



March 25, 2022
Contract No. 2022-08
VETERAN'S BOULEVARD, 2022-08
ADDENDUM No. 3

BID DATE CHANGE:

All SEALED BIDS must be received by the Butler County Engineer not later than 10:30 a.m. local time on **Thursday, March 31, 2022**. All timely received SEALED BIDS will be publicly opened at approximately 10:45 a.m. on that date in the Main Conference Room at the Butler County Engineer's Office, 1921 Fairgrove Avenue, Hamilton, Ohio 45011-1965.

Add Attachment

"Laboratory Test Results – Mix Design"

Add Note(s):

Autumn Joy Sedum is an approved equal to the Purple Emperor Sedum.

Update Note(s):

The completion dates are as follows:

All Work shall be substantially completed by October 1, 2022

All punch list items, incidental repair work shall be completed by October 30, 2022.

Completion of the watermain and restoration associated work and finalization of the project shall be completed by December 15, 2022.

Special - No work is permitted between the October 31, 2022 through November 6, 2022.

Add Items:

Item 638E06709, 24" Steel Pipe Encasement, Open Cut, As Per Plan, 430LF Per Butler County Water and Sewer Specifications:

http://des.butlercountyohio.org/html/contractors/documents/1210.rev08_000.pdf

Delete Items:

Line Item 14, Item 206E30000, Mixture Design for Chemically Stabilized Soils:
1 Lump Sum;

Change Items:

Line Item 158, Item 206E10500, Cement: Change Quantity to 371 Tons;

Updated Engineer's Estimate: \$6,373,332

Please e-mail or call our office when you have received this Addendum.

taylor@bceo.org

Melissa Taylor; 513-785-4115



2390 Advanced Business Center Drive
Columbus, Ohio 43228
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March 25, 2022

Mr. Doug James
John R. Jurgensen
11641 Mosteller Road
Cincinnati, Ohio 45241

RE: Laboratory Test Results - Mix Design
Costco P11-04 – Veterans Boulevard Construction
Liberty Township, Butler County, Ohio
DHDC Project Number: D21-053

Dear Mr. James:

At your request DHDC Engineering Consulting Services, Inc. (DHDC) performed the required laboratory tests for the cement treated subgrade soil mix design. The test samples were prepared as per the Section 1120.03 of ODOT Supplement 1120, dated January 15, 2016.

DHDC collected six (6) soil samples from the proposed cement stabilized subgrade zone. The collected soil samples were transported to the DHDC's laboratory in Columbus, Ohio for the required testing. Two bucket full of soil samples were collected from each location.

From these soil samples DHDC performed laboratory classification test. The laboratory tests included natural moisture content (AASHTO T 265), particle size analysis (AASHTO T 88), Atterberg Limit determinations (AASHTO T 89 and T 90), organic content by loss on ignition (AASHTO T 267, and Sulfate Content Test Colorimetric Method (ODOT S1122). The following are important information about the laboratory test results:

- The natural moisture content of the soil samples ranged from about 10 to 23 percent.
- Liquid Limit of the soil samples ranged from 28 to 39 percent.
- Plastic Limit of the soil samples ranged from 18 to 22 percent.
- Sulfate content on soil samples ranged from less than 100 to 320 ppm.
- Based on the test results the soil samples were classified as A-4a, A-6a and A-6b, according to the Ohio Department of Transportation (ODOT) soil classification system, or CL according to the Unified Soil Classification System (USCS).

Upon examining the collected soil samples, DHDC observed that samples 1 and 5 were contaminated with trace amounts of lime. Hence, DHDC didn't use those two samples to fabricate compressive strength specimen for mix design analysis. Since, all the samples were pretty similar in composition and classified as CL according to the USCS, DHDC combined soil samples from 2, 3, 4, and 6, and prepared one (1) set of test specimens and performed the required laboratory testing to determine the amount of cement required as per Section 1120.04 of ODOT Supplement 1120, dated January 15, 2016.



