This value is expressed in percent and is an indirect measure of rock soundness. It is obtained by summing the total length of all core pieces which are at least four inches long, and then dividing this sum by the total length of the core run.

11. Gradation – when tests are performed, the percentage of each particle size is listed in the appropriate column (defined in Item 9c).

12. When a test is performed to determine the natural moisture content, liquid limit moisture content, or plastic limit moisture content, the moisture content is indicated graphically.

13. The standard penetration (N) value in blows per foot is indicated graphically.

Client: Battelle | **Project:** Fall 2002- West Jefferson North Site | **Job No.** 0221-4016.00

LOG OF: 805 #1 FY-03 | **Location:** N: 717560.17, E: 1757893.93 | **Date Drilled:** 1-9-03 to 1-14-03

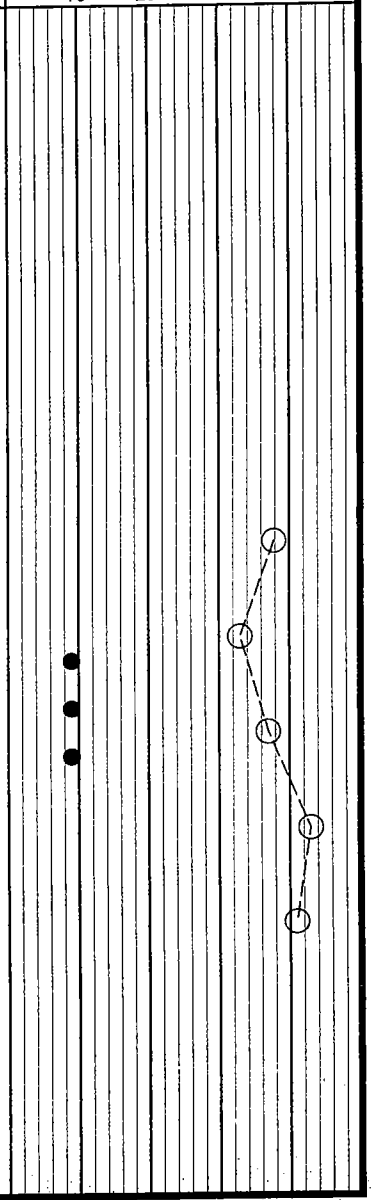
WATER OBSERVATIONS:
Water seepage at: NA
Water level at completion: (after washing) 30.88'

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press	Hand Penetrometer (tsf)	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	914.9												
20	894.9						Augered without sampling to 25 feet.						
25	889.9												
		10 18 20	26	1		3.5	Very stiff to hard dark gray CLAYEY SILT (CL-ML), some to "and" fine to coarse sand, trace fine gravel; damp.						
				2		4.0							
		9 18 15	24	3		4.5+							
				4		4.5+		2	4	9	21	38	27
30	884.9	9 18 19	30	5		4.5+		2	3	10	20	40	26
			24	6		4.5+		2	5	12	18	38	25
		12 21 22	30	7		4.5+							
			24	8		4.5+							
		8 18 23	28	9		4.5+							
35	879.9		24	10		4.5+							
40	874.9						Augered without sampling to 55 feet.						

GRADATION

STANDARD PENETRATION (N)
Blows per foot
10 20 30 40

Moisture Content - %
PL Natural LL
10 20 30 40



Client: Battelle | **Project:** Fall 2002- West Jefferson North Site | **Job No.** 0221-4016.00

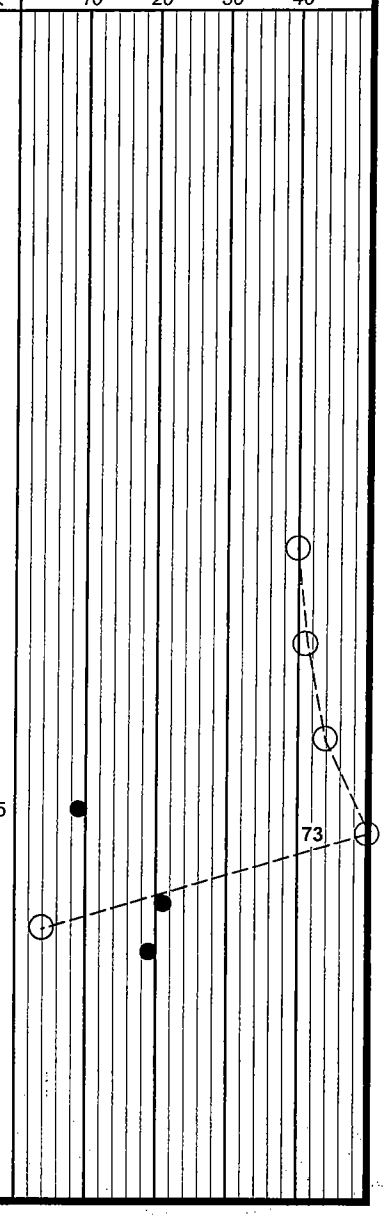
LOG OF: 805 #1 FY-03 | **Location:** N: 717560.17, E: 1757893.93 | **Date Drilled:** 1-9-03 to 1-14-03

WATER OBSERVATIONS:
Water seepage at: NA
Water level at completion: (after washing) 30.88'

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press	Hand Penetrometer (tsf)	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
40	874.9						Augered without sampling to 55 feet.						
50	864.9												
55	859.9												
		9 18 22		11		4.5+	Hard dark gray CLAYEY SILT (CL-ML), "and" fine to coarse sand, trace fine gravel; damp.						
		38	24	12		4.5+							
		11 17 24		13		4.5+							
		32	24	14		4.5+							
60	854.9	10 18 26		15		4.5+							
		36	24	16		4.5+							
		14 24 49		17		4.5+		4	6	16	25	34	15
63.0	851.9	49	24	18		4.5+							
		1 2 2		19		NA	Very loose dark gray fine SAND (SM), "and" clayey silt; wet.	0	0	0	50	47	3
65	849.9	32	24	20		NA	Approximate porosity (n)= 35%	0	0	0	58	39	3
70	844.9						Augered without sampling to 105 feet.						

STANDARD PENETRATION (N) — Blows per foot: 10 20 30 40

Moisture Content - % — PL, Natural, LL: 10 20 30 40



Client: Battelle | **Project:** Fall 2002- West Jefferson North Site | **Job No.** 0221-4016.00

LOG OF: 805 #1 FY-03 | **Location:** N: 717560.17, E: 1757893.93 | **Date Drilled:** 1-9-03 to 1-14-03

WATER OBSERVATIONS:
Water seepage at: NA
Water level at completion: (after washing) 30.88'

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press	Hand Penetrometer (tsf)	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	Moisture Content - % (PL / Natural / LL)	Standard Penetration (N) Blows per foot
70	844.9														
95	819.9						Augered without sampling to 105 feet.								
100	814.9														
105	809.9														
		45 50/4"		21		4.5+	Hard dark gray CLAYEY SILT (CL-ML), "and" fine to coarse sand, trace fine gravel; damp.								50+
			10	22											
		49 50/4"		23		4.5+		7	5	12	27	31	19		50+
			10	24											
110	804.9	47 50/4"		25		4.5+		5	5	15	26	31	19		50+
			10	26											
		45 50/4"		27		4.5+		6	5	14	24	30	20		50+
			10	28											
		49 50/5"		29		4.5+									50+
115	799.9		11	30											

Client: Battelle | **Project:** Fall 2002- West Jefferson North Site | **Job No.** 0221-4016.00

LOG OF: 805 #1 FY-03 | **Location:** N: 717560.17, E: 1757893.93 | **Date Drilled:** 1-9-03 to 1-14-03

WATER OBSERVATIONS:
Water seepage at: NA
Water level at completion: (after washing) 30.88'

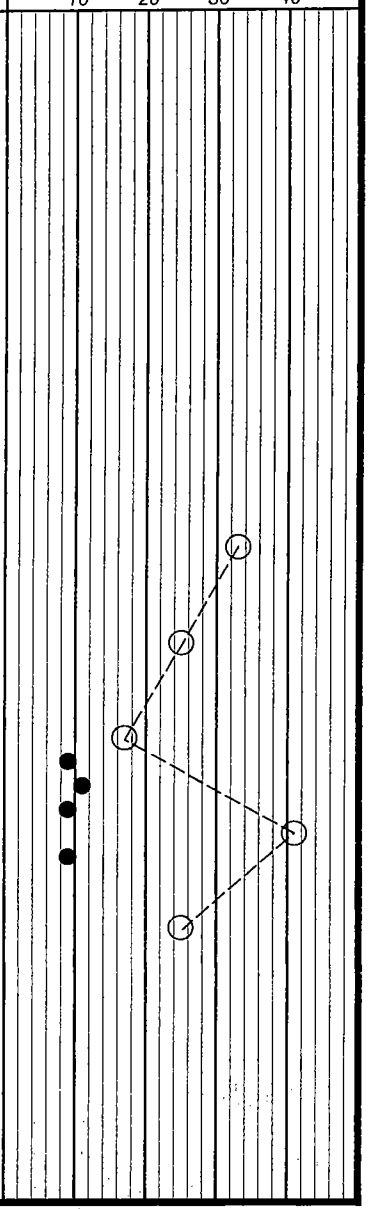
Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press	Hand Penetro-meter (tsf)	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) Blows per foot (10 20 30 40)	Moisture Content - % PL Natural LL (10 20 30 40)
115	799.9														
							Augered without sampling to bedrock at 162.5 feet.								
120	794.9														
160	754.9														
162.5	752.4														
							Bottom of Boring - 162.5'								

Client: Battelle | **Project:** Fall 2002- West Jefferson North Site | **Job No.** 0221-4016.00

LOG OF: 805 #2 FY-03 | **Location:** N: 717723.79, E: 1758430.22 | **Date Drilled:** 1-2-03 to 1-8-03

WATER OBSERVATIONS:
Water seepage at: NA
Water level at completion: 42.78'

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press	Hand Penetro-meter (tsf)	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	910.2												
15	895.2						Augered without sampling to 20 feet.						
20	890.2												
		12 13 20	22	1		NA	Hard dark gray CLAYEY SILT (CL-ML), "and" fine to coarse sand, trace fine gravel; damp-moist.						
		4 11 14	20	2		4.5+							
		6 7 10	23	3		4.5+							
25	885.2	5 20 21	23	4		4.5+							
				5		4.5+							
				6		4.5+		3	5	11	21	39	22
				7a		4.5+		5	6	14	21	36	19
26.9	883.3			7b		NA	Approximate porosity (n)= 20%	11	6	11	28	30	14
27.5	882.7			8		4.5+	Medium dense dark gray fine to coarse SAND (SC-SM), "and" clayey silt, little fine gravel; moist.	11	4	12	21	34	18
		5 10 15	21	9		4.5+	Hard dark gray CLAYEY SILT (CL-ML), "and" fine to coarse sand, little fine gravel; damp.						
30	880.2		24	10		4.5+							
35	875.2						Augered without sampling to 50 feet.						



Client: Battelle | **Project:** Fall 2002- West Jefferson North Site | **Job No.** 0221-4016.00

LOG OF: 805 #2 FY-03 | **Location:** N: 717723.79, E: 1758430.22 | **Date Drilled:** 1-2-03 to 1-8-03

WATER OBSERVATIONS:
Water seepage at: NA
Water level at completion: 42.78'

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press	Hand Penetrometer (tsf)	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	Moisture Content - % (PL / Natural / LL)	Standard Penetration (N) Blows per foot
35	875.2						Augered without sampling to 50 feet.								
45	865.2														
50	860.2														
		36 50/5"		11		4.5+	Hard dark gray CLAYEY SILT (CL-ML), "and" fine to coarse sand, trace fine gravel; damp.								50+
		-	11	12											
		30 50/5"		13		4.5+		3	5	11	25	38	19		50+
53.5	856.7	-	11	14			Medium dense dark gray fine to coarse SAND (SW), some fine-coarse gravel, trace clayey silt; wet.								
54.8	855.4	22		15a		NA									
55	855.2	42 50/4"		15b		4.5+	Approximate porosity (n)= 32%	5	4	12	25	36	19		50+
		-	16	16		4.5+	Hard dark gray CLAYEY SILT (CL-ML), "and" fine to coarse sand, trace gravel; damp-moist.	2	4	11	25	37	21		
		19 50/5"		17		4.5+									50+
		-	11	18		No Smpl									
		27 44		19		4.5+									
60	850.2	47 50/4"	22	20		4.5+									91
65	845.2						Augered without sampling to 95 feet.								

Client: Battelle | **Project:** Fall 2002- West Jefferson North Site | **Job No.** 0221-4016.00

LOG OF: 805 #2 FY-03 | **Location:** N: 717723.79, E: 1758430.22 | **Date Drilled:** 1-2-03 to 1-8-03

WATER OBSERVATIONS:
Water seepage at: NA
Water level at completion: 42.78'

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press	Hand Penetrometer (tsf)	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	Moisture Content - % (PL / Natural / LL)	STANDARD PENETRATION (N) Blows per foot
65	845.2						Augered without sampling to 95 feet.								
95	815.2														
		16 32 49 50/4"	22	21		4.5+	Hard reddish brown SILTY CLAY (CL), little fine to coarse sand, trace fine gravel; contains rock fragments; moist.								81
				22		4.5+									
		20 30 49 50/4"	22	23		4.5+									79
				24		4.5+									
100	810.2	17 33 48 50/4"	22	25		4.5+									81
				26		4.5+									
		16 25 46 50/4"	22	27		4.5+									71
				28		4.5+									
		20 44 50/5" -	17	29		4.5+		3	2	6	10	36	43	●	50+
105	805.2			30		4.5+		3	3	6	12	37	39	●	
		49 50/2" - -	8	31		4.5+									50+
				32											
		25 36 49 50/3"	21	33		4.5+									85
				34		4.5+									
110	800.2	23 40 50/5" -	17	35		4.5+									50+
				36		4.5+									
		28 50/4" - -	10	37		4.5+									50+
				38											
		28 42 50/5" -	17	39		4.5+									50+
115	795.2			40		4.5+									

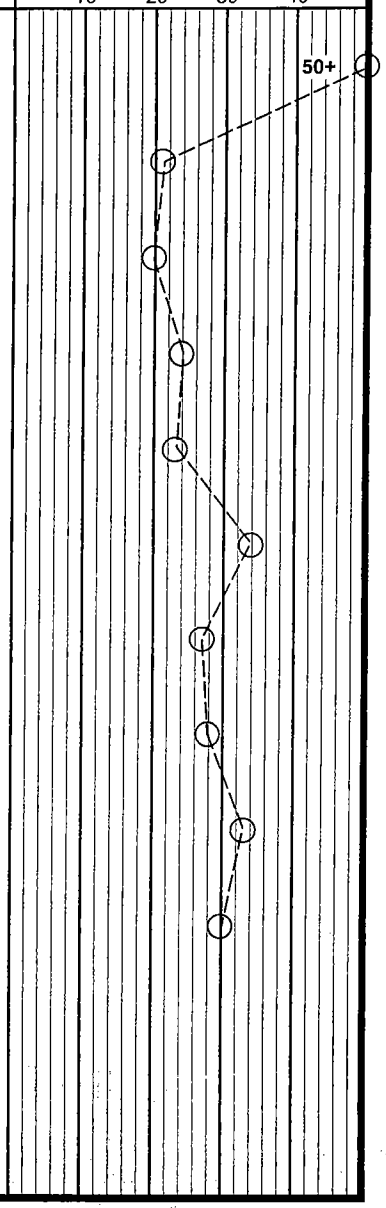
Client: Battelle	Project: Fall 2002- West Jefferson North Site	Job No. 0221-4016.00
LOG OF: 805 #2 FY-03	**Location:** N: 717723.79, E: 1758430.22	**Date Drilled:** 1-2-03 to 1-8-03

WATER OBSERVATIONS:
Water seepage at: NA
Water level at completion: 42.78'

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press	Hand Penetrometer (tsf)	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
115	795.2												
		28 43 50/4"		41		4.5+	Hard reddish brown SILTY CLAY (CL), little fine to coarse sand, trace fine gravel; contains rock fragments; moist.						
117.0	793.2	-	16	42		4.5+							
		8 10 11 19	24	43 44		3.5 3.0	Stiff to very stiff dark gray CLAYEY SILT (CL-ML), some fine to coarse sand, trace fine to coarse gravel; damp.						
120	790.2	5 6 14 20	24	45 46		2.5 1.5							
		7 10 14 22	24	47 48		3.5 2.8							
		7 9 14 20	24	49 50		2.0 3.0							
125	785.2	7 14 20 22	24	51 52		4.0 4.2							
		7 12 15 23	24	53 54		3.8 2.5							
129.0	781.2												
130	780.2	8 10 18 22	24	55 56		2.8 3.3	Hard reddish brown SILTY CLAY (CL), little fine to coarse sand, trace fine gravel; contains rock fragments; moist.						
		8 15 18 24	24	57 58		2.8 2.8							
		8 12 18 26	24	59 60		2.0 3.3							
135	775.2												
							Augered without sampling to bedrock @170.0 feet.						
170	740.2						Bottom of Boring - 170.0'						

STANDARD PENETRATION (N)
Blows per foot
10 20 30 40

Moisture Content - %
PL Natural LL
10 20 30 40



Client: Battelle | **Project:** Fall 2002- West Jefferson North Site | **Job No.** 0221-4016.00

LOG OF: 805 #3 FY-03 | **Location:** N: 717301.05, E: 1758242.79 | **Date Drilled:** 1-28-03 to 1-30-03

WATER OBSERVATIONS:
Water seepage at: 31.4'
Water level at completion: 35.56' (after washing)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press	Hand Penetro-meter (tsf)	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	Moisture Content - % (PL / Natural / LL)	Blows per foot
0	914.7														
15	899.7						Augered without sampling to 24 feet.								
20	894.7														
24.0	890.7														
25	889.7	10 20 21		1		4.5+	Hard dark gray CLAYEY SILT (CL-ML), "and" fine to coarse sand, trace fine gravel; moist.								
		28	24	2		4.5+									
		14 34 44		3											78
		49	0	4											
		12 22 30		5		4.5+									52
30	884.7	40	24	6		4.5+									
		14 20		7		4.5+		3	4	11	25	35	22		
31.4	883.3	29		8a		4.5+	Approximate porosity (n)= 32%	5	4	10	26	35	21		
32.0	882.7	23	20	8b		NA	Medium dense dark gray fine to coarse SAND (SM), trace clayey silt; wet.	0	1	7	71	11	11		
		14 22 31		9		4.5+		2	5	11	23	36	24		53
34.0	880.7	40	24	10		3.5	Hard dark gray CLAYEY SILT (CL-ML), "and" fine to coarse sand, trace fine gravel; moist.	3	4	11	23	36	24		
35	879.7						Augered without sampling to 54 feet.								

STANDARD PENETRATION (N) — Blows per foot: 10 20 30 40

Moisture Content - %: PL — Natural — LL; 10 20 30 40

Client: Battelle | **Project:** Fall 2002- West Jefferson North Site | **Job No.** 0221-4016.00

LOG OF: 805 #3 FY-03 | **Location:** N: 717301.05, E: 1758242.79 | **Date Drilled:** 1-28-03 to 1-30-03

WATER OBSERVATIONS:
Water seepage at: 31.4'
Water level at completion: 35.56' (after washing)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press	Hand Penetro-meter (tsf)	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	Moisture Content - % (PL / Natural / LL)	Standard Penetration (N) Blows per foot
35	879.7						Augered without sampling to 54 feet.								
45	869.7														
50	864.7														
54.0	860.7														
55	859.7	14 24 27 29	24	11		NA	Medium dense dark gray fine to coarse SAND (SC-SM), "and" clayey silt, trace fine gravel; moist.								51
				12		NA		6	7	15	33	28	11		
56.6	858.1	2 17		13a		NA		8	8	19	29	25	12		
				13b		NA	Medium dense dark gray fine to coarse SAND (SP), "and" fine to coarse gravel, trace clayey silt; moist.	41	19	28	8	3	2		
57.5	857.2	22 29	24	14a		NA		48	16	20	13	2	1		
				14b		4.5+	Approximate porosity (n)= 20%	2	4	12	27	36	19		
60	854.7	48 50/5" - -	11	15		4.5+	Very stiff to hard dark gray CLAYEY SILT (CL-ML), "and" fine to coarse sand, trace fine gravel; moist.								50+
				16											
		49 50/4" - -	10	17		4.5+									50+
				18											
64.0	850.7	42 46 50/4" -	16	19		4.5+									50+
				20		3.0									
65	849.7						Augered without sampling to 88.5 feet.								

Client: Battelle	Project: Fall 2002- West Jefferson North Site	Job No. 0221-4016.00
LOG OF: 805 #3 FY-03	Location: N: 717301.05, E: 1758242.79	Date Drilled: 1-28-03 to 1-30-03

WATER OBSERVATIONS:
Water seepage at: 31.4'
Water level at completion: 35.56' (after washing)

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press	Hand Penetro-meter (tsf)	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
65													
							Augered without sampling to 88.5 feet.						
85													
90							Bottom of Boring - 88.5'						
95													
100													
105													

GRADATION

STANDARD PENETRATION (N)
Blows per foot
10 20 30 40

Moisture Content - %
PL Natural LL
10 20 30 40

Client: Battelle	Project: Fall 2002- West Jefferson North Site	Job No. 0221-4016.00

LOG OF: JN-3 #5 FY-03

Location: N: 717402.82, E: 1757996.49

Date Drilled: 1-31-03

WATER OBSERVATIONS:
Water seepage at: NA
Water level at completion: No Free Water

STANDARD PENETRATION (N) — Blows per foot: 10 20 30 40

Moisture Content - % — PL Natural LL: 10 20 30 40

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press	Hand Penetro-meter (tsf)	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	914.5						Augered without sampling to 32 feet.						
15	899.5						Encountered concrete fragments and barbed wire in fill.						
16.0	898.5						Inferred till contact at 16 feet.						
20	894.5												
25	889.5												
30	884.5												
32.0	882.5												
							Bottom of Boring - 32.0'						
35	879.5												

Client: Battelle	Project: Fall 2002- West Jefferson North Site	Job No. 0221-4016.00
LOG OF: JN-3 #6 FY-03	Location: N: 717429.54, E: 1758024.81	Date Drilled: 2-3-03

WATER OBSERVATIONS:
Water seepage at: NA
Water level at completion: No Free Water

STANDARD PENETRATION (N) — Blows per foot: 10 20 30 40

Moisture Content - % — PL Natural LL: 10 20 30 40

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press	Hand Penetro-meter (tsf)	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay
0	914.6						Augered without sampling to 32 feet.						
15	899.6						Encountered concrete and brick fragments in fill.						
16.0	898.6						Inferred till contact at 16 feet.						
20	894.6												
25	889.6												
30	884.6												
32.0	882.6						Bottom of Boring - 32.0'						
35	879.6												

Client: Battelle	Project: Fall 2002- West Jefferson North Site	Job No. 0221-4016.00
LOG OF: JN-3 #7 FY-03	Location: N: 71740399, E: 1758047.01	Date Drilled: 2-4-03

WATER OBSERVATIONS:
Water seepage at: NA
Water level at completion: No Free Water

Depth (ft)	Elev. (ft)	Blows per 6"	Recovery (in)	Sample No. Drive	Sample No. Press	Hand Penetrometer (tsf)	DESCRIPTION	% Aggregate	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	STANDARD PENETRATION (N) Blows per foot (10 20 30 40)	Moisture Content - % PL Natural LL (10 20 30 40)
0	914.6						Augered without sampling to 32 feet.								
15	899.6						Encountered concrete fragments and barbed wire in fill.								
16.0	898.6						Inferred till contact at 16 feet.								
20	894.6														
25	889.6														
30	884.6														
32.0	882.6														
							Bottom of Boring - 32.0'								
35	879.6														

MONITORING WELL INSTALLATION REPORTS-3 WELLS
DEWATERING WELL INSTALLATION REPORTS-3 WELLS

MONITORING WELL INSTALLATION REPORT

PROJECT: Fall 2002- West Jefferson North Site

PROJECT NO: 0221-4016.00

GROUND SURFACE ELEVATION: 914.86

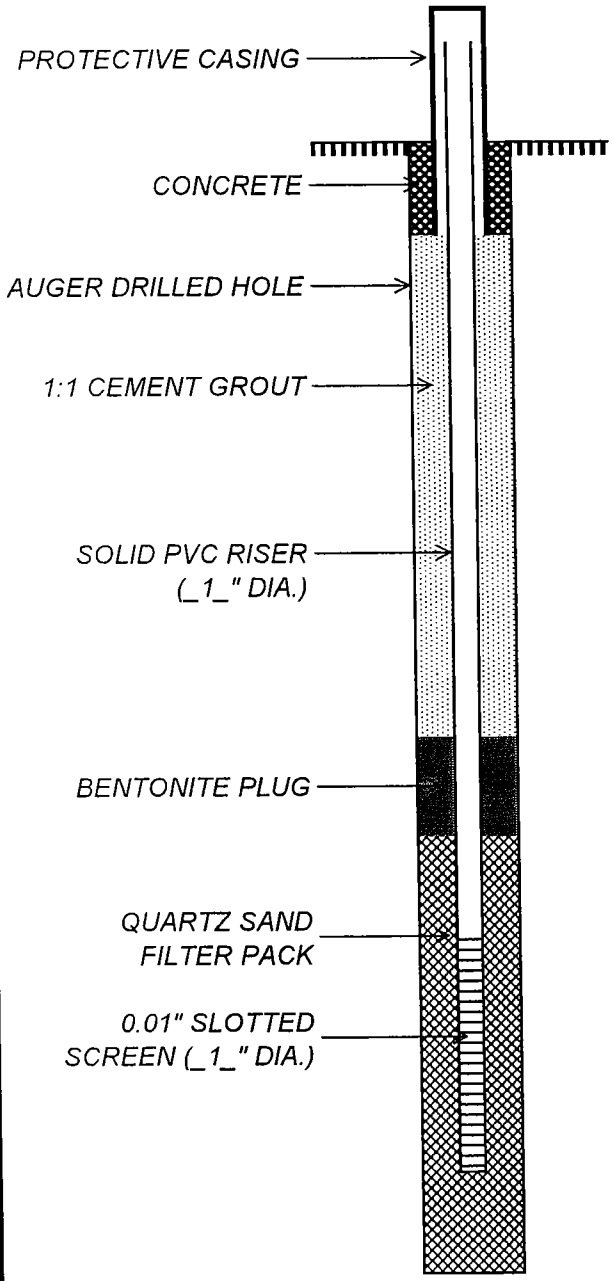
TOP OF RISER PIPE ELEVATION: 916.98

BORING NO.: 805#1 FY-03

DATE INSTALLED: 7/14/03

LOGGED BY: Mark Evener

GROUND WATER LEVEL AT COMPLETION: 30.88' **



DEPTH BELOW GROUND SURFACE	
152.5'	TOP OF PLUG
155.5'	TOP OF SAND
157.5'	TOP OF SCREEN
162.5'	BOTTOM OF SCREEN
162.5'	BOTTOM OF SAND PACK

REMARKS AND NOTES

** Water level includes water used during drilling

Water level on 2-7-03= 32.65' *

Water level on 2-18-03= 40.59' *

* Water level readings taken from top of riser

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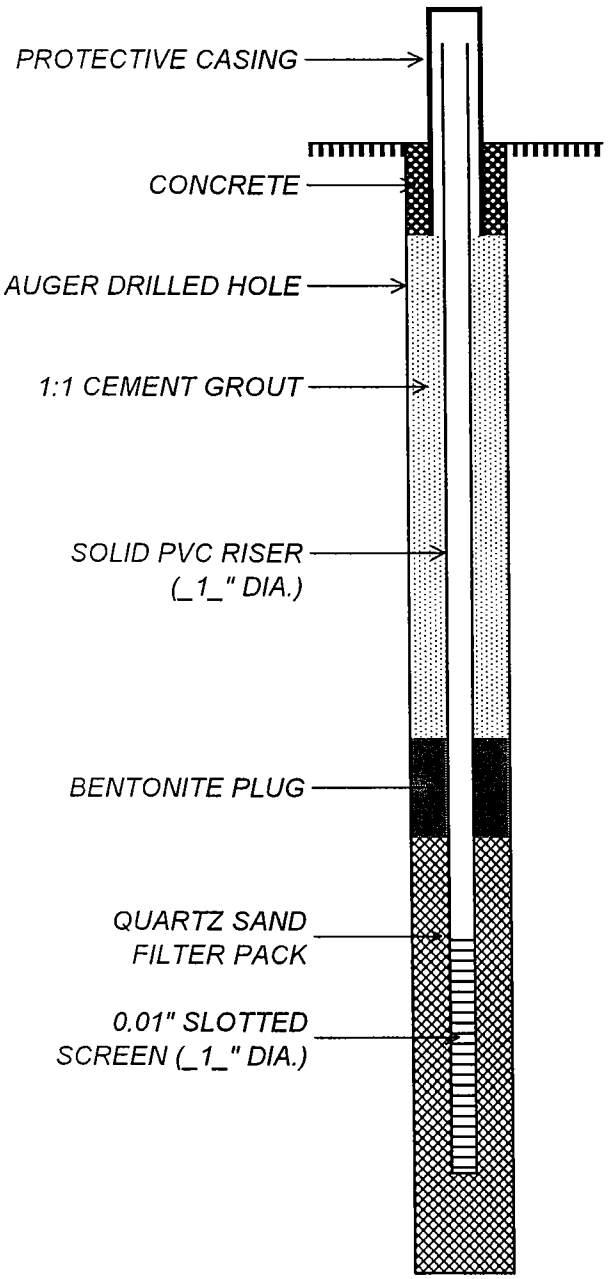
MONITORING WELL INSTALLATION REPORT

PROJECT:	Fall 2002- West Jefferson North Site	*BORING NO.:*	805 #2 FY-03
PROJECT NO:	0221-4016.00	*DATE INSTALLED:*	1/8/03
GROUND SURFACE ELEVATION:	910.16	*LOGGED BY:*	Mark Evener
TOP OF RISER PIPE ELEVATION:	912.11	*GROUND WATER LEVEL AT COMPLETION:*	34.31'



DEPTH BELOW GROUND SURFACE	
161.5'	*TOP OF PLUG*
163.5'	*TOP OF SAND*
165'	*TOP OF SCREEN*
170'	*BOTTOM OF SCREEN*
170'	*BOTTOM OF SAND PACK*

REMARKS AND NOTES

Water level on 2-7-03= 44.51' *

Water level on 2-18-03= 43.15' *

* Water level readings taken from top of riser

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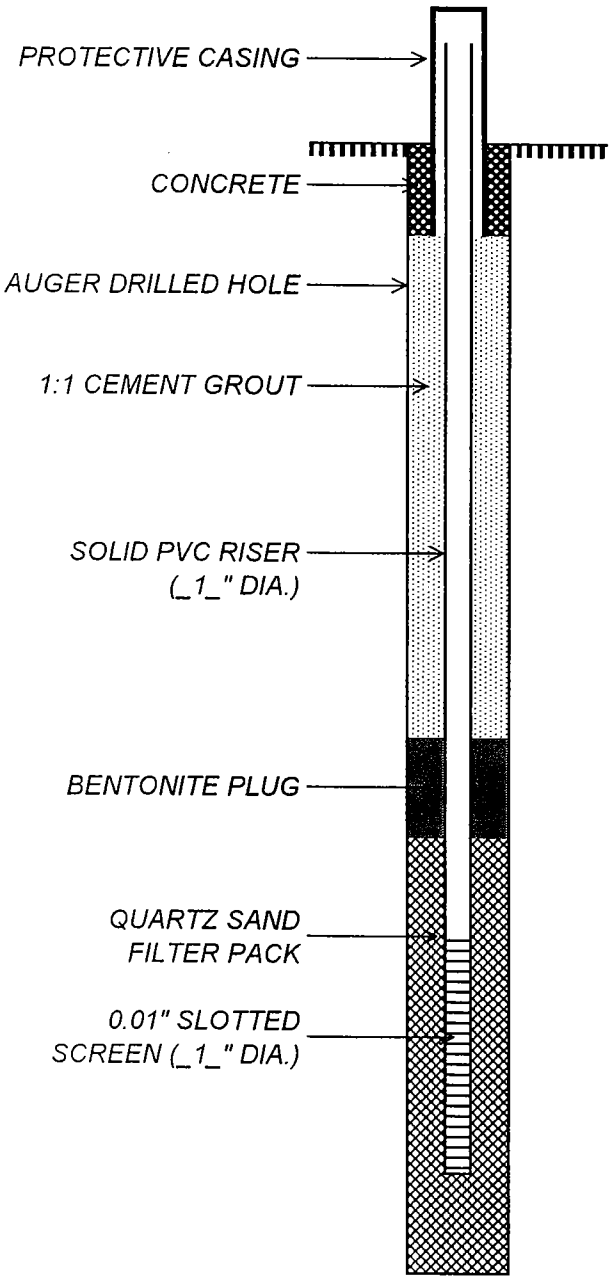
MONITORING WELL INSTALLATION REPORT

PROJECT:	Fall 2002- West Jefferson North Site	*BORING NO.:*	805 #3 FY-03
PROJECT NO:	0221-4016.00	*DATE INSTALLED:*	1/30/03
GROUND SURFACE ELEVATION:	914.68	*LOGGED BY:*	Mark Evener
TOP OF RISER PIPE ELEVATION:	916.64	*GROUND WATER LEVEL AT COMPLETION:*	35.56' **



DEPTH BELOW GROUND SURFACE	
77.5'	*TOP OF PLUG*
79.5'	*TOP OF SAND*
83.5'	*TOP OF SCREEN*
88.5'	*BOTTOM OF SCREEN*
88.5'	*BOTTOM OF SAND PACK*

REMARKS AND NOTES

** Water level includes water used during drilling

Water level on 2-7-03= 38.66' *

Water level on 2-18-03= 43.93' *

* Water level readings taken from top of riser

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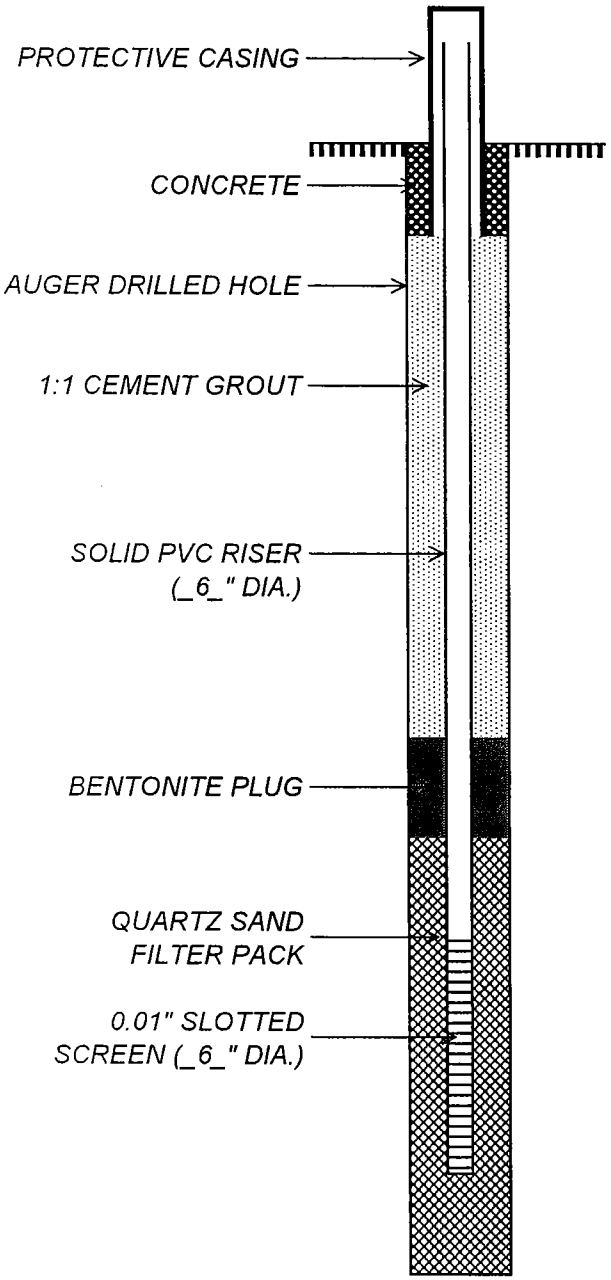
DEWATERING WELL INSTALLATION REPORT

PROJECT:	Fall 2002- West Jefferson North Site	*BORING NO.:*	JN-3 #5 FY-03
PROJECT NO:	0221-4016.00	*DATE INSTALLED:*	1/31/03
GROUND SURFACE ELEVATION:	914.54	*LOGGED BY:*	Mark Evener
TOP OF WELL CAP ELEVATION:	916.26	*GROUND WATER LEVEL AT COMPLETION:*	No Free Water



DEPTH BELOW GROUND SURFACE	
3'	*TOP OF PLUG*
5'	*TOP OF SAND*
7'	*TOP OF SCREEN*
32'	*BOTTOM OF SCREEN*
32'	*BOTTOM OF SAND PACK*

REMARKS AND NOTES

Water level on 2-7-03= 8.15' *

Water level on 2-18-03= 8.61' *

* Water level readings taken from top of riser

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DEWATERING WELL INSTALLATION REPORT

PROJECT: Fall 2002- West Jefferson North Site

PROJECT NO: 0221-4016.00

GROUND SURFACE ELEVATION: 914.56

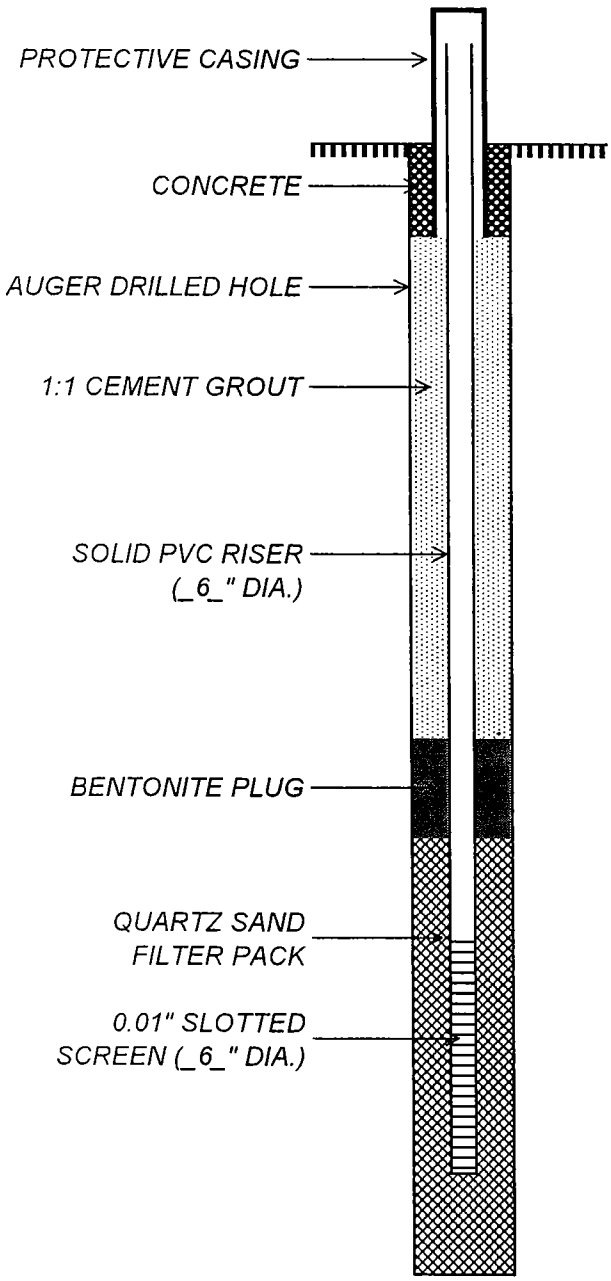
TOP OF WELL CAP ELEVATION: 916.74

BORING NO.: JN-3 #6 FY-03

DATE INSTALLED: 2/3/03

LOGGED BY: Mark Evener

GROUND WATER LEVEL AT COMPLETION: No Free Water



DEPTH BELOW GROUND SURFACE	
3'	TOP OF PLUG
5'	TOP OF SAND
7'	TOP OF SCREEN
32'	BOTTOM OF SCREEN
32'	BOTTOM OF SAND PACK

REMARKS AND NOTES

Water level on 2-7-03= 11.83' *

Water level on 2-18-03= 11.13' *

* Water level readings taken from top of riser

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DEWATERING WELL INSTALLATION REPORT

PROJECT: Fall 2002- West Jefferson North Site

PROJECT NO: 0221-4016.00

GROUND SURFACE ELEVATION: 914.61

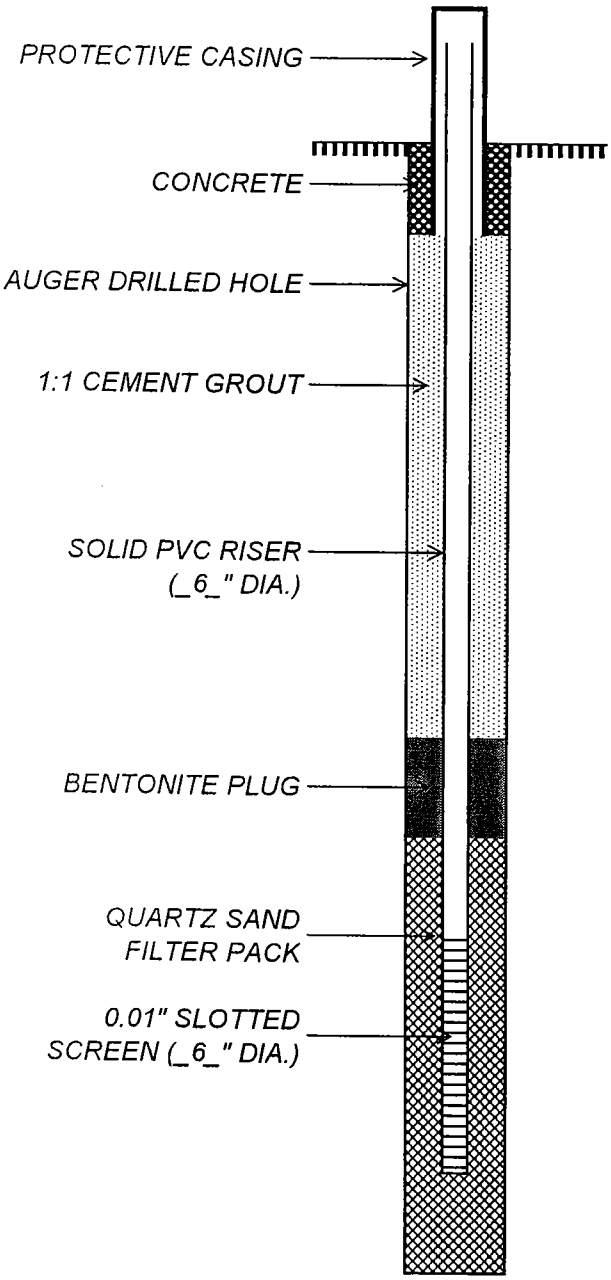
TOP OF WELL CAP ELEVATION: 916.66

BORING NO.: JN-3 #7 FY-03

DATE INSTALLED: 2/4/03

LOGGED BY: Mark Evener

GROUND WATER LEVEL AT COMPLETION: No Free Water



DEPTH BELOW GROUND SURFACE

3'	TOP OF PLUG
5'	TOP OF SAND
7'	TOP OF SCREEN
32'	BOTTOM OF SCREEN
32'	BOTTOM OF SAND PACK

REMARKS AND NOTES

No Free Water on 2-7-03

Water level on 2-18-03= 31.91' *

* Water level readings taken from top of riser

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WELL DEVELOPMENT DATA

DLZ Job No. 0221-4016.00

FALL 2002-WEST JEFFERSON NORTH SITE

WELL DEVELOPMENT SUMMARY

In accordance with the Statement of Work attached to the request for Proposal dated October 25, 2002, DLZ developed all newly installed groundwater-monitoring wells and de-watering wells. The wells were developed between February 7, 2003 and February 27, 2003, under the supervision of Dr. Thomas Naymik and Mr. Thomas Worthington of Battelle.

JN-3 Dewatering Wells

The static water level was measured at the beginning of development for all JN-3 wells. The de-watering wells JN-3 #5 FY-03, JN-3 #6 FY-03, and JN-3 #7 FY-03 were not sampled for pH, temperature or specific conductivity, as instructed by Dr. Thomas Naymik. All wells were purged using a submersible pump until they were dry. In the case of JN-3 #7 FY-03, water was added to the well, since the well was not producing any water. The water was subsequently pumped from the well, following the same procedure as the remaining de-watering wells. All well development data recorded can be observed in the following Well Development Sheets.

805 Monitoring Wells

The three monitoring wells were constructed of 1-inch schedule 40 PVC risers and screens. The screens were five feet in length and had 0.010 sawn slots. Global #5 sand was recorded as the filter pack for the screens. Because the wells were at a significant depth (88 to 170 feet below surface) and were small diameter the wells were developed with a combination of compressed air lift and foot valve lift pump. The air lift was used to displace sediment from the bottom of the well and surge the sand pack of the well to remove additional sediment. Wells were repeatedly air lifted until the larger particle sizes of sediment were removed from the well. Following air lifting a Waterra® check valve lift pump was used to surge the sand pack and withdraw the sediment laden water from the wells. Because the Waterra® pump is unable to entrain larger particle sizes or provide significant lift to remove significant amounts of sediment the wells were periodically air surged to remove the excess sediment. It was noted that well 805 No. 2 had a very slow rate of recharge and that sediment accumulation was significant, resulting in the frequent fouling of the check valve body and piping of the Waterra® pump. This well was repeatedly air lifted until sediment levels were reduced so that pumping could proceed. In addition, approximately fifty gallons of water were added to the well 805 No. 2 to facilitate the surging and sediment removal. The wells were pumped until the water contained predominantly clay size particles and the visual turbidity was significantly reduced.

All well locations and elevations were surveyed by DLZ upon completion.

WELL DEVELOPMENT SHEET

PROJECT: 0221-4016.00 DATE: 2/20/03

WELL NUMBER: 805- # 1 EQUIPMENT USED: Waterra Pump & Compressor

FIELD PERSONNEL: B. Mott. W. Rutherford SIGNATURE:

WELL DATA

Well secure upon arrival? Yes Well condition Good

Observations upon well opening (i.e. odors, etc.) None

Well depth 162.5

Top of riser elevation (msl) 916.98

Depth to water below riser 41.3

Groundwater elevation (msl) 875.68

PURGING DATA

Date of purge 2/20/03 Time of purge 10:00

Volume of water in casing (gal.) -- Purge volume (gal.) Not Measured

Purge water appearance Dark gray changing to milkey gray in color after purging

OBSERVATIONS Well was air lifted to remove coarser grained sediment the well was then surger and pumped with the Waterra Pump untill the well water cleared to a milkey consistancy

WELL SECURED UPON DEPARTURE? YES

WELL DEVELOPMENT SHEET

PROJECT: 0221-4016.00

DATE: 2/7/03

WELL NUMBER: 805- # 2

EQUIPMENT USED: Waterra Pump & Compressor

FIELD PERSONNEL: B. Mott. W. Rutherford

SIGNATURE:

WELL DATA

Well secure upon arrival? Yes

Well condition Good

Observations upon well opening (i.e. odors, etc.) None

Well depth 170.8

Top of riser elevation (msl) 912.11

Depth to water below riser 68.2

Groundwater elevation (msl) 843.91

PURGING DATA

Date of purge 2/20/03

Time of purge 3:00 PM

Volume of water in casing (gal.) --

Purge volume (gal.) Not Measured

Purge water appearance Dark Orange Brown changing to milky tan at end of purging

OBSERVATIONS: Well was repeatedly air lifted to remove the significant amount of silt in the well and filter pack. Well was then surged with a Waterra Pump. Air and air lift were repeated several times over the coarse of several days in an attempt to clear the well. Because the well was slow to recharge. Approximately fifty gallons of water were added to the well to promote the surging and cleaning of the filter pack

WELL SECURED UPON DEPARTURE? YES

WELL DEVELOPMENT SHEET

PROJECT: 0221-4016.00 DATE: 2/7/03

WELL NUMBER: 805- # 3 EQUIPMENT USED: Waterra Pump & Compressor

FIELD PERSONNEL: B. Mott. W. Rutherford SIGNATURE:

WELL DATA

Well secure upon arrival? Yes Well condition Good

Observations upon well opening (i.e. odors, etc.) None

Well depth 88.8

Top of riser elevation (msl) 914.68

Depth to water below riser 51.46

Groundwater elevation (msl) 863.22

PURGING DATA

Date of purge 2/21/03 Time of purge 9:30

Volume of water in casing (gal.) -- Purge volume (gal.) Not Measured

Purge water appearance Orange Brown changing to milky tan at end of purging

OBSERVATIONS Well was air lifted to remove coarser grained sediment the well was then surged and pumped with the Waterra Pump until the well water cleared to a milky consistency

WELL SECURED UPON DEPARTURE? YES

WELL DEVELOPMENT SHEET

PROJECT: 0221-4016.00 DATE: 2/7/03

WELL NUMBER: JN-3 #5 FY-03 EQUIPMENT USED: Pump

FIELD PERSONNEL: Mark Evener SIGNATURE:

WELL DATA

Well secure upon arrival? Yes Well condition Good

Observations upon well opening (i.e. odors, etc.) None

Well depth 33.48'

Top of riser elevation (msl) 916.26

Depth to water below riser 8.15'

Groundwater elevation (msl) 908.11

PURGING DATA

Date of purge 2/7/03 Time of purge 9:30

Volume of water in casing (gal.) 149 Purge volume (gal.) 149

Purge water appearance Clear

OBSERVATIONS Well pumped dry at 149 gallons

WELL SECURED UPON DEPARTURE? YES

WELL DEVELOPMENT SHEET

PROJECT: 0221-4016.00 DATE: 2/7/03

WELL NUMBER: JN-3 #6 FY-03 EQUIPMENT USED: Pump

FIELD PERSONNEL: Mark Evener SIGNATURE:

WELL DATA

Well secure upon arrival? Yes Well condition Good

Observations upon well opening (i.e. odors, etc.) None

Well depth 33.86'

Top of riser elevation (msl) 916.74

Depth to water below riser 11.83'

Groundwater elevation (msl) 904.91

PURGING DATA

Date of purge 2/7/03 Time of purge 10:00

Volume of water in casing (gal.) 130 Purge volume (gal.) 130

Purge water appearance Clear

OBSERVATIONS Well pumped dry at 130 gallons

WELL SECURED UPON DEPARTURE? YES

WELL DEVELOPMENT SHEET

PROJECT: 0221-4016.00 DATE: 2/7/03

WELL NUMBER: JN-3 #7 FY-03 EQUIPMENT USED: Pump

FIELD PERSONNEL: Mark Evener SIGNATURE:

WELL DATA

Well secure upon arrival? Yes Well condition Good

Observations upon well opening (i.e. odors, etc.) None

Well depth 34.06'

Top of riser elevation (msl) 916.66

Depth to water below riser No Free Water

Groundwater elevation (msl) NA

PURGING DATA

Date of purge 2/7/03 Time of purge 11:00

Volume of water in casing (gal.) 171 Purge volume (gal.) 171

Purge water appearance Clear

OBSERVATIONS Pumped well dry at 171 gallons

WELL SECURED UPON DEPARTURE? YES

SLUG TEST DATA

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March 17, 2003

Mr. Thomas G. Naymik, PhD
Environmental Restoration Department
Battelle Memorial Institute
505 King Avenue
Columbus, Ohio 43201-2693

Re: Well Development and Slug Testing
Fall 2002-Well Installation and Geotechnical Testing
West Jefferson North Facility
DLZ Project No. 0221-4016.00

Dear Mr. Naymik:

DLZ Ohio, Inc. (DLZ) has completed the well development and slug testing of three deep (805) wells at the West Jefferson North Facility located north east of the city of West Jefferson, Ohio. The wells were developed and tested from February 18 thru 27, 2003, and are identified as 805 No. 1, 805 No. 2, and 805 No. 3. All three wells are located inside the facility's controlled area.