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The Maximum Dry Density and Optimum Moisture content of the untreated soil was obtained from ODOT family of curves. The maximum Dry Density and Optimum Moisture content of the cement treated soils were also obtained from the ODOT family of curves.

ODOT Supplement 1120, dated January 15, 2016, requires that the minimum cement content (by weight) for subgrade stabilization should increase the 8-day compressive strength by 50 psi over the untreated soil. The supplement also requires that the minimum percentage rate be rounded to the nearest 0.5 percent and additional 0.5 percent of cement be added. The supplement also states that the minimum recommended spreading rate shall be at least 4.0 percent.

The test result show 3.0 percent cement requirement for the cement treated soil sample to attain a compressive strength of 149 psi (99 psi plus 50 psi). Since the cement requirement to attain the 8-day compressive strength by 50 psi over the untreated soil is less than 4.0 percent, DHDC recommends that the minimum spreading rate shall be at least 4.0 percent of cement of the dry unit weight (119.3 pcf) of subgrade soil

It should be noted that the Optimum Moisture Content of the samples fabricated with 3 percent and 5 percent cement was 13.5 percent and 14.6 percent, respectively. However, the Optimum Moisture Content of the stabilized soil at the time of field compaction may differ slightly, which can be within +3 percent margin.

It is DHDC's belief that the variations of the natural moisture content, as encountered in the collected soil samples (10 to 23 percent), and uneven spreading of Cement and mixing with subgrade soil may affect the performance of cement stabilized subgrade. Hence, some areas of the subgrade may fail to achieve the required minimum strength. Hence, field quality control is vital for the performance of cement stabilized subgrade. It is recommended that DHDC perform field compaction tests, and perform field verification of the mix design based on Section 1120.07 of the ODOT Supplement 1120.

If you have any questions or require additional information, please to not hesitate to contact us. We appreciate this opportunity and look forward to working with you.

Sincerely,

DHDC Engineering Consulting Services, Inc.

A handwritten signature in black ink, appearing to read "Mohammed O. Haque", written over a horizontal line.

Mohammed O. Haque, P.E.
Project Coordinator

Attachments



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LABORATORY TEST RESULTS - MIX DESIGN FOR CHEMICALLY STABILIZED SUBGRADE SOIL

Veterans Boulevard

Liberty Township, Butler County, Ohio

DHDC Project Number: D21-053

Laboratory Test Results for Untreated Soils

Sample No.	Moisture Content (%)	Organic Content (%)	Particle Size Analysis (%)			Atterberg Limits		One Point Proctor		ODOT Soil Class	
			Gravel	Sand	Silt	Clay	Liquid Limit (%)	Plastic Limit (%)	Dry Density (pcf)		Optimum Moisture (%)
1	16	3	8	36	41	15	28	18	119.3	12.7	A-4a
2	15	2	10	25	36	29	35	21	119.3	12.7	A-6a
2	20	2	5	26	38	31	36	21	119.3	12.7	A-6a
4	15	1	4	39	32	25	35	20	119.3	12.7	A-6a
5	10	2	4	32	37	27	34	19	119.3	12.7	A-6a
6	23	2	5	24	36	35	39	22	119.3	12.7	A-6b

Note: Sample No. 1 and 5 are contaminated soil samples having trace amounts of lime.