Discussion relative to the procedures and results of the slug testing follow. Discussion relative to the well development is covered in the Well Development Data section

The slug tests were conducted by installing a pneumatic pressure assembly on the well and lowering the potentiometeric head with air pressure. The pressure on the water column was released and recovery of the displaced water column was measured over time. Water displacement was measured using an In-Situ Mini Troll Pro®. The Mini Troll® utilizes a vented pressure transducer to measure changes in head pressure of the water column and compensate for barometric pressure variations. The Mini Troll® was programmed using the Win-Situ software via a cable to a hand held computer (e.g. Palm Pilot) at the surface. Each test data was logged onto a logarithmic time scale, in seconds, over a displacement of water column in feet of water. Two slug tests were performed on each well.

The slug test data was analyzed with AqteSolv® for Windows® version 3.01. Well construction and geologic formation data were input into the software for each well. No samples were collected in the screened zone, therefore the saturated thickness of the aquifer was assumed to be 2.5 feet of penetration into the aquifer. Because the Anisotropy Ratio for the aquifer was unknown, a value of 1 was used. Additionally, the porosity of the coarse sand filter pack was assumed to be 39 percent, based on a value presented in Johnson, 1986. Data from the data logger was imported into AqteSolv®. The displacement data was manipulated to invert the recovery curve to assist the software in completing the analysis. This data was also edited to remove extraneous data at the beginning of the slug test.

Computer analysis of the data was conducted using the Bouwer-Rice straight-line method for partially penetrating wells in confined aquifers to assess the hydraulic conductivity of the wells. The Bouwer-Rice method assumes the following conditions: the aquifer has infinite aerial extent; it is homogenous and of uniform thickness; the potentiometric head is initially horizontal; the slug is instantaneously inserted or removed from the well; flow is steady and the aquifer is confined. Based on geological information collected

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from the well construction, the sands that encounter the screened interval are over run by lower permeability units. Based on the field observations, the sand layer appears to be confined.

Results from test well 805-No. 1 and test well 805 No. 3 had a hydraulic conductivity (K) value of 10^{-4} cm/sec. The K value for test well 805 No. 2 showed a lower hydraulic conductivity of 10^{-5} cm/sec. Raw data from the data logger and the AqteSolv® data sheets are provided as an enclosure.

If you have any questions, or require additional information, please do not hesitate to call us at 614/888-0040.

Sincerely,

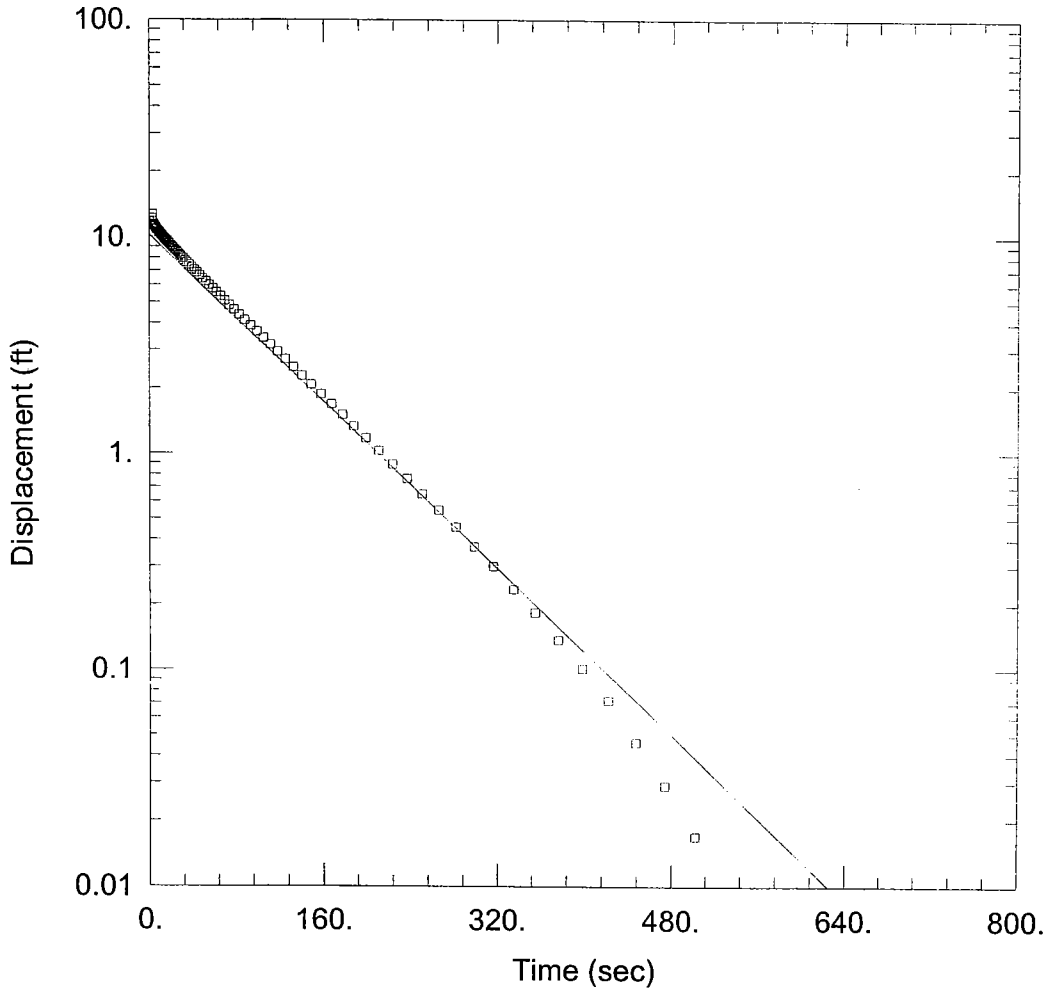
DLZ OHIO, INC.

Brian Mott

Brian Mott
Senior Geologist

Enclosure
BM:asg

M:\proj\0221\4016.00\Well Development and Slug Testing.doc



PNEUMATIC SLUG OUT

Data Set: C:\...\Battelle 805 No 1 (retest) BouwerRice.aqt
Date: 03/17/03 Time: 08:43:19

PROJECT INFORMATION

Company: DLZ Ohio, Inc
Client: Battelle West Jefferson
Project: 0221-4016.00
Test Location: West Jefferson North Site
Test Well: 805 #1
Test Date: 02-27-03

AQUIFER DATA

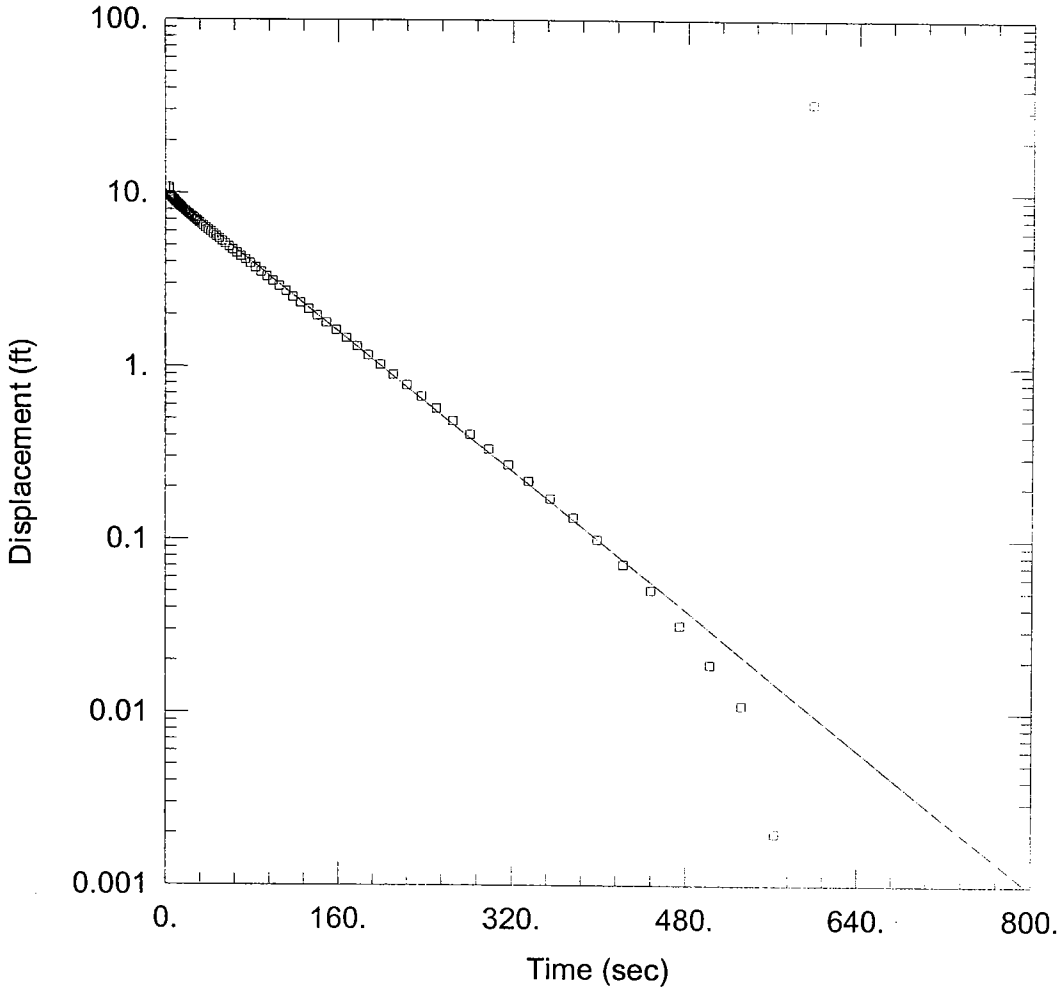
Saturated Thickness: 2.5 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (805 No. 1)

Initial Displacement: 12.18 ft
Wellbore Radius: 0.06875 ft
Screen Length: 5. ft
Gravel Pack Porosity: 0.39
Casing Radius: 0.04167 ft
Well Skin Radius: 0.06875 ft
Total Well Penetration Depth: 2.5 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 0.0001661 cm/sec
y0 = 10.23 ft



PNEUMATIC SLUG OUT

Data Set: C:\...\Battelle 805 No 1 (retest2) BouwerRice.aqt
Date: 03/17/03 Time: 08:43:27

PROJECT INFORMATION

Company: DLZ Ohio, Inc
Client: Battelle West Jefferson
Project: 0221-4016.00
Test Location: West Jefferson North Site
Test Well: 805 #1
Test Date: 02-27-03

AQUIFER DATA

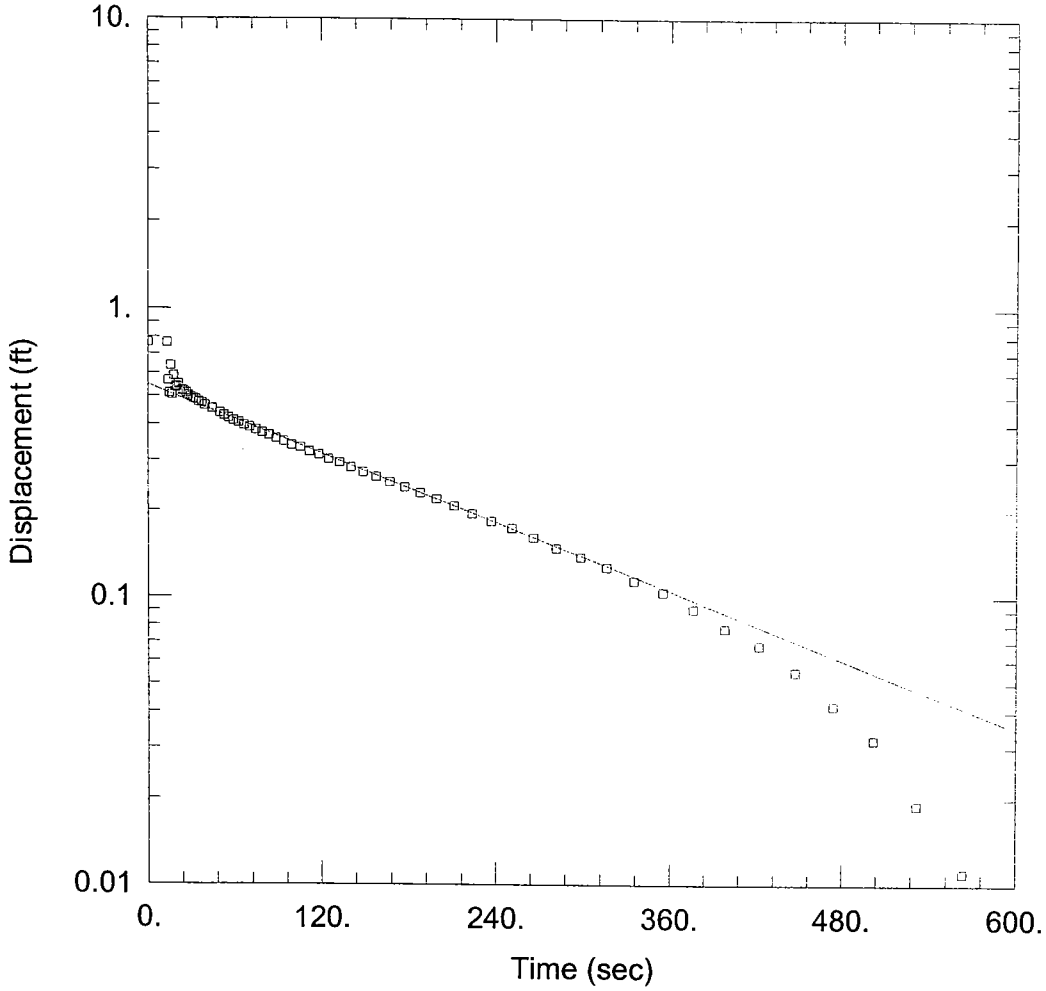
Saturated Thickness: 2.5 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (805 No. 1)

Initial Displacement: 10.71 ft
Wellbore Radius: 0.06875 ft
Screen Length: 5. ft
Gravel Pack Porosity: 0.39
Casing Radius: 0.04167 ft
Well Skin Radius: 0.06875 ft
Total Well Penetration Depth: 2.5 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 0.000174 cm/sec
y0 = 10.23 ft



PNEUMATIC SLUG OUT

Data Set: C:\...\Battelle 805 No 2 BouwerRice.aqt
Date: 03/17/03 Time: 08:43:35

PROJECT INFORMATION

Company: DLZ Ohio, Inc
Client: Battelle West Jefferson
Project: 0221-4016.00
Test Location: West Jefferson North Site
Test Well: 805 #2
Test Date: 02-27-03

AQUIFER DATA

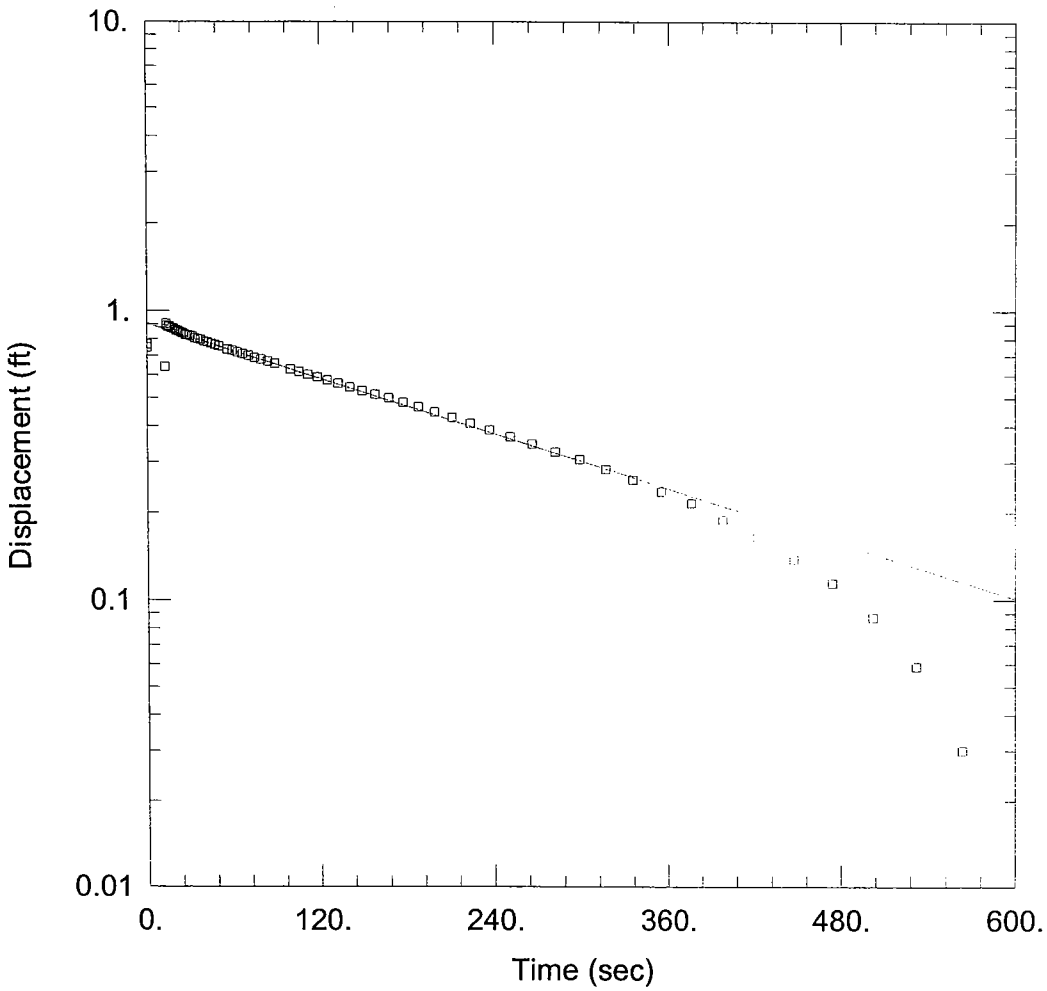
Saturated Thickness: 2.5 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (805 No. 2)

Initial Displacement: 0.765 ft
Wellbore Radius: 0.06875 ft
Screen Length: 5. ft
Gravel Pack Porosity: 0.39
Casing Radius: 0.04167 ft
Well Skin Radius: 0.06875 ft
Total Well Penetration Depth: 2.5 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 6.882E-05 cm/sec
y0 = 0.5492 ft



PNEUMATIC SLUG OUT

Data Set: C:\...\Battelle 805 No 2 (2) BouwerRice.aqt
Date: 03/17/03 Time: 08:44:21

PROJECT INFORMATION

Company: DLZ Ohio, Inc
Client: Battelle West Jefferson
Project: 0221-4016.00
Test Location: West Jefferson North Site
Test Well: 805 #2
Test Date: 02-27-03

AQUIFER DATA

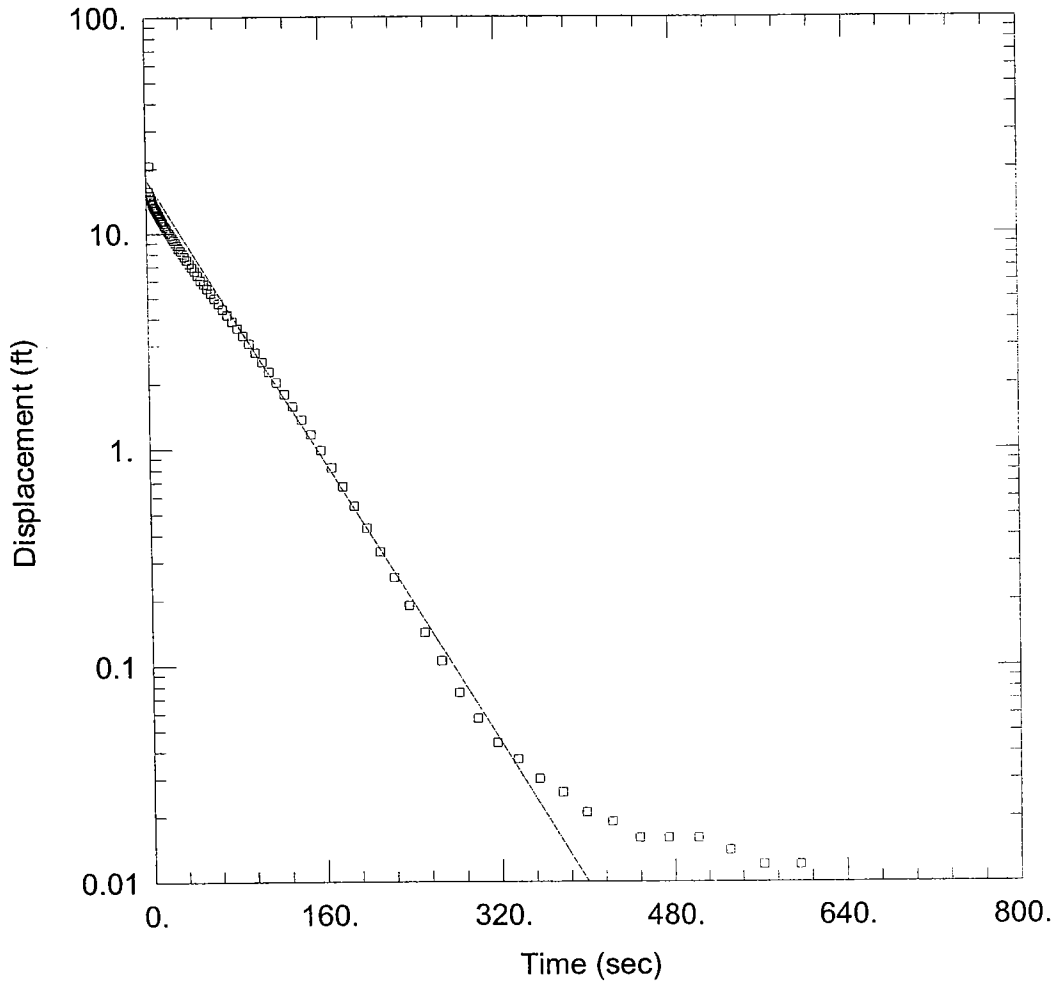
Saturated Thickness: 2.5 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (805 No. 2)

Initial Displacement: 0.765 ft
Wellbore Radius: 0.06875 ft
Screen Length: 5. ft
Gravel Pack Porosity: 0.39
Casing Radius: 0.04167 ft
Well Skin Radius: 0.06875 ft
Total Well Penetration Depth: 2.5 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 5.474E-05 cm/sec
y0 = 0.9041 ft



PNUMATIC SLUG OUT

Data Set: C:\...\Battelle 805 No 3 BouwerRice.aqt
Date: 03/17/03 Time: 08:44:29

PROJECT INFORMATION

Company: DLZ Ohio, Inc
Client: Battelle West Jefferson
Project: 0221-4016.00
Test Location: West Jefferson North Site
Test Well: 805 #3
Test Date: 02-27-03

AQUIFER DATA

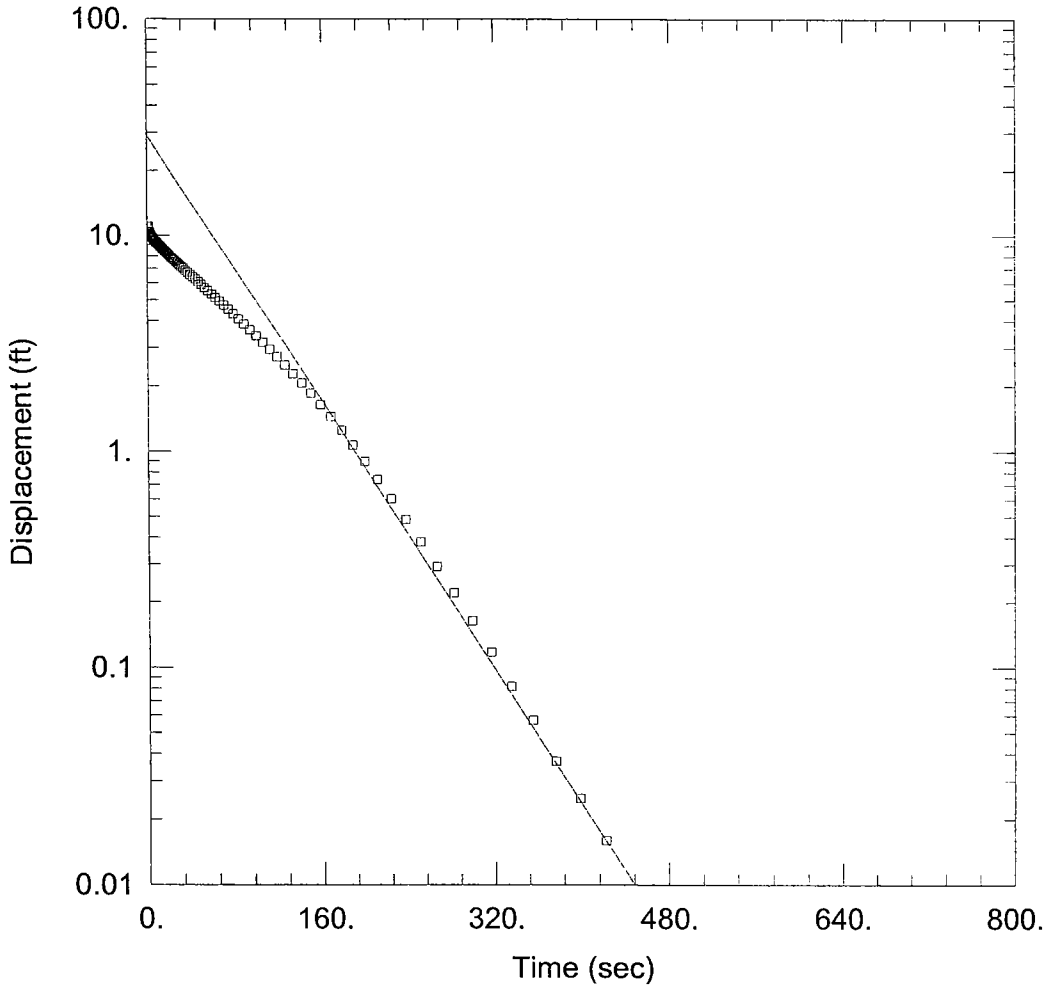
Saturated Thickness: 2.5 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (805 No. 3)

Initial Displacement: 14.62 ft
Wellbore Radius: 0.06875 ft
Screen Length: 5. ft
Gravel Pack Porosity: 0.39
Casing Radius: 0.04167 ft
Well Skin Radius: 0.06875 ft
Total Well Penetration Depth: 2.5 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 0.0002808 cm/sec
y0 = 17.88 ft



PNEUMATIC SLUG OUT

Data Set: C:\...\Battelle 805 No 3(2) BouwerRice.aqt
Date: 03/17/03 Time: 08:48:55

PROJECT INFORMATION

Company: DLZ Ohio, Inc
Client: Battelle West Jefferson
Project: 0221-4016.00
Test Location: West Jefferson North Site
Test Well: 805 #3
Test Date: 02-27-03

AQUIFER DATA

Saturated Thickness: 2.5 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (805 No. 3)

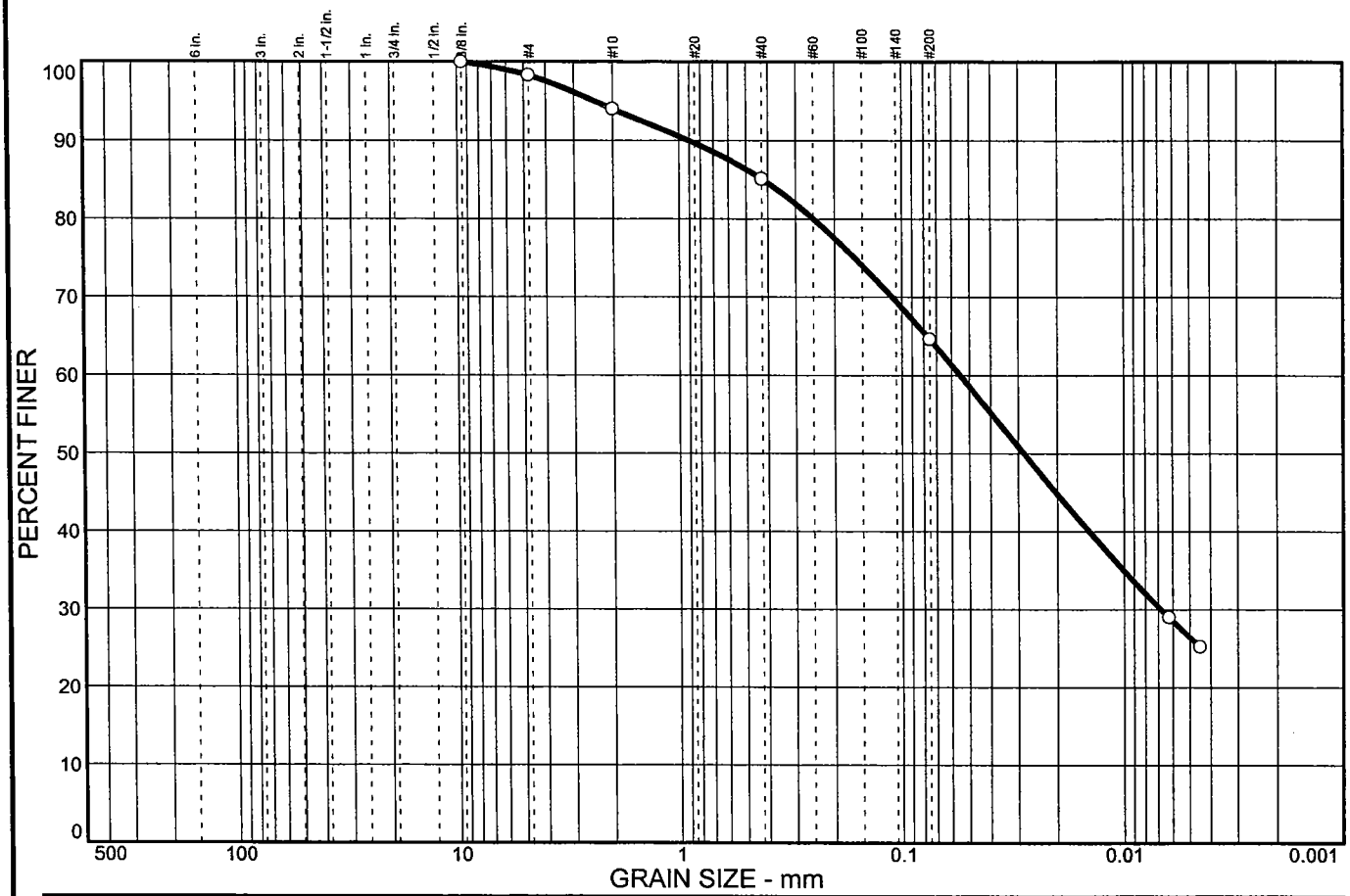
Initial Displacement: 10.97 ft
Wellbore Radius: 0.06875 ft
Screen Length: 5. ft
Gravel Pack Porosity: 0.39
Casing Radius: 0.04167 ft
Well Skin Radius: 0.06875 ft
Total Well Penetration Depth: 2.5 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 0.0002667 cm/sec
y0 = 29.15 ft

LABORATORY TEST DATA

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	1.7	4.3	8.9	20.5	38.1	26.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	98.3		
#10	94.0		
#40	85.1		
#200	64.6		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.420 D_{60}= 0.0548 D_{50}= 0.0282
D_{30}= 0.0068 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

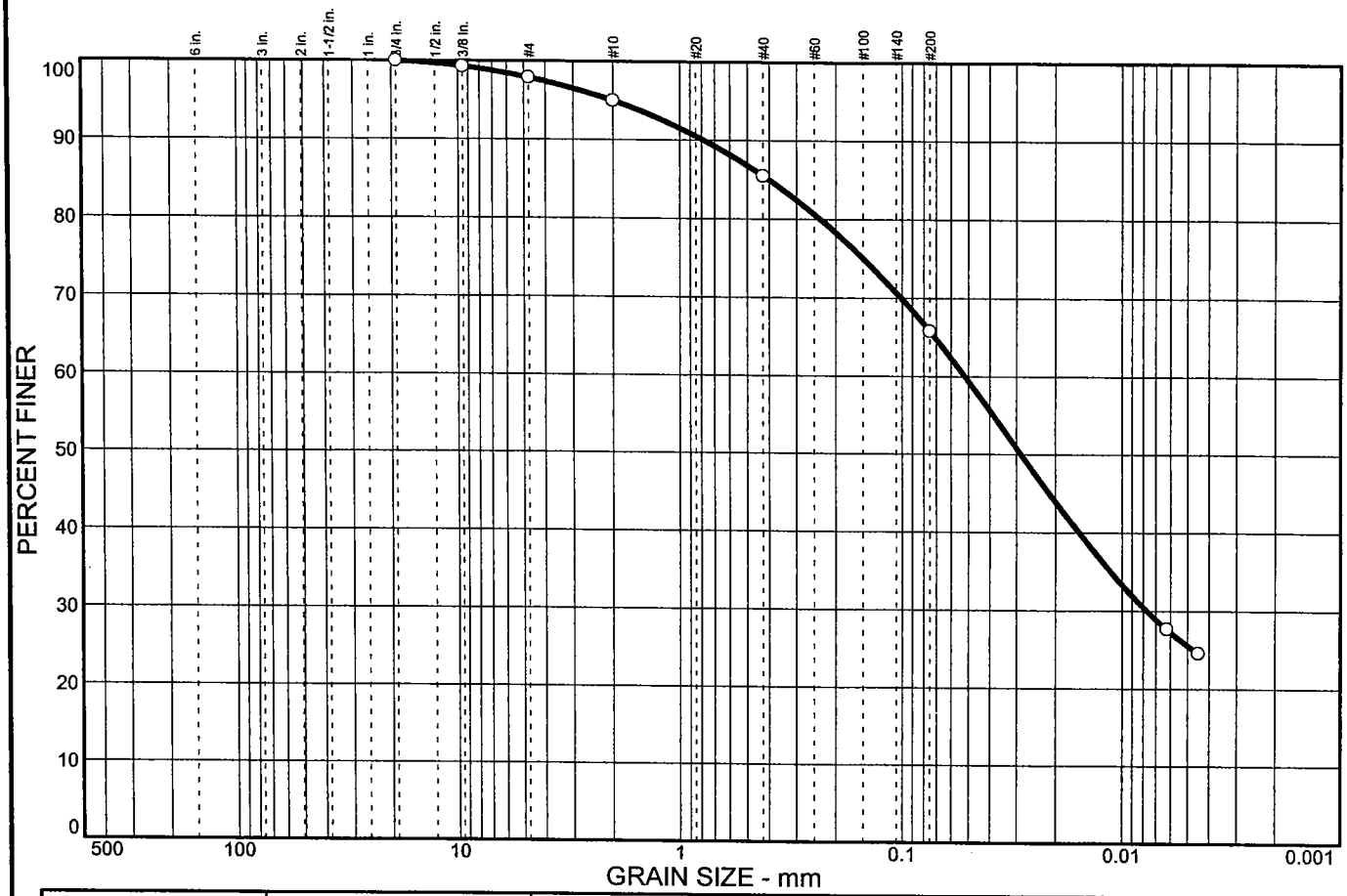
Moisture Content= 9.2%

Sample No.: 805 # 1, S-4 **Source of Sample:** **Date:** 2/3/03
Location: **Elev./Depth:** 28.0'-29.0'

DLZ

Client: Battelle Memorial Institute
Project: West Jefferson North Site
Test Methods: ASTM D-421, D-422, D-2216
Project No: 0221-4016.00 **Plate**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	2.1	2.9	9.5	19.7	40.2	25.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	99.3		
#4	97.9		
#10	95.0		
#40	85.5		
#200	65.8		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.400 D_{60}= 0.0518 D_{50}= 0.0286
D_{30}= 0.0077 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

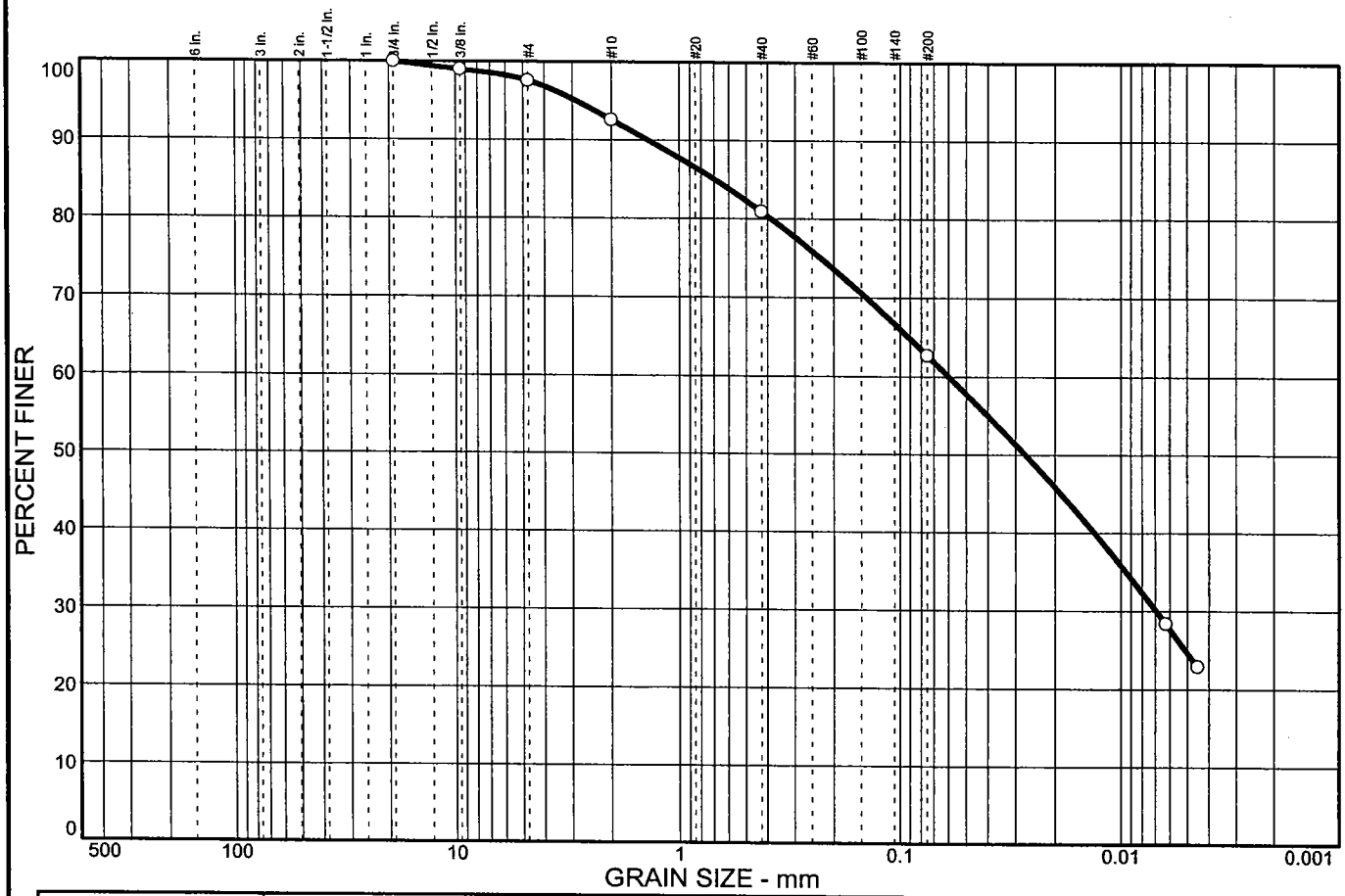
Moisture Content= 9.1%

Sample No.: 805 # 1, S-5 **Source of Sample:** **Date:** 2/3/03
Location: **Elev./Depth:** 29.0'-30.0'

DLZ

Client: Battelle Memorial Institute
Project: West Jefferson North Site
Test Methods: ASTM D-421, D-422, D-2216
Project No: 0221-4016.00 **Plate**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	2.4	5.0	11.7	18.2	38.1	24.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	99.0		
#4	97.6		
#10	92.6		
#40	80.9		
#200	62.7		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.697 D_{60}= 0.0598 D_{50}= 0.0271
D_{30}= 0.0069 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

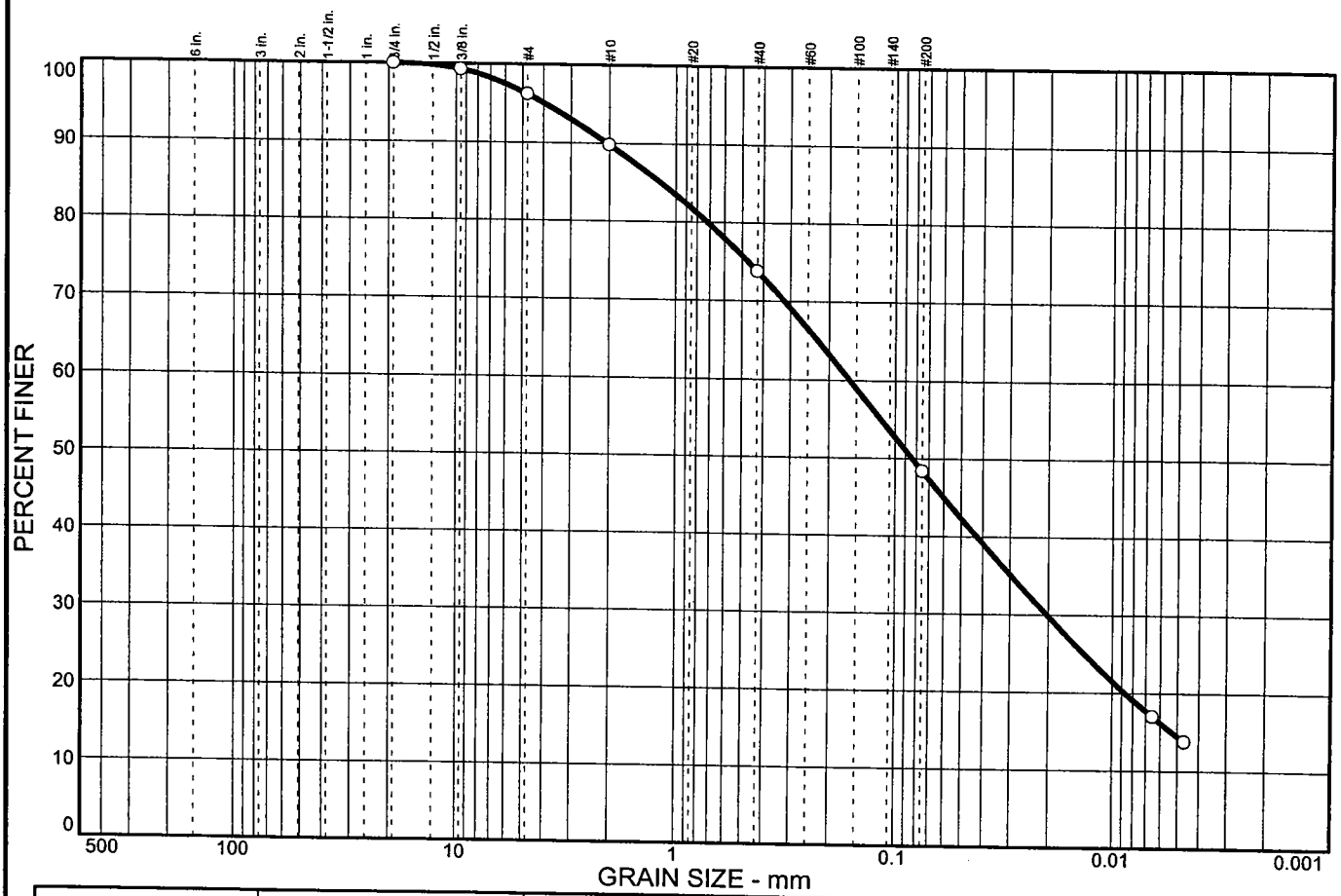
Moisture Content= 8.7%

Sample No.: 805 # 1, S-6 **Source of Sample:** **Date:** 1/3/03
Location: **Elev./Depth:** 30.0'-31.0'

DLZ

Client: Battelle Memorial Institute
Project: West Jefferson North Site
Test Methods: ASTM D-421, D-422, D-2216
Project No: 0221-4016.00 **Plate**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	3.8	6.4	16.0	25.4	33.9	14.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	99.3		
#4	96.2		
#10	89.8		
#40	73.8		
#200	48.4		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 1.17 D_{60}= 0.161 D_{50}= 0.0834
D_{30}= 0.0202 D_{15}= 0.0053 D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

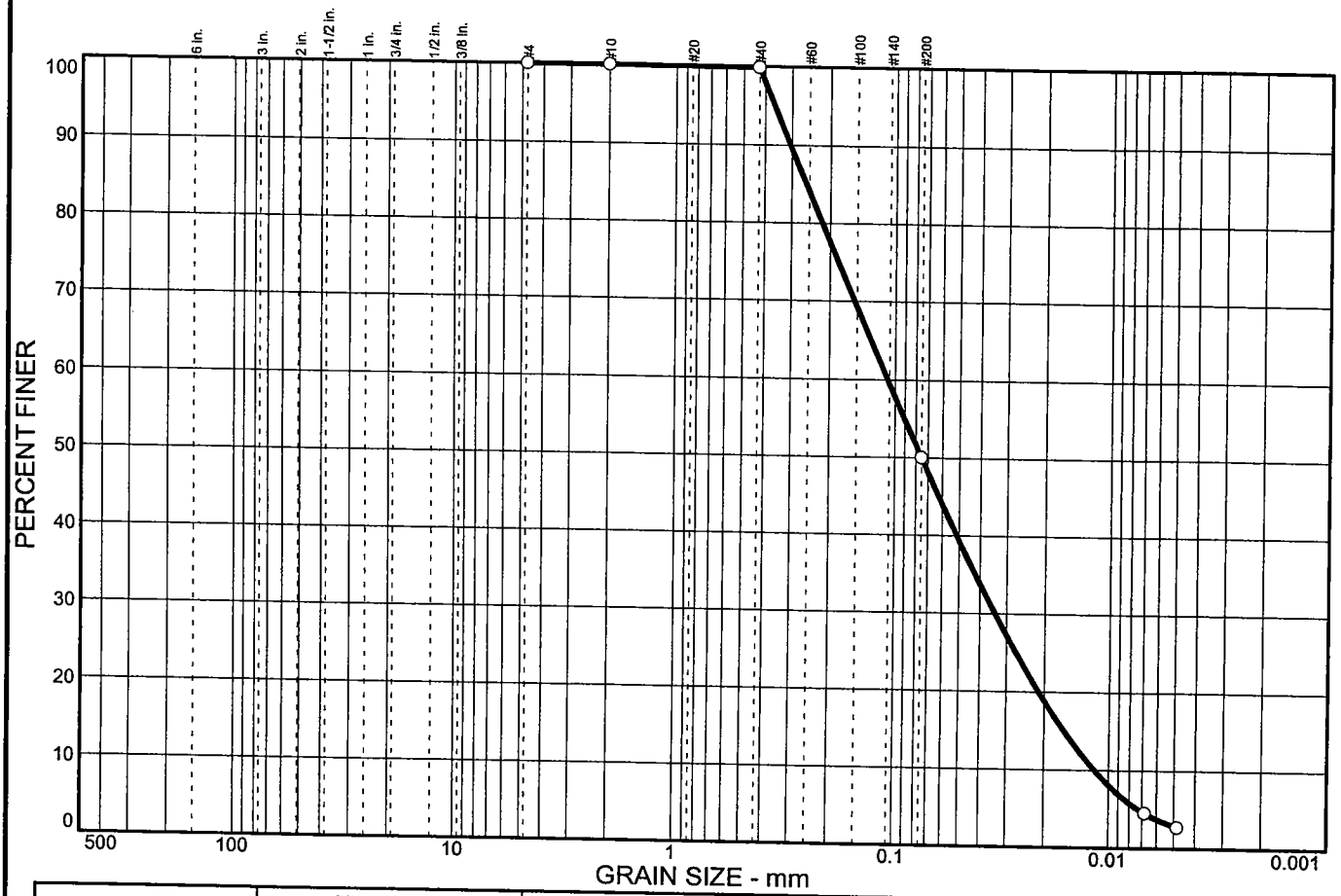
Moisture Content= 9.0%

Sample No.: 805 # 1, S-17 **Source of Sample:** **Date:** 1/3/03
Location: **Elev./Depth:** 61.0'-62.0'

DLZ

Client: Battelle Memorial Institute
Project: West Jefferson North Site
Test Methods: ASTM D-421, D-422, D-2216
Project No: 0221-4016.00 **Plate**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.0	0.1	49.9	47.1	2.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	100.0		
#40	99.9		
#200	50.0		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.257 D_{60}= 0.108 D_{50}= 0.0750
D_{30}= 0.0339 D_{15}= 0.0161 D_{10}= 0.0116
C_u= 9.30 C_c= 0.92