Sulfate Content Test Results

Sample No.	Soaking Time (hrs.)	Dilution Ratio	Replicate Sulfate Measurements (mg/L)			Average Sulfate Measurements (mg/L)	Sulfate Content (ppm)
			1	2	3		
1	24	1:20	< 5	< 5	< 5	< 5	< 100
2	24	1:20	< 5	< 5	< 5	< 5	< 100
3	24	1:20	< 5	< 5	< 5	< 5	< 100
4	24	1:20	12	12	12	12	240
5	24	1:20	< 5	< 5	< 5	< 5	< 100
6	24	1:20	16	16	16	16	320

One-Point Proctor Test Results from ODOT Family of Density Curves

ODOT Soil Type	One-Point Proctor Maximum Dry Density/Optimum Moisture Content			
	0%	3%	5%	7%
Mixture of A-6a & A-6b	119.3/12.7	117.0/13.5	114.6/14.6	114.6/14.6

Sample 1 (Untreated Soil)

ASTM D 1633 – Method A

Unconfined Compression Test Results

Specimen No. 1

Age of Specimen (Days)	1
Avg. Sample Height (in.):	4.599
Avg. Sample Diameter (in.)	3.999
Height-to-diameter ratio:	1.15
Volume Change (%):	0.0
Cross-Sectional Areas (in ²):	12.55
Maximum Load (lbs.):	1267
Ultimate Strength (psi):	100.9
Wet Density (pcf):	131.3
Dry Density (pcf):	116.5
Moisture Content (%):	12.7

Specimen No. 2

Age of Specimen (Days)	1
Avg. Sample Height (in.):	4.570
Avg. Sample Diameter (in.)	3.999
Height-to-diameter ratio:	1.14
Volume Change (%):	0.0
Cross-Sectional Areas (in ²):	12.55
Maximum Load (lbs.):	1226
Ultimate Strength (psi):	97.7
Wet Density (pcf):	132.0
Dry Density (pcf):	117.1
Moisture Content (%):	12.7

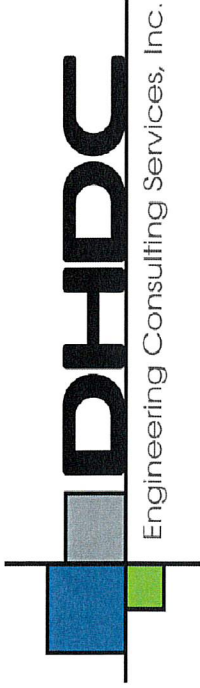


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Specimen No. 3

Age of Specimen (Days)	1
Avg. Sample Height (in.):	4.568
Avg. Sample Diameter (in.)	3.999
Height-to-diameter ratio:	1.14
Volume Change (%)	0.0
Cross-Sectional Areas (in ²):	12.55
Maximum Load (lbs.):	1240
Ultimate Strength (psi):	98.8
Wet Density (pcf):	132.8
Dry Density (pcf):	117.8
Moisture Content (%)	12.7

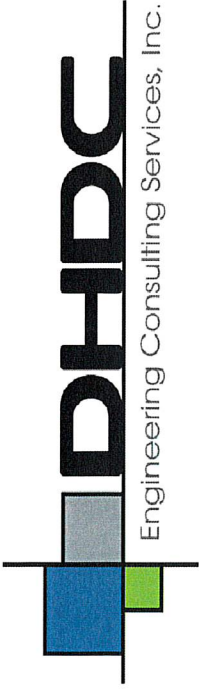
Average Compressive Strength = 99.1 psi.~ 99.0 psi



Volume of Soil Specimen Before and After Moisture Conditioning

Combined Material collected from Samples 2, 3, 4, & 6 (Mixture of A-6a & A-6b Soils)			
Before	3% Cement	5% Cement	7% Cement
Average Height (in)	Specimen 1: 4.61 Specimen 2: 4.61 Specimen 3: 4.59	Specimen 1: 4.60 Specimen 2: 4.61 Specimen 3: 4.62	Specimen 1: 4.61 Specimen 2: 4.61 Specimen 3: 4.61
Average Diameter (in)	Specimen 1: 3.99 Specimen 2: 3.99 Specimen 3: 3.99	Specimen 1: 4.03 Specimen 2: 4.00 Specimen 3: 4.00	Specimen 1: 4.00 Specimen 2: 4.00 Specimen 3: 4.01
After	3% Cement	5% Cement	5% Cement
Average Height (in)	Specimen 1: 4.61 Specimen 2: 4.61 Specimen 3: 4.60	Specimen 1: 4.61 Specimen 2: 4.61 Specimen 3: 4.61	Specimen 1: 4.61 Specimen 2: 4.61 Specimen 3: 4.62
Average Diameter (in)	Specimen 1: 3.99 Specimen 2: 3.99 Specimen 3: 3.99	Specimen 1: 4.03 Specimen 2: 4.01 Specimen 3: 4.00	Specimen 1: 4.01 Specimen 2: 4.01 Specimen 3: 4.01