Classification

USCS= AASHTO=

Remarks

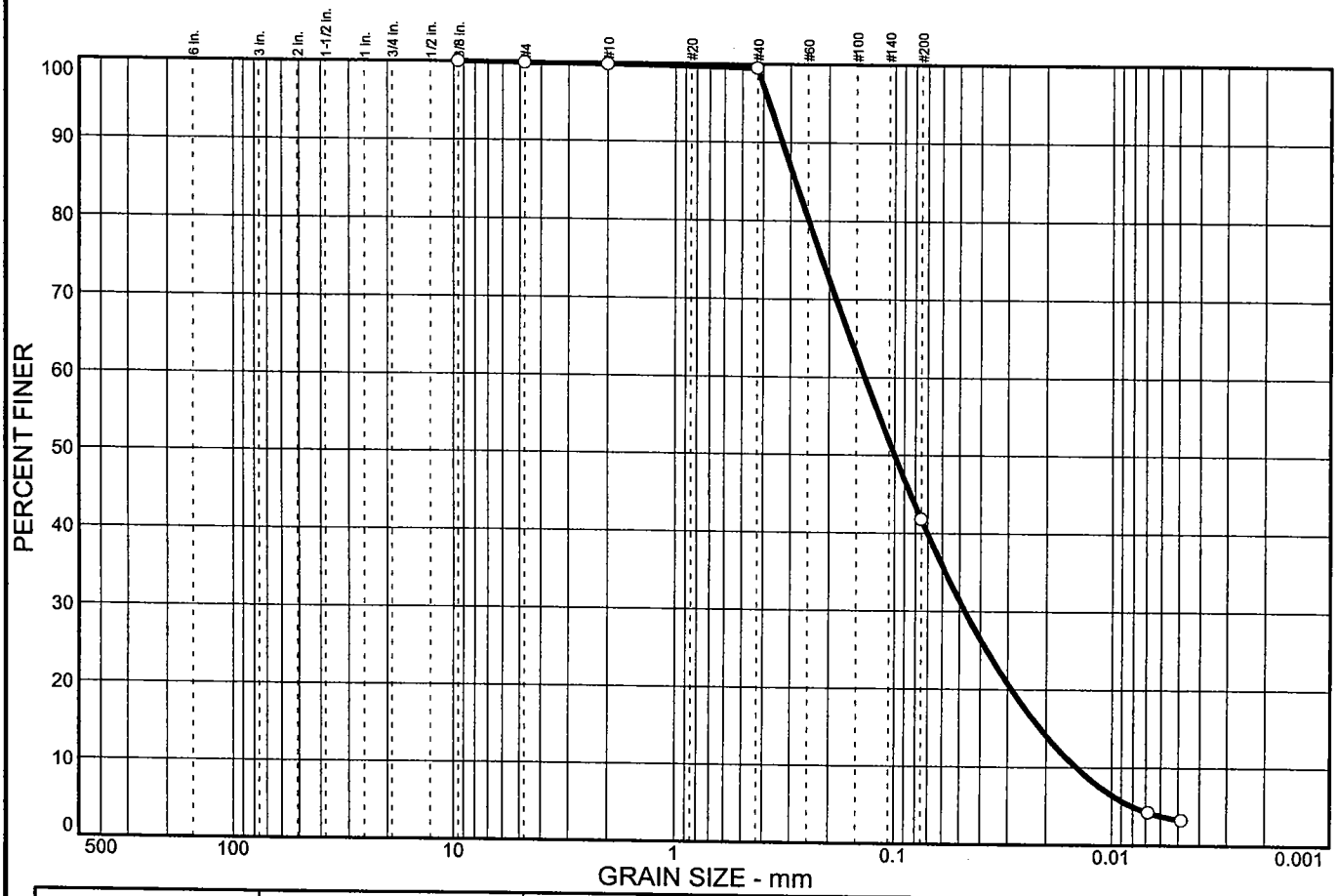
Moisture Content= 20.9%
Specific Gravity= 2.73

Sample No.: 805 # 1, S-19 **Source of Sample:** **Date:** 2/3/03
Location: **Elev./Depth:** 63.0'-64.0'

DLZ

Client: Battelle Memorial Institute
Project: West Jefferson North Site
Test Methods: ASTM D-421, D-422, D-2216
Project No: 0221-4016.00 **Plate**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.1	0.1	0.3	57.7	38.5	3.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	99.9		
#10	99.8		
#40	99.5		
#200	41.8		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.284 D_{60}= 0.137 D_{50}= 0.0997
D_{30}= 0.0469 D_{15}= 0.0212 D_{10}= 0.0145
C_u= 9.44 C_c= 1.11

Classification

USCS= AASHTO=

Remarks

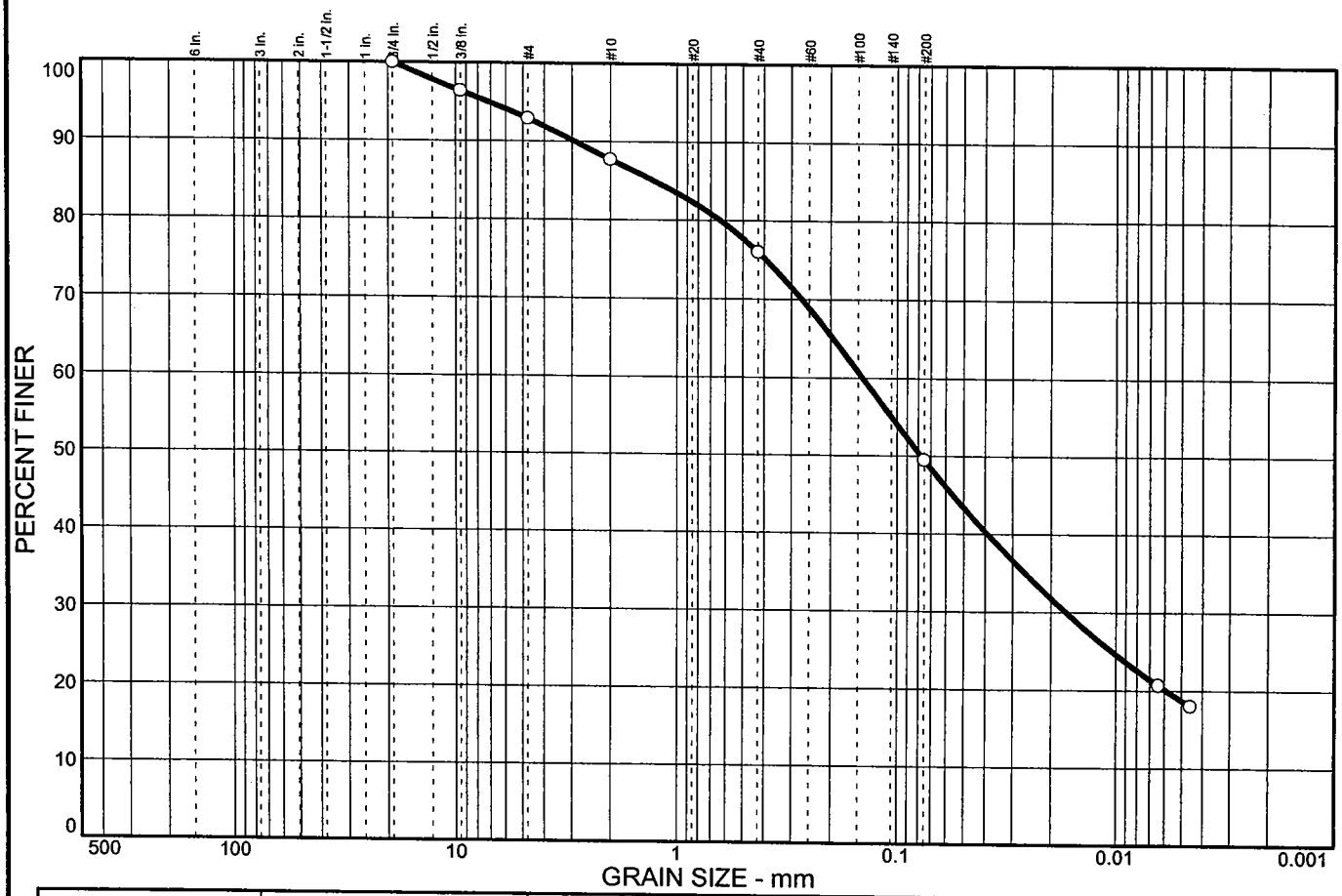
Moisture Content= 18.5%
Specific Gravity= 2.72

Sample No.: 805 # 1, S-20 **Source of Sample:** **Date:** 2/3/03
Location: **Elev./Depth:** 64.0'-65.0'

DLZ

Client: Battelle Memorial Institute
Project: West Jefferson North Site
Test Methods: ASTM D-421, D-422, D-2216
Project No: 0221-4016.00 **Plate**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	7.1	5.2	11.7	26.5	30.8	18.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	96.4		
#4	92.9		
#10	87.7		
#40	76.0		
#200	49.5		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 1.27 D_{60}= 0.143 D_{50}= 0.0774
D_{30}= 0.0170 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

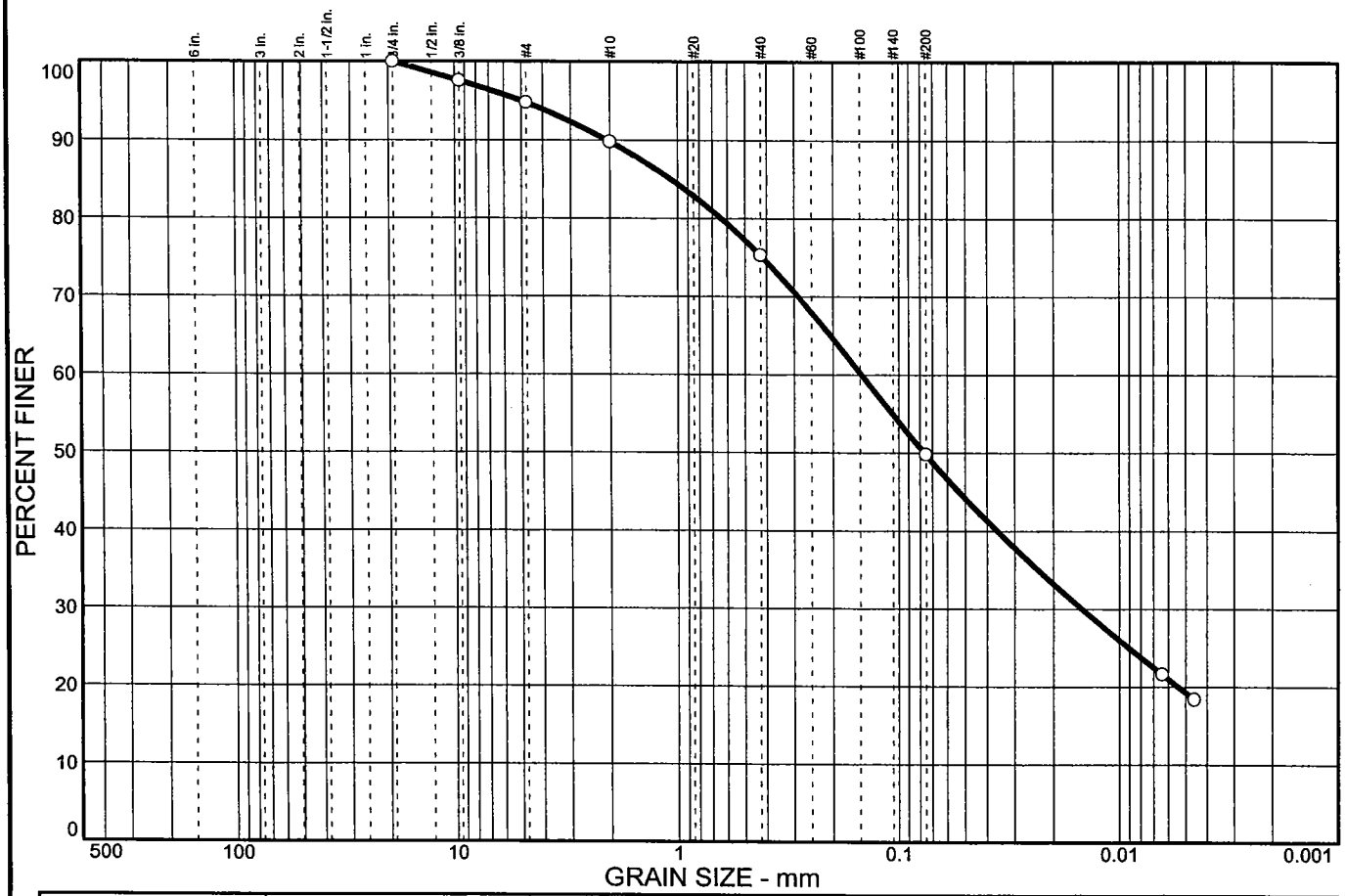
Moisture Content= 11.9%

Sample No.: 805 # 1, S-23 **Source of Sample:** **Date:** 2/3/03
Location: **Elev./Depth:** 107.0'-108.0'

DLZ

Client: Battelle Memorial Institute
Project: West Jefferson North Site
Test Methods: ASTM D-421, D-422, D-2216
Project No: 0221-4016.00 **Plate**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	5.2	5.0	14.5	25.5	30.5	19.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	97.6		
#4	94.8		
#10	89.8		
#40	75.3		
#200	49.8		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 1.07 D_{60}= 0.148 D_{50}= 0.0761
D_{30}= 0.0148 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

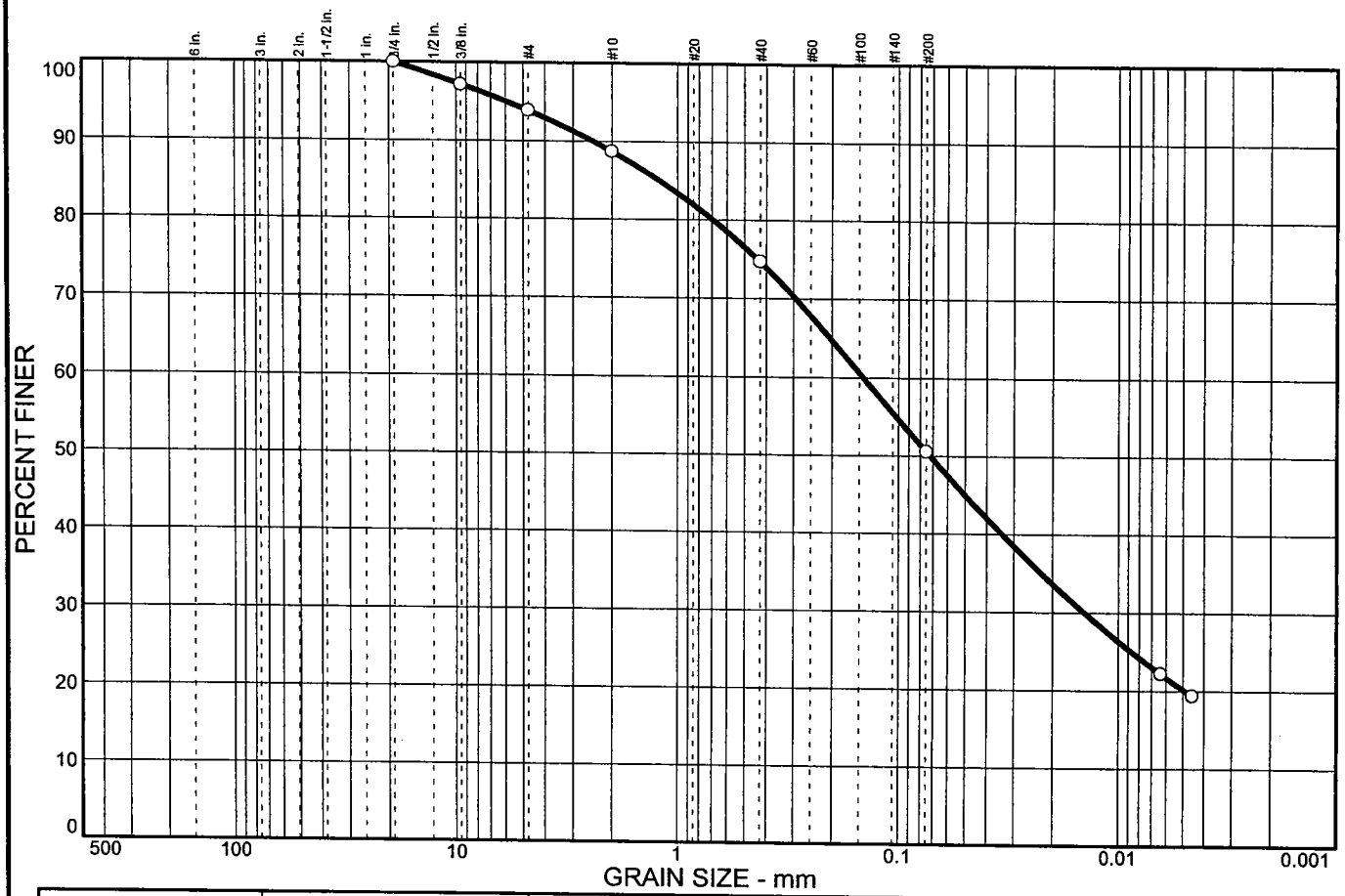
Moisture Content= 8.6%

Sample No.: 805 # 1, S-25 **Source of Sample:** **Date:** 2/3/03
Location: **Elev./Depth:** 109.0'-110.0'

DLZ

Client: Battelle Memorial Institute
Project: West Jefferson North Site
Test Methods: ASTM D-421, D-422, D-2216
Project No: 0221-4016.00 **Plate**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	6.1	5.2	14.0	24.1	30.4	20.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	97.2		
#4	93.9		
#10	88.7		
#40	74.7		
#200	50.6		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 1.21 D_{60}= 0.144 D_{50}= 0.0719
D_{30}= 0.0143 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

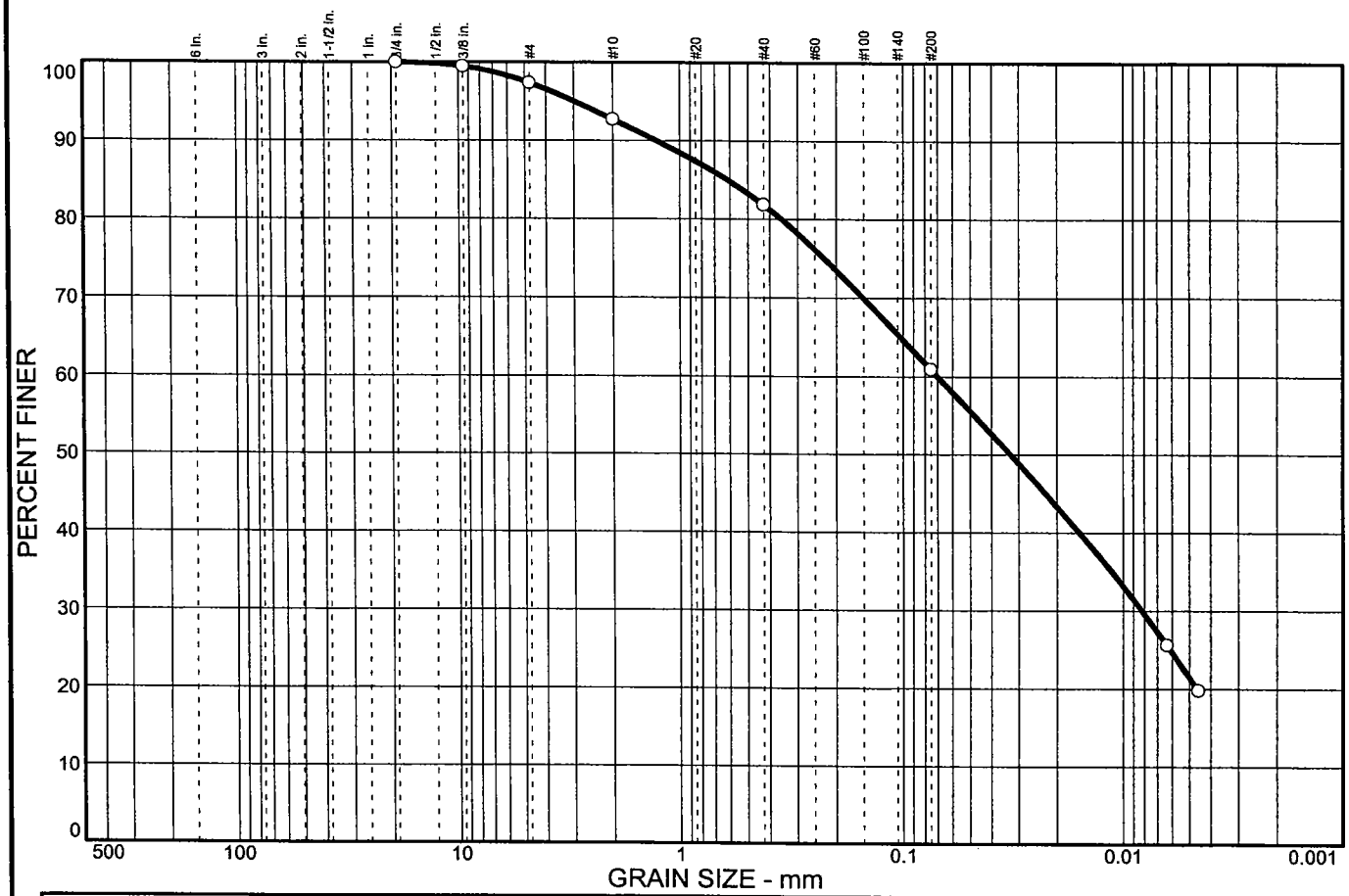
Moisture Content= 9.0%

Sample No.: 805 # 1, S-27 **Source of Sample:** **Date:** 2/3/03
Location: **Elev./Depth:** 111.0'-112.0'

DLZ

Client: Battelle Memorial Institute
Project: West Jefferson North Site
Test Methods: ASTM D-421, D-422, D-2216
Project No: 0221-4016.00 **Plate**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	2.6	4.7	10.9	20.9	39.4	21.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	99.5		
#4	97.4		
#10	92.7		
#40	81.8		
#200	60.9		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.616 D_{60}= 0.0700 D_{50}= 0.0326
D_{30}= 0.0082 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

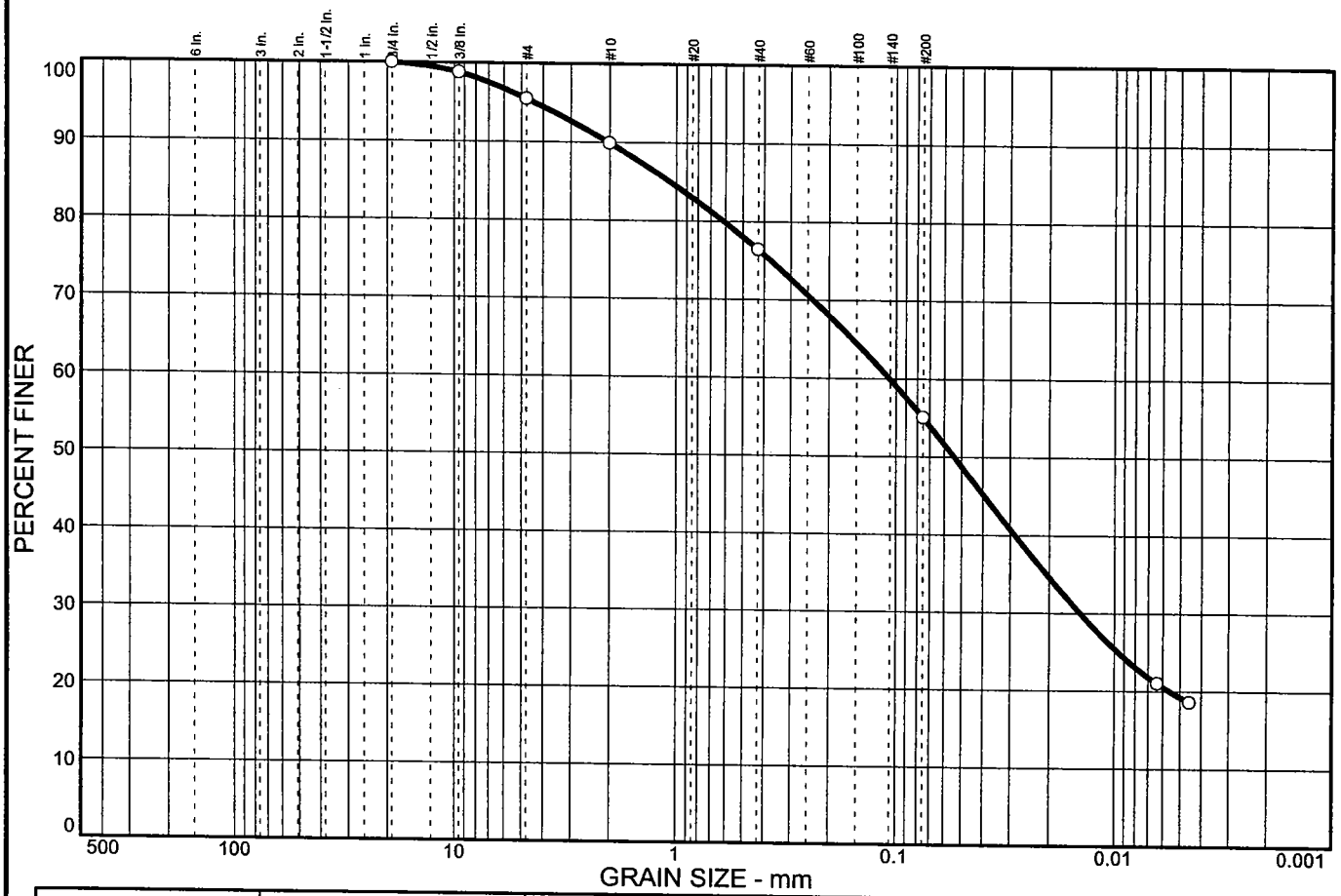
Moisture Content= 9.1%

Sample No.: 805 # 2, S-6 **Source of Sample:** **Date:** 2/3/03
Location: **Elev./Depth:** 25.0'-26.0'

DLZ

Client: Battelle Memorial Institute
Project: West Jefferson North Site
Test Methods: ASTM D-421, D-422, D-2216
Project No: 0221-4016.00 **Plate**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	4.5	5.6	13.5	21.4	35.8	19.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	98.8		
#4	95.5		
#10	89.9		
#40	76.4		
#200	55.0		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 1.07 D_{60}= 0.107 D_{50}= 0.0539
D_{30}= 0.0144 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

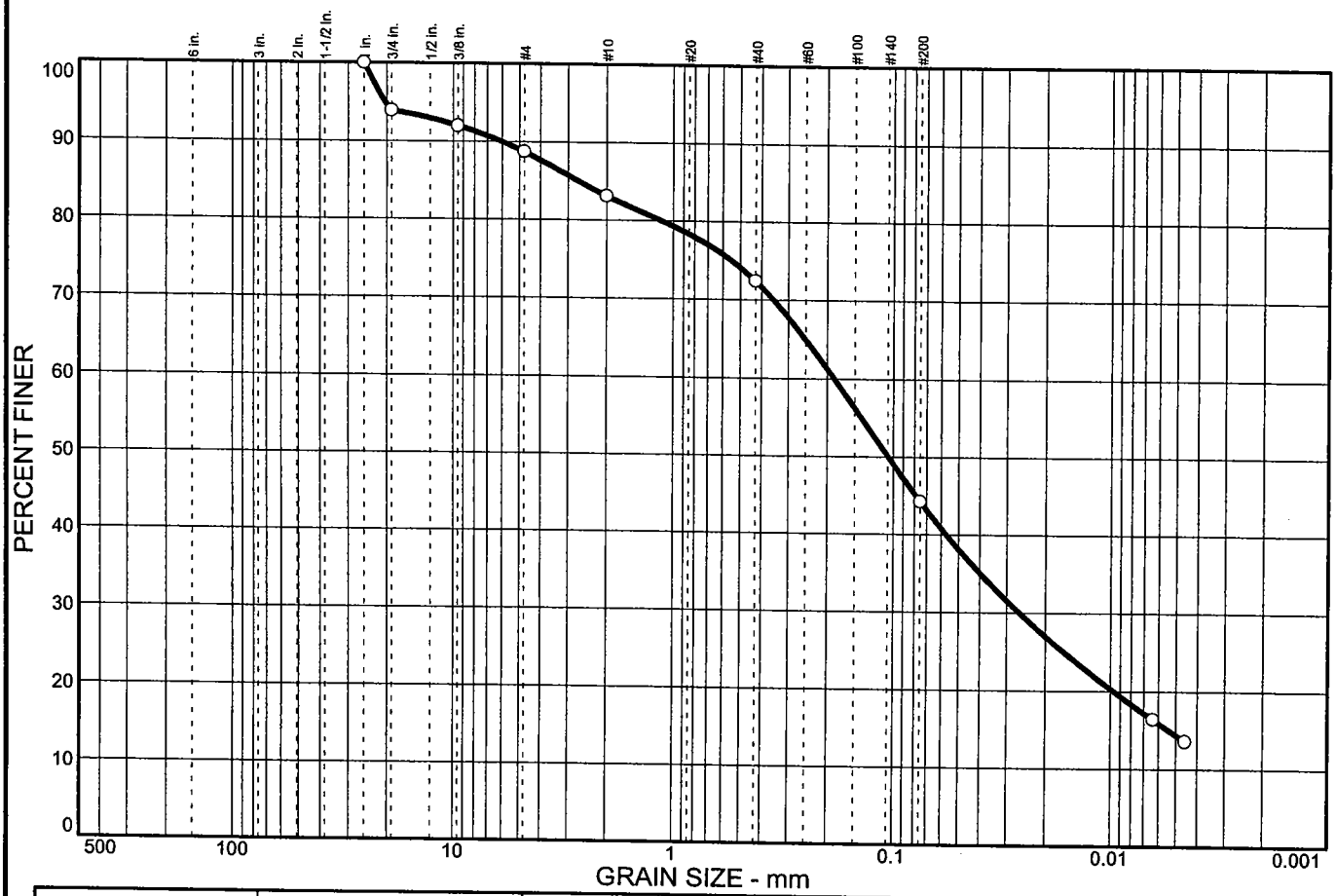
Moisture Content= 11.3%

Sample No.: 805 # 2, S-7A **Source of Sample:** **Date:** 2/3/03
Location: **Elev./Depth:** 26.0'-27.0'

DLZ

Client: Battelle Memorial Institute
Project: West Jefferson North Site
Test Methods: ASTM D-421, D-422, D-2216
Project No: 0221-4016.00 **Plate**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	6.1	5.2	5.6	10.7	28.1	29.9	14.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.00 in.	100.0		
0.75 in.	93.9		
0.375 in.	92.0		
#4	88.7		
#10	83.1		
#40	72.4		
#200	44.3		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 2.69 D_{60}= 0.185 D_{50}= 0.105
D_{30}= 0.0262 D_{15}= 0.0054 D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

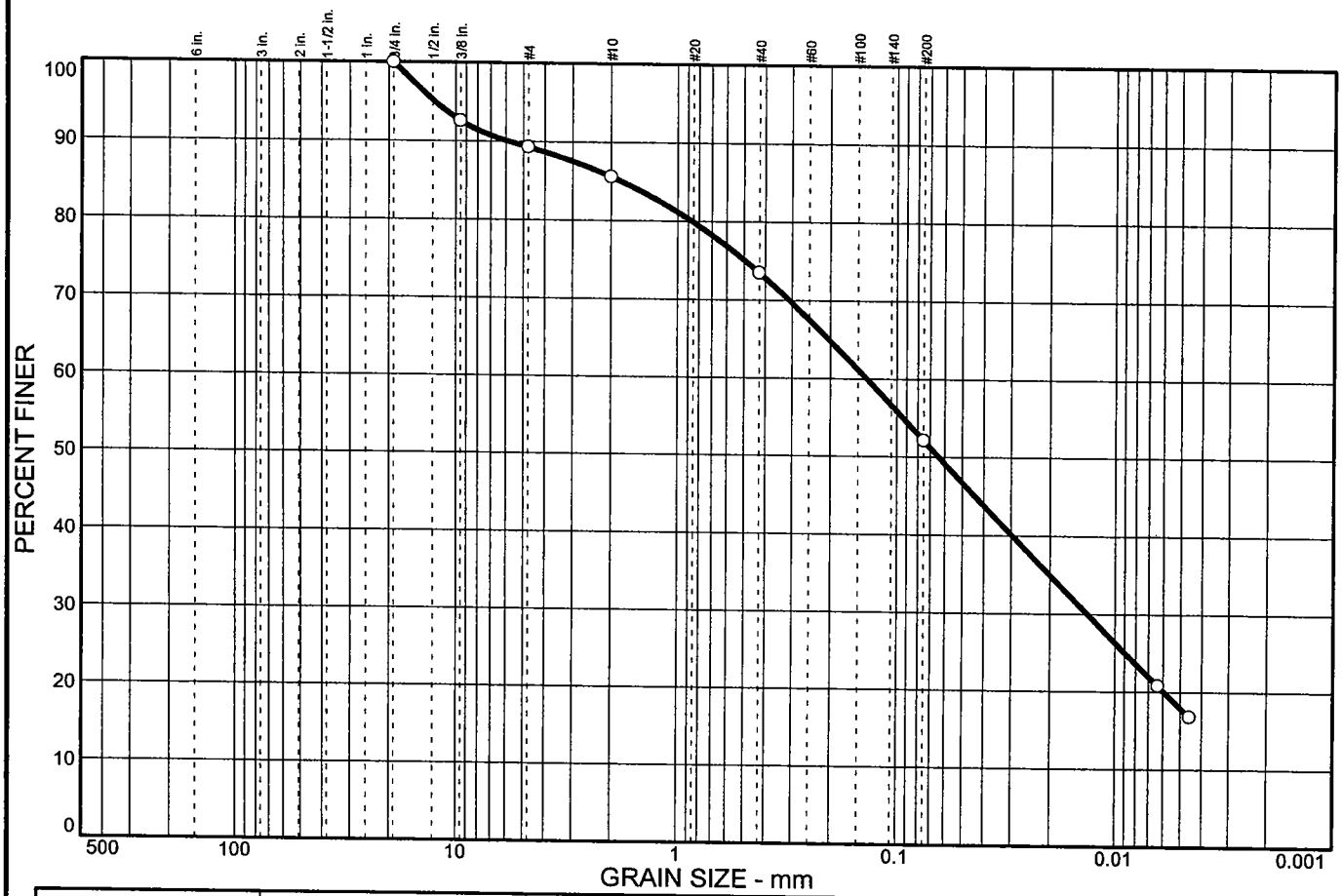
Moisture Content= 8.6%
Specific Gravity= 2.75

Sample No.: 805 # 2, S-7B **Source of Sample:** **Date:** 2/3/03
Location: **Elev./Depth:** 26.0'-27.0'

DLZ

Client: Battelle Memorial Institute
Project: West Jefferson North Site
Test Methods: ASTM D-421, D-422, D-2216
Project No: 0221-4016.00 **Plate**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	10.7	3.7	12.1	21.4	34.2	17.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	92.6		
#4	89.3		
#10	85.6		
#40	73.5		
#200	52.1		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 1.79 D_{60}= 0.137 D_{50}= 0.0639
D_{30}= 0.0134 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

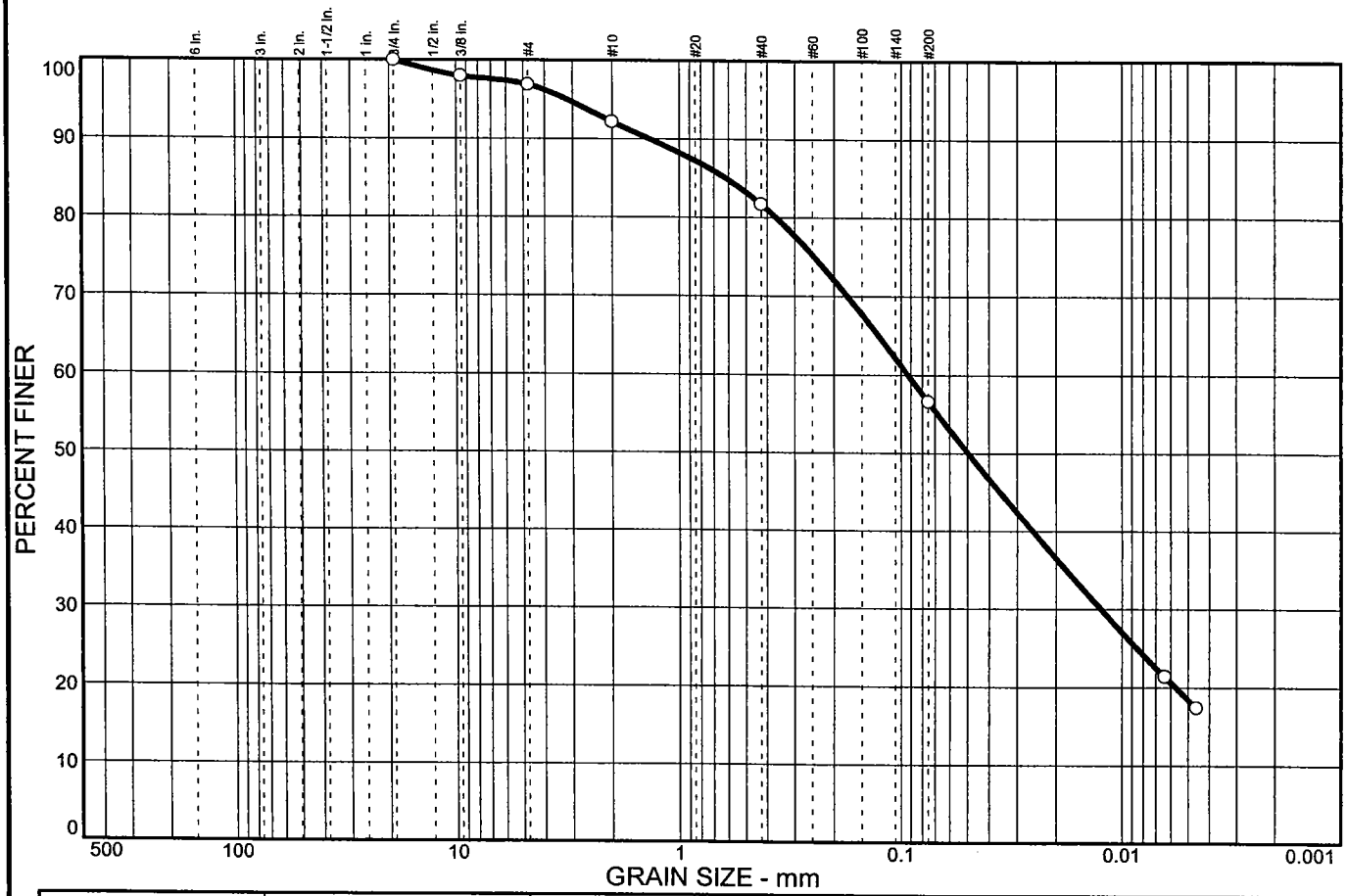
Moisture Content= 8.8%

Sample No.: 805 # 2, S-8 **Source of Sample:** **Date:** 2/3/03
Location: **Elev./Depth:** 27.0'-28.0'

DLZ

Client: Battelle Memorial Institute
Project: West Jefferson North Site
Test Methods: ASTM D-421, D-422, D-2216
Project No: 0221-4016.00 **Plate**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	3.1	4.7	10.5	25.1	38.1	18.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	98.0		
#4	96.9		
#10	92.2		
#40	81.7		
#200	56.6		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.615 D_{60}= 0.0926 D_{50}= 0.0494
D_{30}= 0.0125 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Moisture Content= 7.3%

Sample No.: 805 # 2, S-13 **Source of Sample:** **Date:** 2/3/03
Location: **Elev./Depth:** 52.0'-53.0'

DLZ

Client: Battelle Memorial Institute
Project: West Jefferson North Site
Test Methods: ASTM D-421, D-422, D-2216
Project No: 0221-4016.00 **Plate**

Report of Specific Gravity & Moisture Content

Client: Battelle Memorial Institute
Project Name: West Jefferson North Site
DLZ Project Number: 0221-4016.00
Date: 2/3/03

Boring: 805 # 2 **Sample:** S-15A **Depth:** 54.0'-55.0'

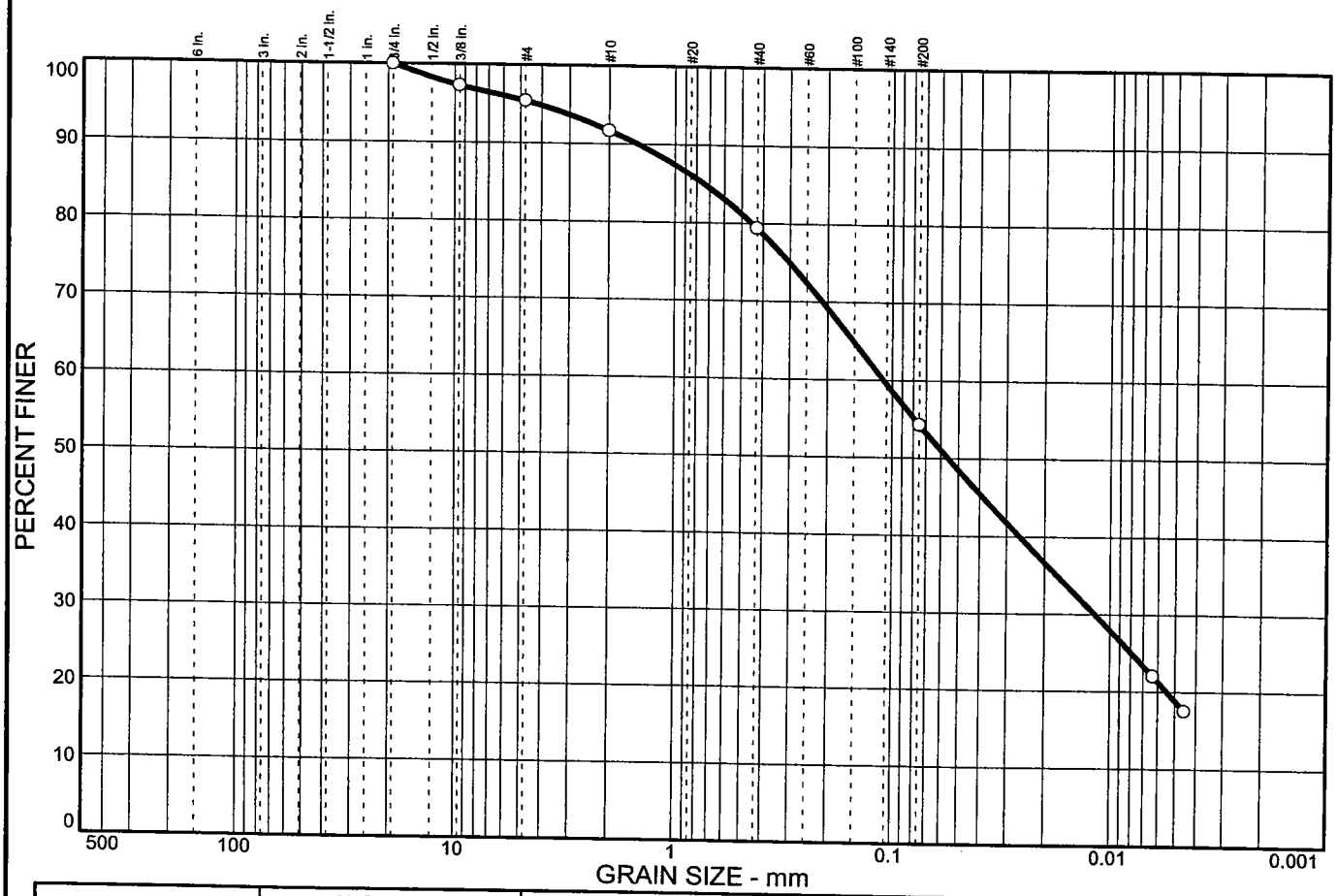
Specific Gravity Calculation	
Specific Gravity Bottle number	9
Mass of saturated soil,bottle & water+tare	699.86
Mass of bottle full of water	666.76
Temperature	18.8
Mass of soil & bottle	220.36
Mass of bottle	168.18
Mass of oven dry sample	52.18
Correction to 20 Celcius (K)	1.0002

Specific Gravity	2.73520872
Reported Specific Gravity	2.74

Moisture Content (MC)	
Container No.	360
Wet Wt. & Container	255.76
Dry Wt. & Container	228.14
Wt. of Container	63.00
Wt. of Water	27.62
Dry Wt. of Soil	165.14
Moisture Content	**16.7**

DLZ

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	4.6	3.7	12.3	25.1	35.5	18.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	97.3		
#4	95.4		
#10	91.7		
#40	79.4		
#200	54.3		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.741 D_{60}= 0.110 D_{50}= 0.0555
D_{30}= 0.0117 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

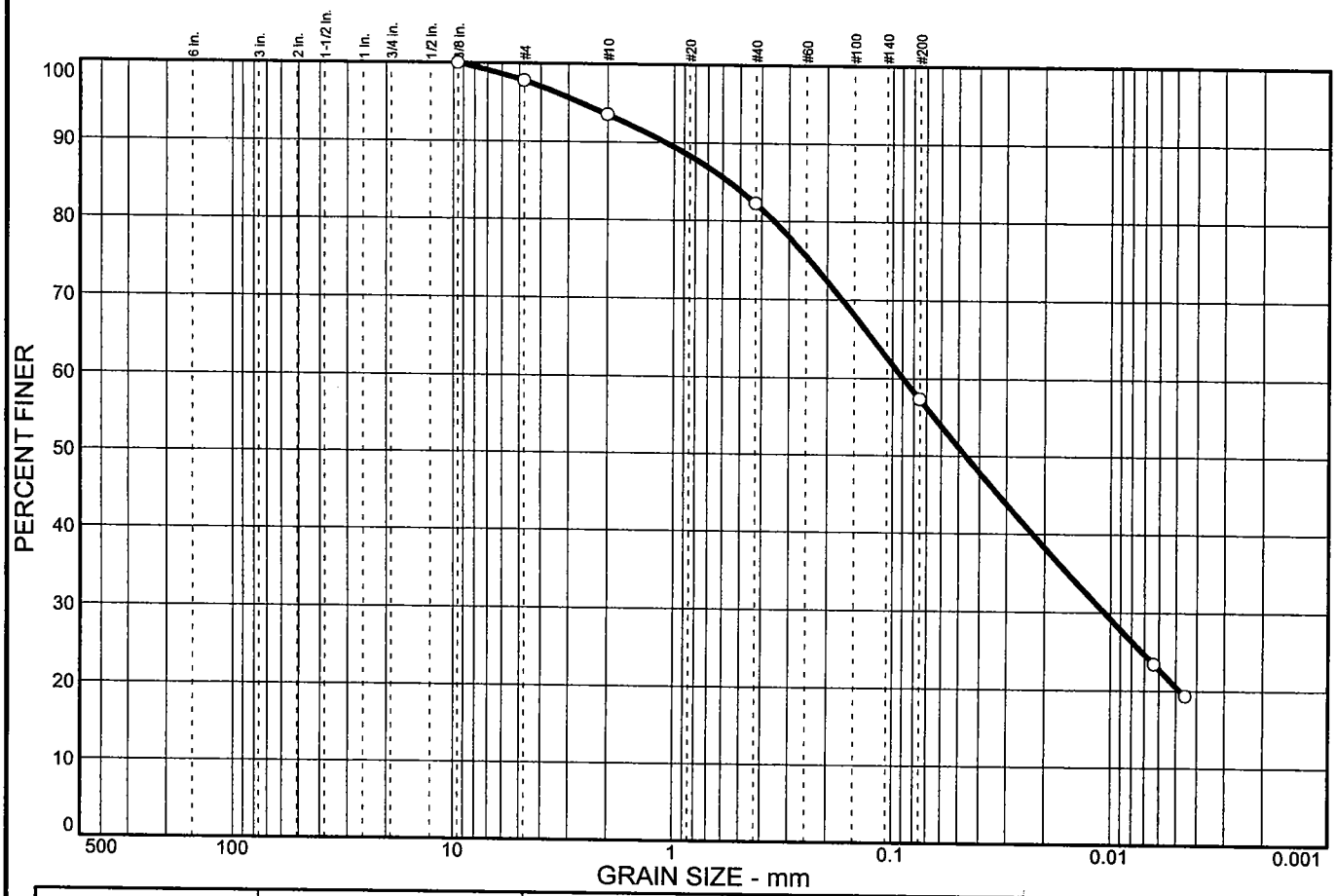
Moisture Content= 10.2%

Sample No.: 805 # 2, S-15B **Source of Sample:** **Date:** 2/3/03
Location: **Elev./Depth:** 54.0'-55.0'

DLZ

Client: Battelle Memorial Institute
Project: West Jefferson North Site
Test Methods: ASTM D-421, D-422, D-2216
Project No: 0221-4016.00 **Plate**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	2.2	4.3	11.3	24.9	36.8	20.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	97.8		
#10	93.5		
#40	82.2		
#200	57.3		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.563 D_{60}= 0.0893 D_{50}= 0.0461
D_{30}= 0.0107 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

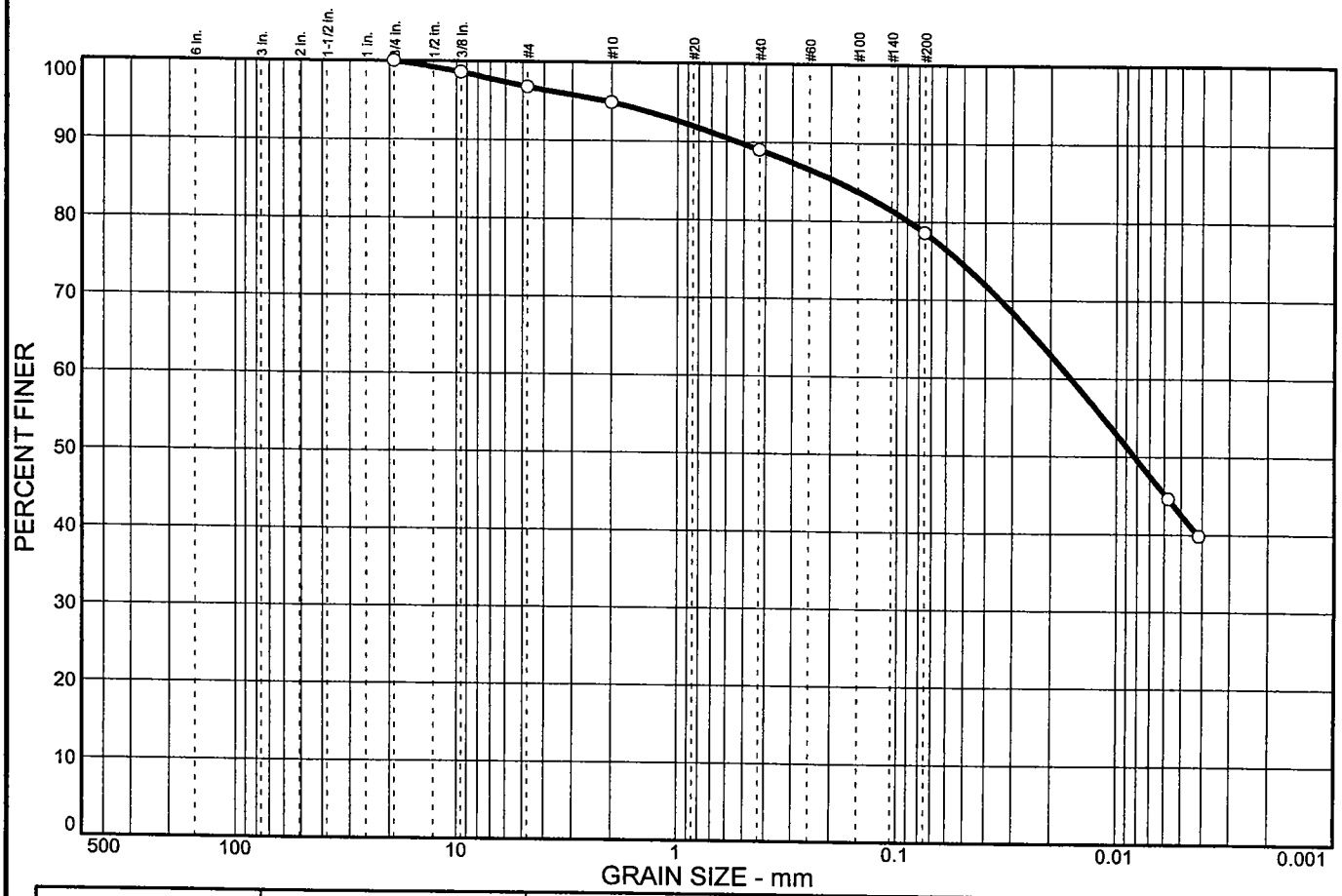
Moisture Content= 9.1%

Sample No.: 805 # 2, S-16 **Source of Sample:** **Date:** 2/3/03
Location: **Elev./Depth:** 55.0'-56.0'

DLZ

Client: Battelle Memorial Institute
Project: West Jefferson North Site
Test Methods: ASTM D-421, D-422, D-2216
Project No: 0221-4016.00 **Plate**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	3.2	1.9	5.9	10.4	36.0	42.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	98.6		
#4	96.8		
#10	94.9		
#40	89.0		
#200	78.6		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.185 D_{60}= 0.0162 D_{50}= 0.0082
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

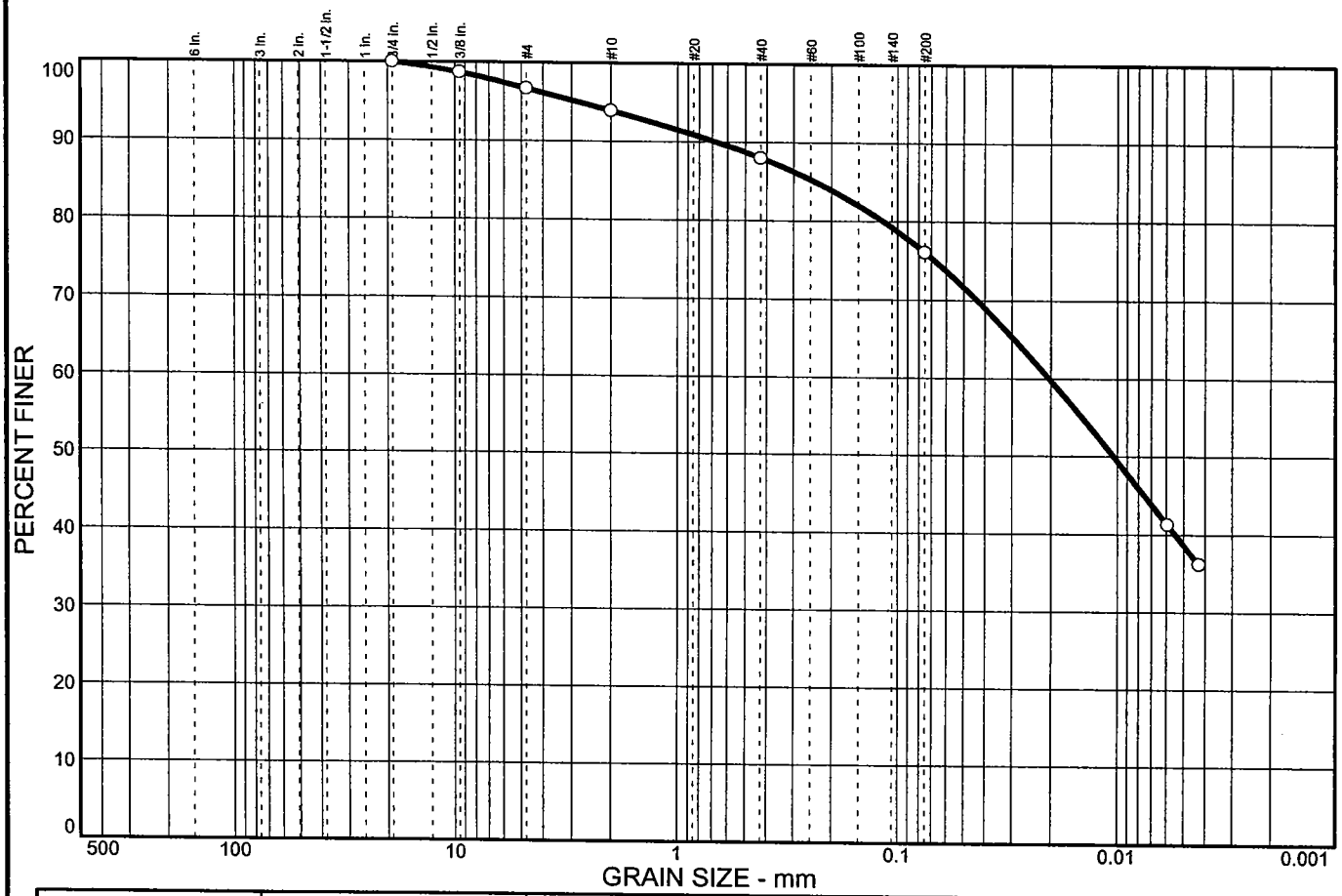
Moisture Content= 15.3%

Sample No.: 805 # 2, S-29 **Source of Sample:** **Date:** 2/3/03
Location: **Elev./Depth:** 103.0'-104.0'

DLZ

Client: Battelle Memorial Institute
Project: West Jefferson North Site
Test Methods: ASTM D-421, D-422, D-2216
Project No: 0221-4016.00 **Plate**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	3.3	2.8	5.9	11.9	37.4	38.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	98.7		
#4	96.7		
#10	93.9		
#40	88.0		
#200	76.1		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.239 D_{60}= 0.0203 D_{50}= 0.0104
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

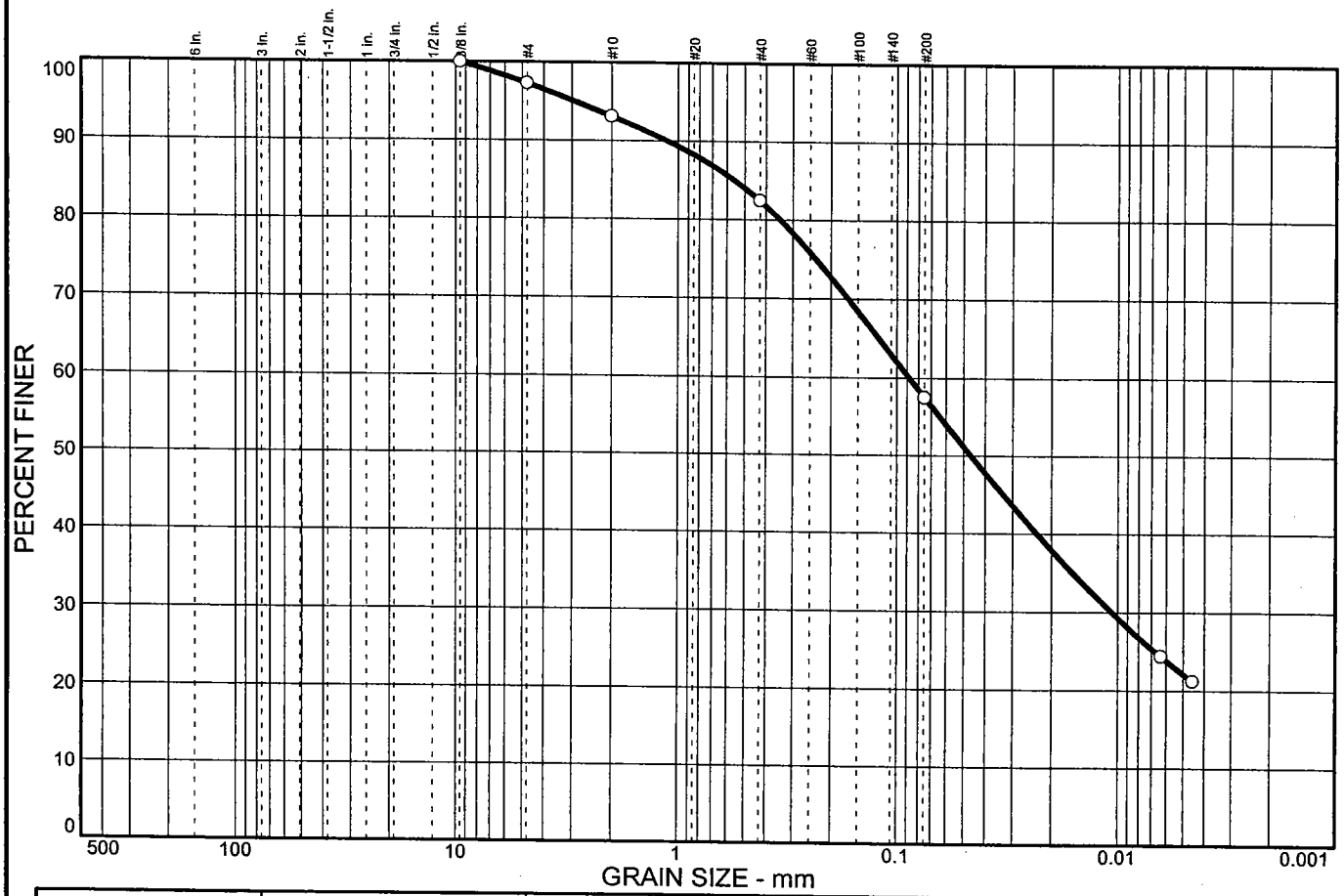
Moisture Content= 14.7%

Sample No.: 805 # 2, S-30 **Source of Sample:** **Date:** 2/3/03
Location: **Elev./Depth:** 104.0'-105.0'

DLZ

Client: Battelle Memorial Institute
Project: West Jefferson North Site
Test Methods: ASTM D-421, D-422, D-2216
Project No: 0221-4016.00 **Plate**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	2.7	4.2	10.7	24.9	35.4	22.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	97.3		
#10	93.1		
#40	82.4		
#200	57.5		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.556 D_{60}= 0.0878 D_{50}= 0.0462
D_{30}= 0.0106 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

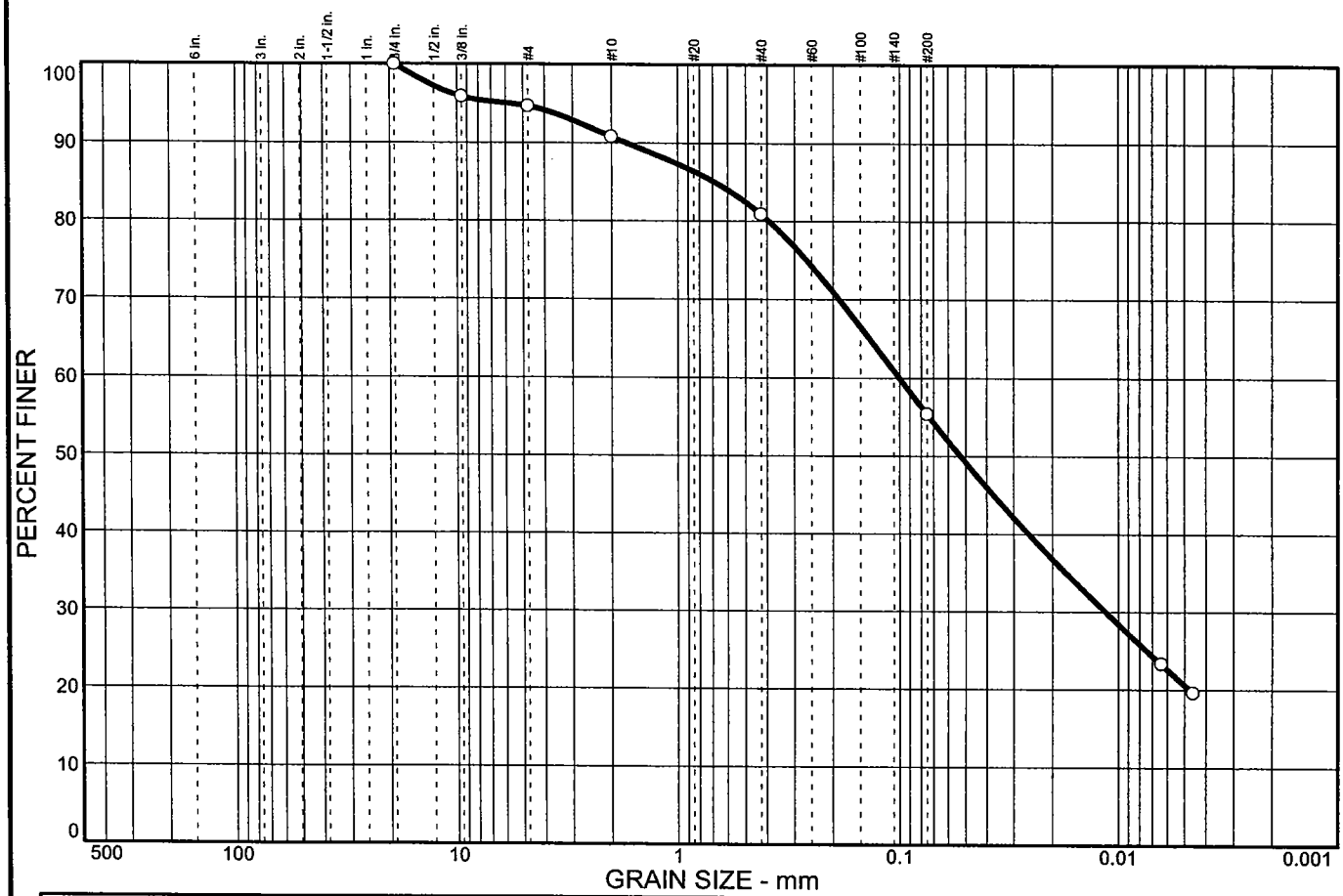
Moisture Content= 10.5%

Sample No.: 805 # 3, S-7 **Source of Sample:** **Date:** 2/18/03
Location: **Elev./Depth:** 30.0'-31.0'

DLZ

Client: Battelle Memorial Institute
Project: West Jefferson North Site
Test Methods: ASTM D-421, D-422, D-2216
Project No: 0221-4016.00 **Plate**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	5.3	3.9	9.9	25.5	34.8	20.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	95.9		
#4	94.7		
#10	90.8		
#40	80.9		
#200	55.4		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.685 D_{60}= 0.100 D_{50}= 0.0525
D_{30}= 0.0114 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

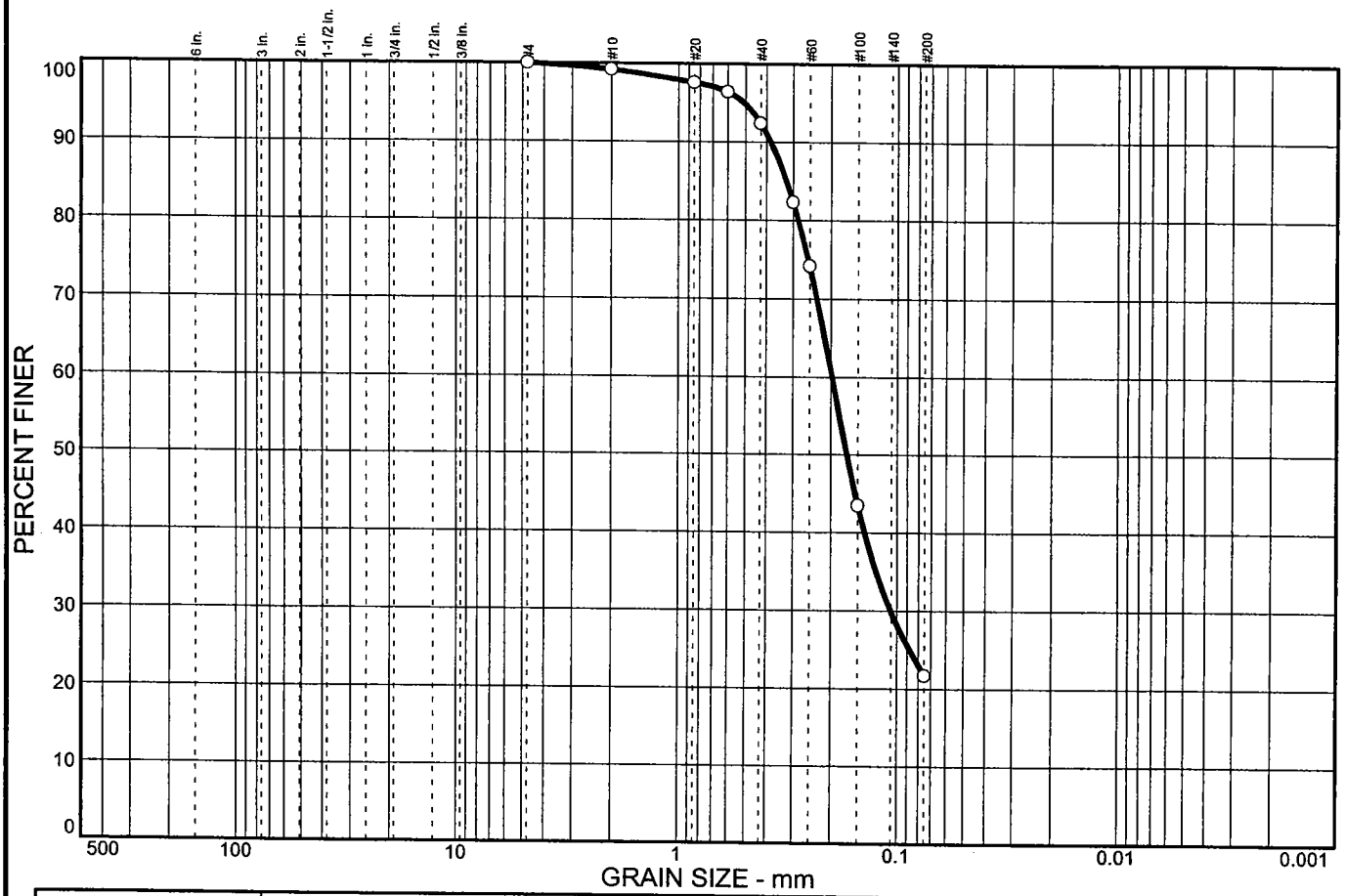
Moisture Content= 10.4%

Sample No.: 805 # 3, S-8A **Source of Sample:** **Date:** 3/18/03
Location: **Elev./Depth:** 31.0'-32.0'

DLZ

Client: Battelle Memorial Institute
Project: West Jefferson North Site
Test Methods: ASTM D-421, D-422, D-2216
Project No: 0221-4016.00 **Plate**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.8	6.8	70.7	21.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.2		
#20	97.6		
#30	96.4		
#40	92.4		
#50	82.3		
#60	74.2		
#100	43.5		
#200	21.7		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.323 D_{60}= 0.197 D_{50}= 0.168
D_{30}= 0.107 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

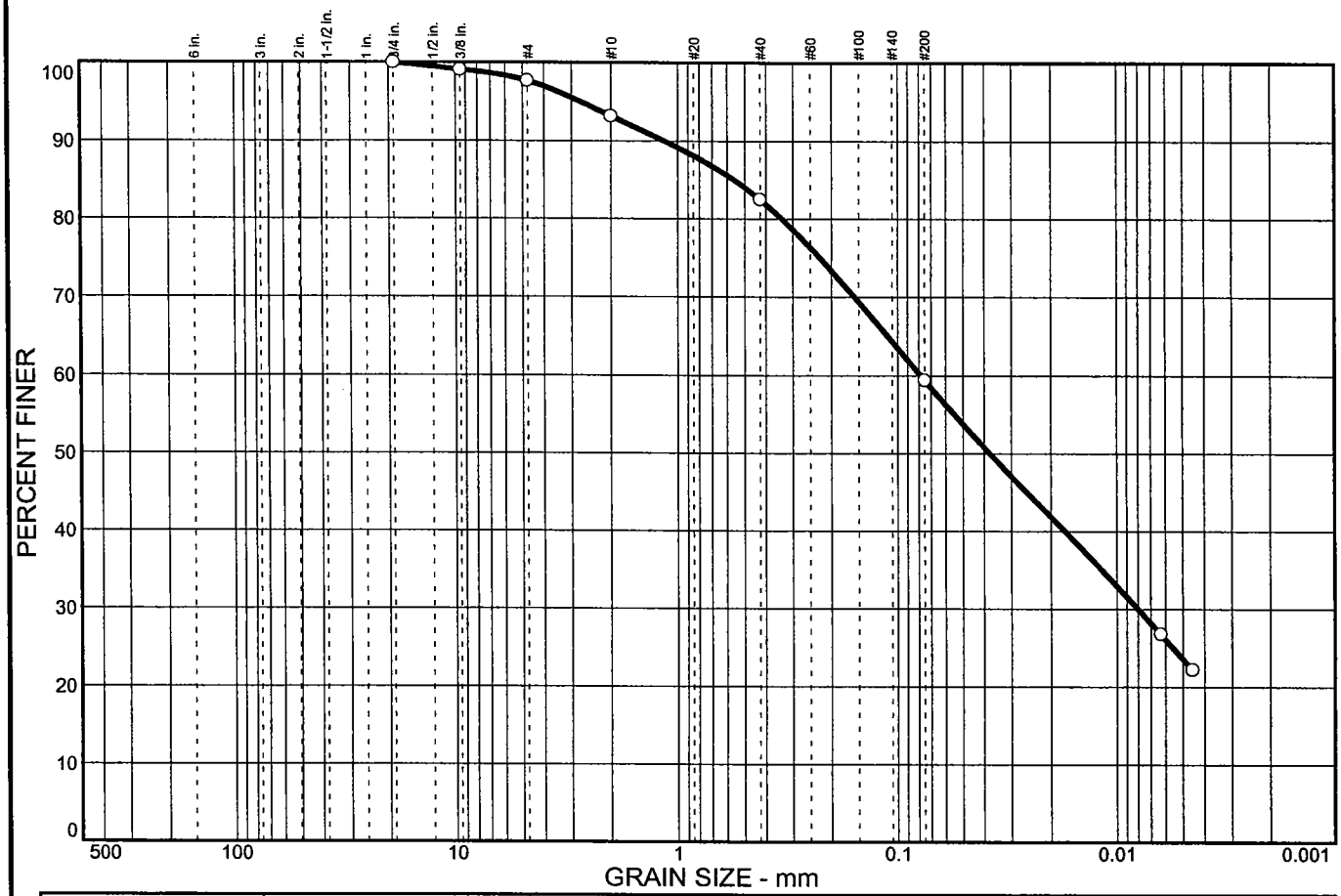
Moisture Content= 16.7%
Specific Gravity= 2.71

Sample No.: 805 # 3, S-8B **Source of Sample:** **Date:** 2/18/03
Location: **Elev./Depth:** 31.0'-32.0'

DLZ

Client: Battelle Memorial Institute
Project: West Jefferson North Site
Test Methods: ASTM C-117, C-136, D-854, D-2216
Project No: 0221-4016.00 **Plate**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	2.3	4.5	10.7	23.1	35.8	23.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	99.1		
#4	97.7		
#10	93.2		
#40	82.5		
#200	59.4		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.558 D_{60}= 0.0783 D_{50}= 0.0375
D_{30}= 0.0080 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

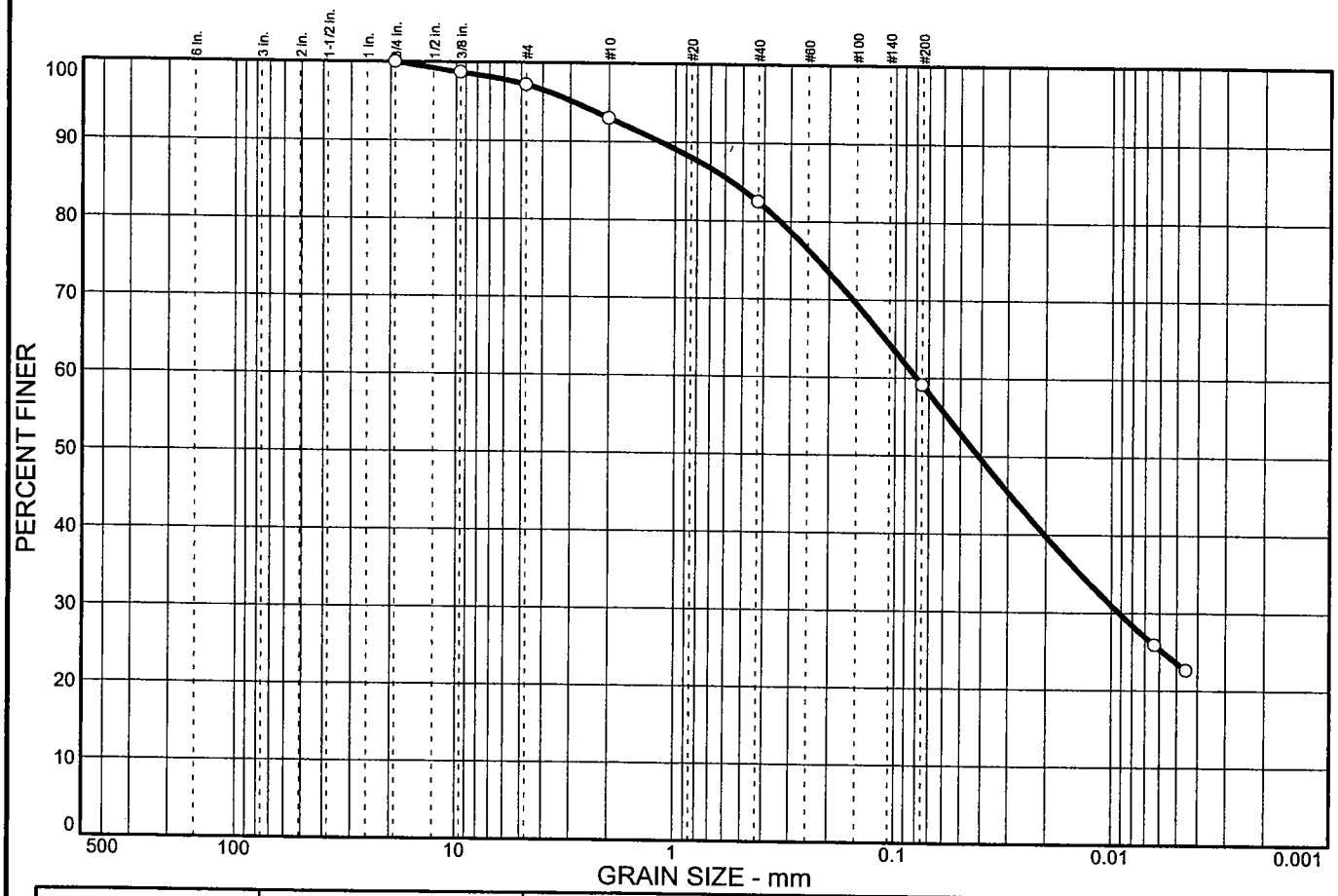
Moisture Content= 13.1%

Sample No.: 805 # 3, S-9 **Source of Sample:** **Date:** 2/18/03
Location: **Elev./Depth:** 32.0'-33.0'

DLZ

Client: Battelle Memorial Institute
Project: West Jefferson North Site
Test Methods: ASTM D-421, D-422, D-2216
Project No: 0221-4016.00 **Plate**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	2.8	4.2	10.5	23.4	35.5	23.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	98.7		
#4	97.2		
#10	93.0		
#40	82.5		
#200	59.1		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.560 D_{60}= 0.0796 D_{50}= 0.0409
D_{30}= 0.0092 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

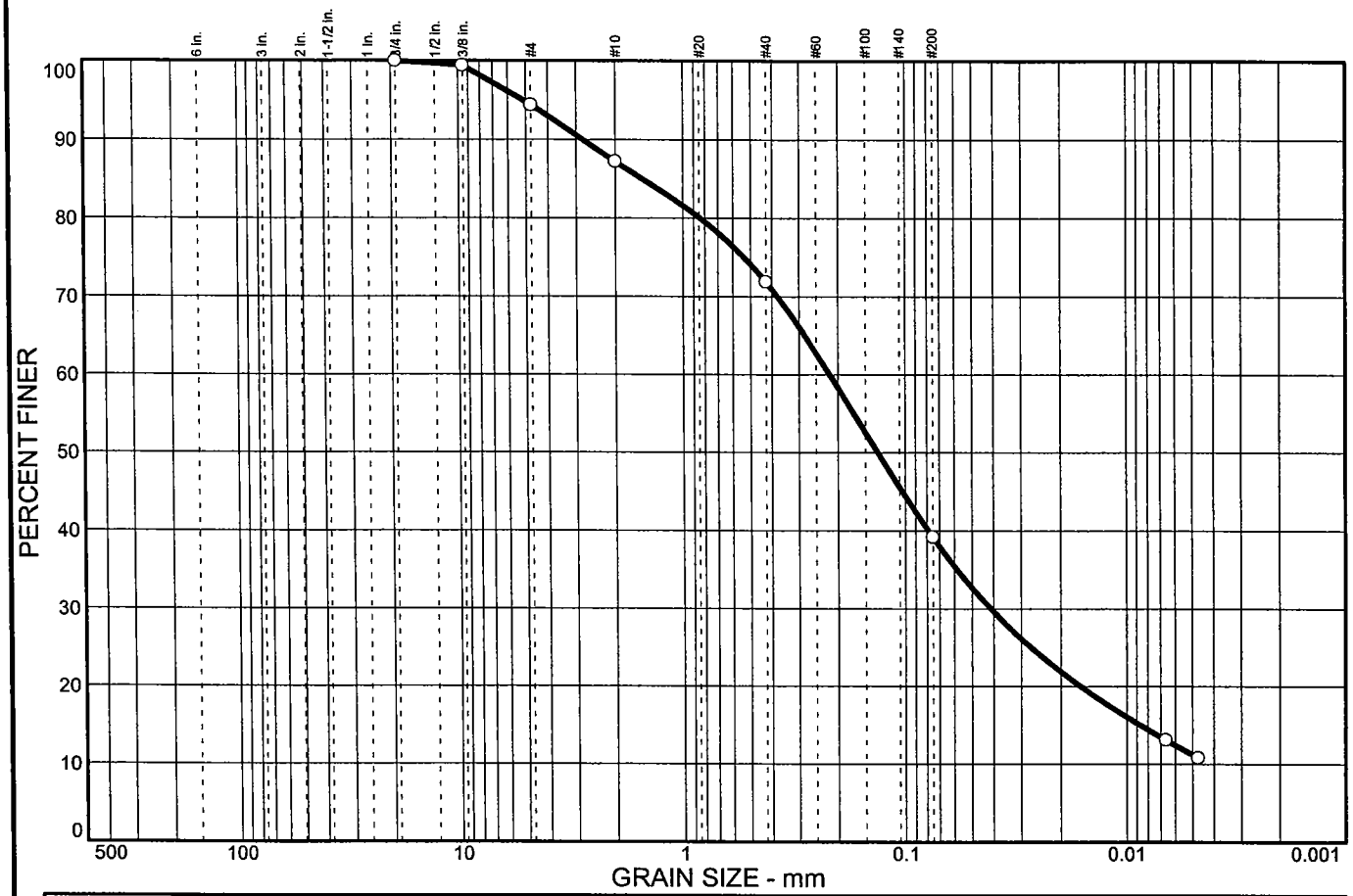
Moisture Content= 12.1%

Sample No.: 805 # 3, S-10 **Source of Sample:** **Date:** 2/18/03
Location: **Elev./Depth:** 33.0'-34.0'

DLZ

Client: Battelle Memorial Institute
Project: West Jefferson North Site
Test Methods: ASTM D-421, D-422, D-2216
Project No: 0221-4016.00 **Plate**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	5.6	7.2	15.3	32.7	28.0	11.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	99.4		
#4	94.4		
#10	87.2		
#40	71.9		
#200	39.2		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 1.52 D_{60}= 0.217 D_{50}= 0.132
D_{30}= 0.0410 D_{15}= 0.0087 D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

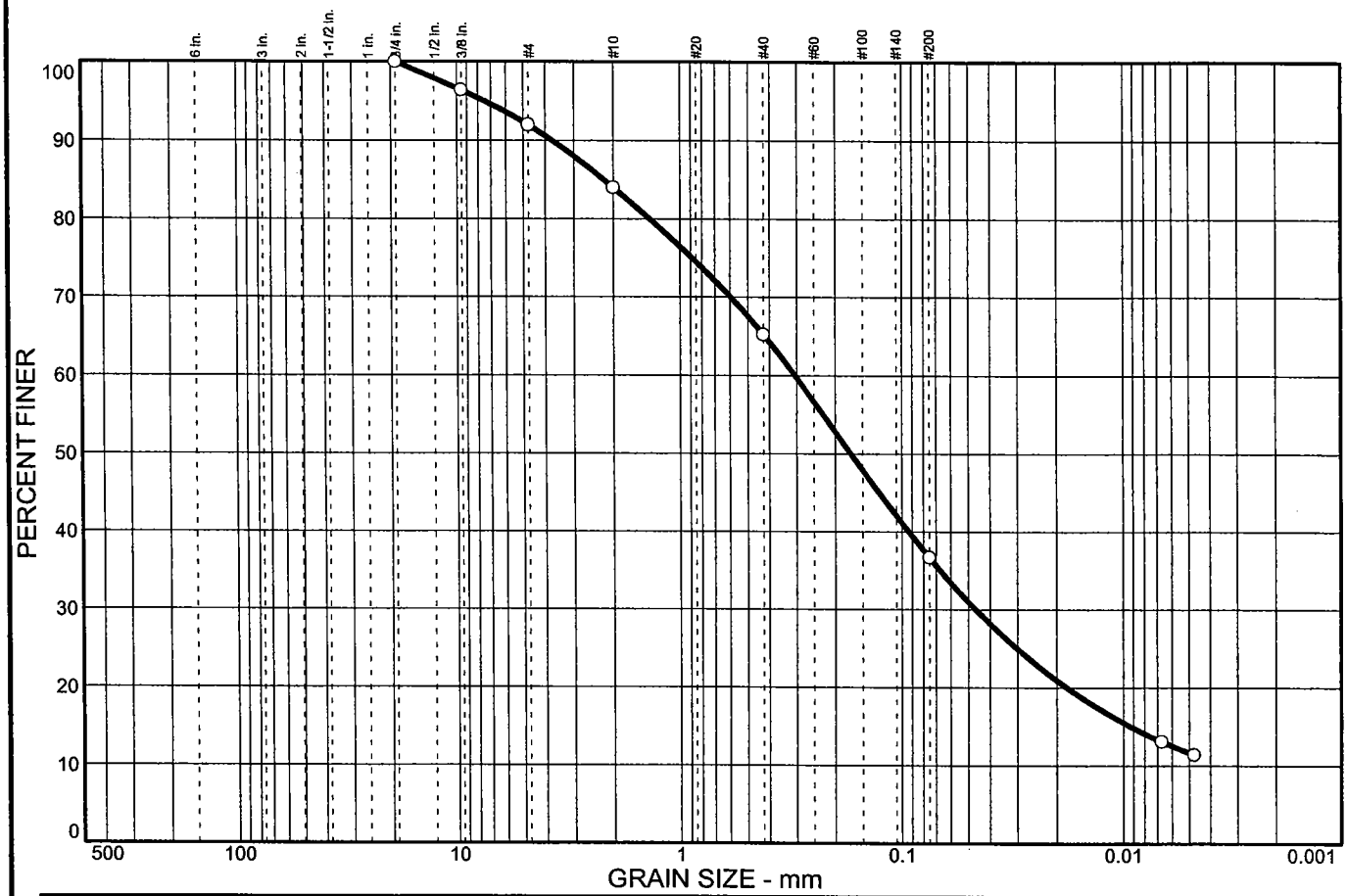
Moisture Content= 10.0%

Sample No.: 805 # 3, S-12 **Source of Sample:** **Date:** 2/18/03
Location: **Elev./Depth:** 55.0'-56.0'

DLZ

Client: Battelle Memorial Institute
Project: West Jefferson North Site
Test Methods: ASTM D-421, D-422, D-2216
Project No: 0221-4016.00 **Plate**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	8.0	8.0	18.8	28.5	25.1	11.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.375 in.	96.4		
#4	92.0		
#10	84.0		
#40	65.2		
#200	36.7		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 2.21 D_{60}= 0.305 D_{50}= 0.169
D_{30}= 0.0462 D_{15}= 0.0092 D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

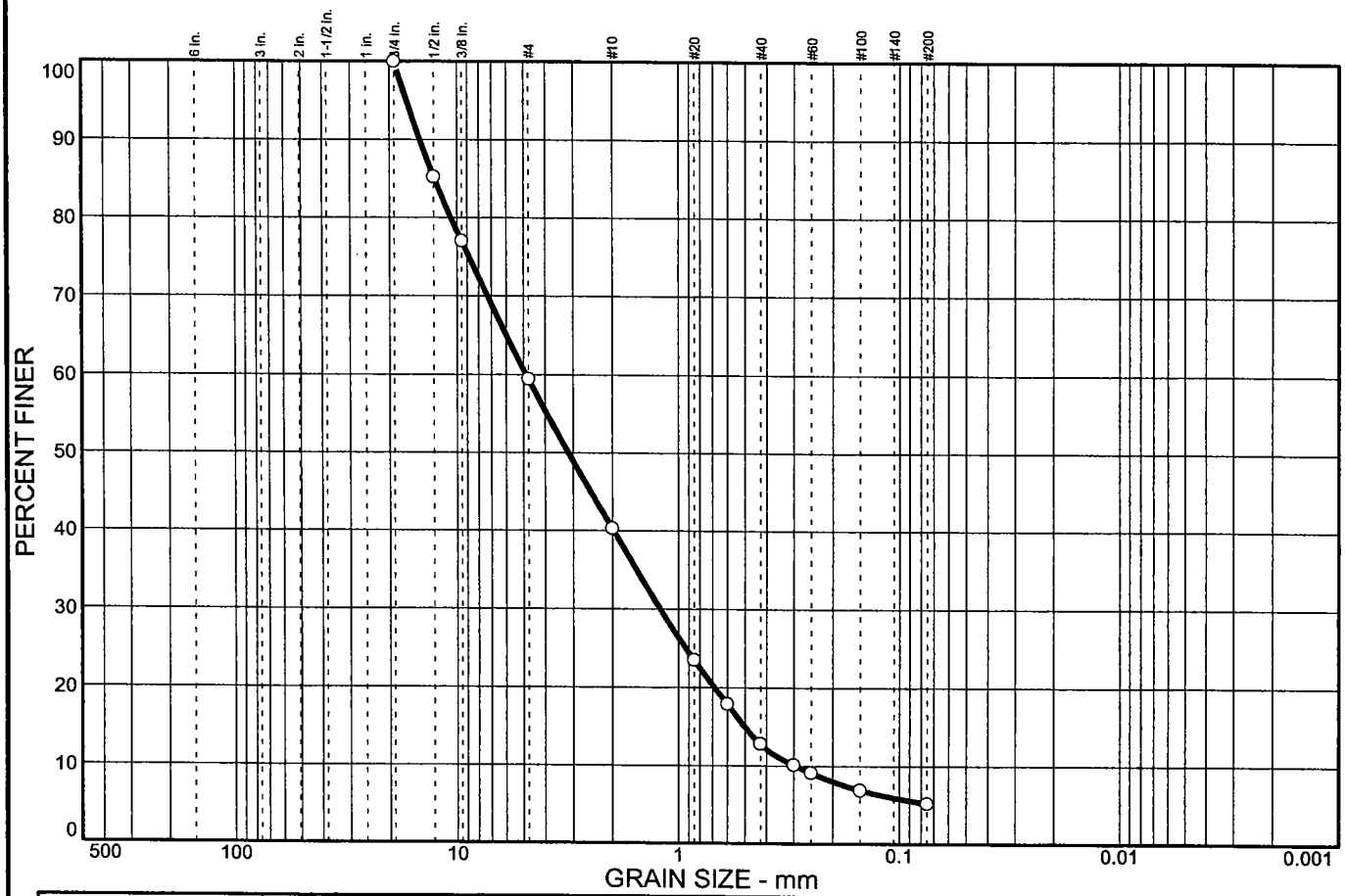
Moisture Content= 13.9%

Sample No.: 805 # 3, S-13A **Source of Sample:** **Date:** 2/18/03
Location: **Elev./Depth:** 56.0'-57.0'

DLZ

Client: Battelle Memorial Institute
Project: West Jefferson North Site
Test Methods: ASTM D-421, D-422, D-2216
Project No: 0221-4016.00 **Plate**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	40.6	19.1	27.5	7.6	5.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75 in.	100.0		
0.50 in.	85.2		
0.375 in.	77.0		
#4	59.4		
#10	40.3		
#20	23.5		
#30	17.9		
#40	12.8		
#50	10.1		
#60	9.1		
#100	6.9		
#200	5.2		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 12.6 D_{60}= 4.87 D_{50}= 3.14
D_{30}= 1.21 D_{15}= 0.500 D_{10}= 0.295
C_u= 16.53 C_c= 1.02

Classification

USCS= AASHTO=

Remarks

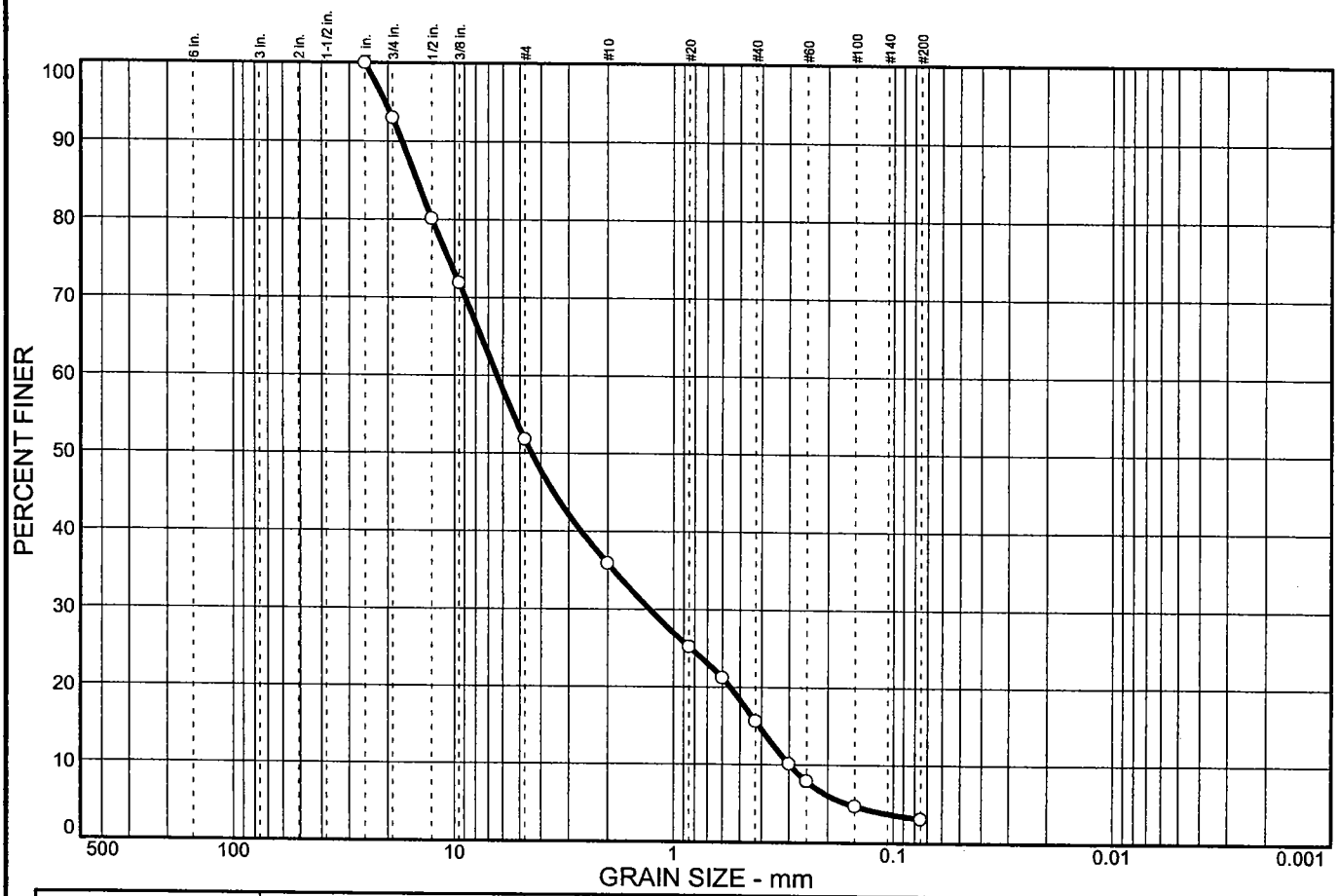
Moisture Content= 8.4%
Specific Gravity= 2.75

Sample No.: 805 # 3, S-13B **Source of Sample:** **Date:** 2/18/03
Location: **Elev./Depth:** 56.0'-57.0'

DLZ

Client: Battelle Memorial Institute
Project: West Jefferson North Site
Test Methods: ASTM C-117, C-136, D-854, D-2216
Project No: 0221-4016.00 **Plate**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	7.0	41.2	15.9	20.3	12.5	3.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.00 in.	100.0		
0.75 in.	93.0		
0.50 in.	80.1		
0.375 in.	71.9		
#4	51.8		
#10	35.9		
#20	25.2		
#30	21.2		
#40	15.6		
#50	10.1		
#60	7.9		
#100	4.7		
#200	3.1		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 14.8 D_{60}= 6.38 D_{50}= 4.41
D_{30}= 1.29 D_{15}= 0.410 D_{10}= 0.298
C_u= 21.42 C_c= 0.87

Classification

USCS= AASHTO=

Remarks

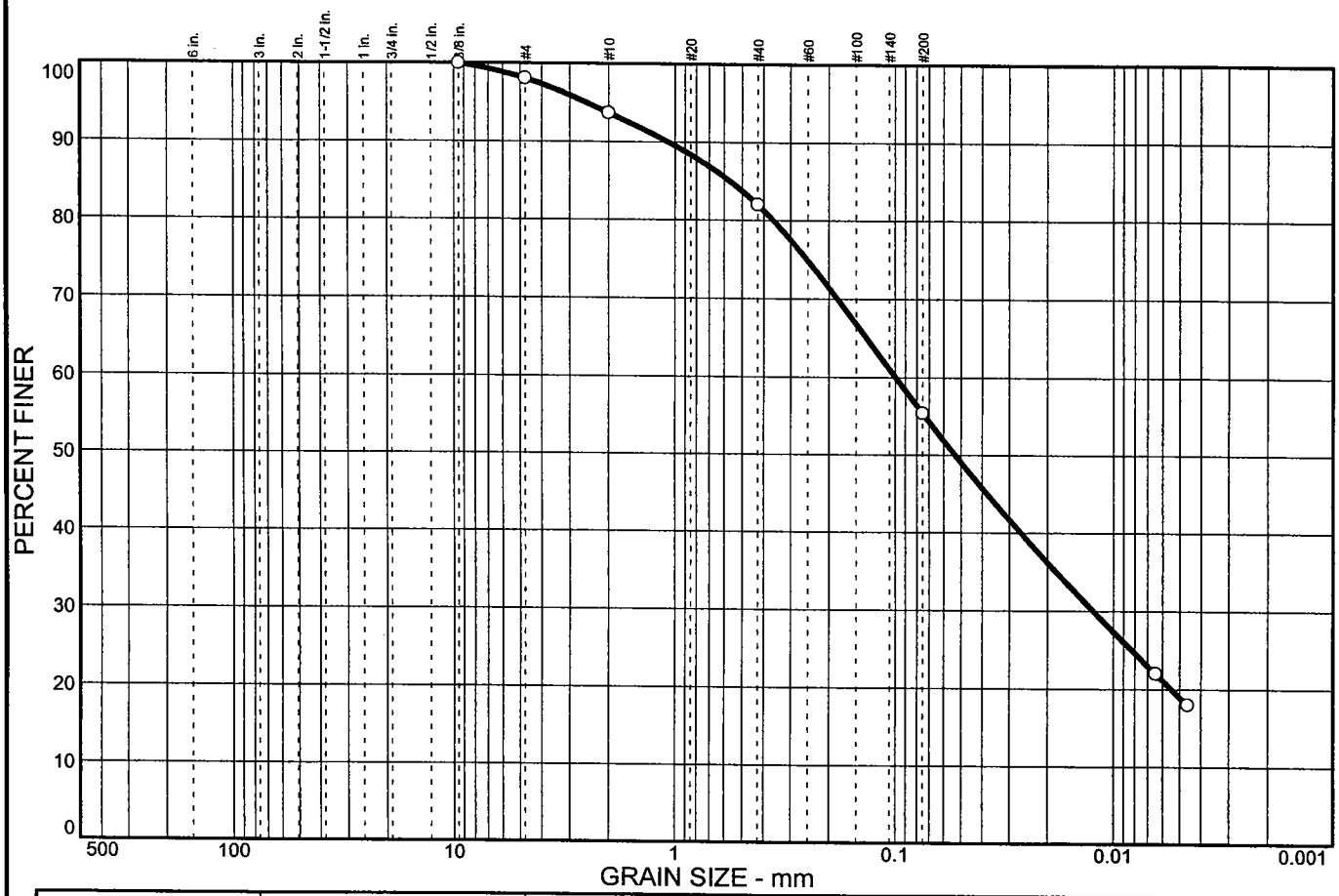
Moisture Content= 9.5%
Specific Gravity= 2.72

Sample No.: 805 # 3, S-14A **Source of Sample:** **Date:** 2/18/03
Location: **Elev./Depth:** 57.0'-58.0'

DLZ

Client: Battelle Memorial Institute
Project: West Jefferson North Site
Test Methods: ASTM C-117, C-136, D-854, D-2216
Project No: 0221-4016.00 **Plate**

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	1.9	4.4	11.7	26.6	36.4	19.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375 in.	100.0		
#4	98.1		
#10	93.7		
#40	82.0		
#200	55.4		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.566 D_{60}= 0.0994 D_{50}= 0.0530
D_{30}= 0.0123 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Moisture Content= 12.0%

Sample No.: 805 # 3, S-14B **Source of Sample:** **Date:** 2/18/03
Location: **Elev./Depth:** 57.0'-58.0'

DLZ

Client: Battelle Memorial Institute
Project: West Jefferson North Site
Test Methods: ASTM D-421, D-422, D-2216
Project No: 0221-4016.00 **Plate**