Combined Material collected from Locations 2, 3, 4, & 6 (Mixture of A-6a & A-6b Soils)			
Before	3% Cement	5% Cement	7% Cement
Volume (in ³)	Specimen 1: 57.612 Specimen 2: 57.612 Specimen 3: 57.363	Specimen 1: 58.646 Specimen 2: 57.902 Specimen 3: 58.027	Specimen 1: 57.902 Specimen 2: 57.902 Specimen 3: 58.191
After	3% Cement	5% Cement	5% Cement
Volume (in ³)	Specimen 1: 57.612 Specimen 2: 57.612 Specimen 3: 57.487	Specimen 1: 58.773 Specimen 2: 58.191 Specimen 3: 57.902	Specimen 1: 58.191 Specimen 2: 58.191 Specimen 3: 58.317
Average Change in Volume (%)	0.07	0.17	0.40



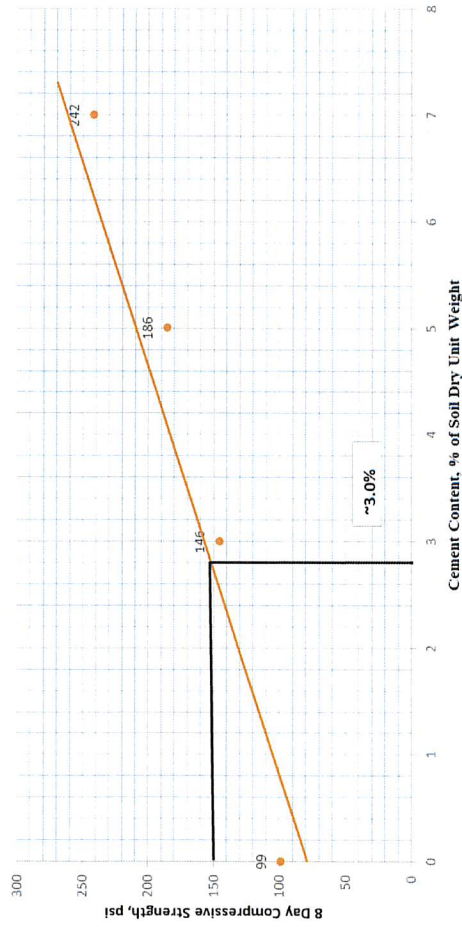
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Mix Design for Chemically Stabilized (Cement) Soils

Tasks	% Cement Content				
	0	3	5	7	
Combined Material collected from Locations 2, 3, 4, & 6 (Mixture of A-6a & A-6b Soils)					
% Swell after 24 hr. Soak (as per ODOT Supplement 1120)	N/A	0.07	0.17	0.40	
8 Day Compressive Strength, PSI (Avg. of 3 Specimens; after 7-day curing and 24-hour soaking, as per ODOT Supplement 1120)	99	146	186	242	

* No curing of untreated soil specimen. Compressive strength after 1 day.

8 Day Compressive Strengths vs. Cement Content
Soil Type: Mixture of A-6a and A-6b Soils (Combined Sample)
Veterans Boulevard Construction
Liberty Township, Butler County, County, Ohio
DHDC Project No.: D21-053



The Minimum Recommended Cement Spreading Percentage Rate is 4.0% of Soil Dry Weight



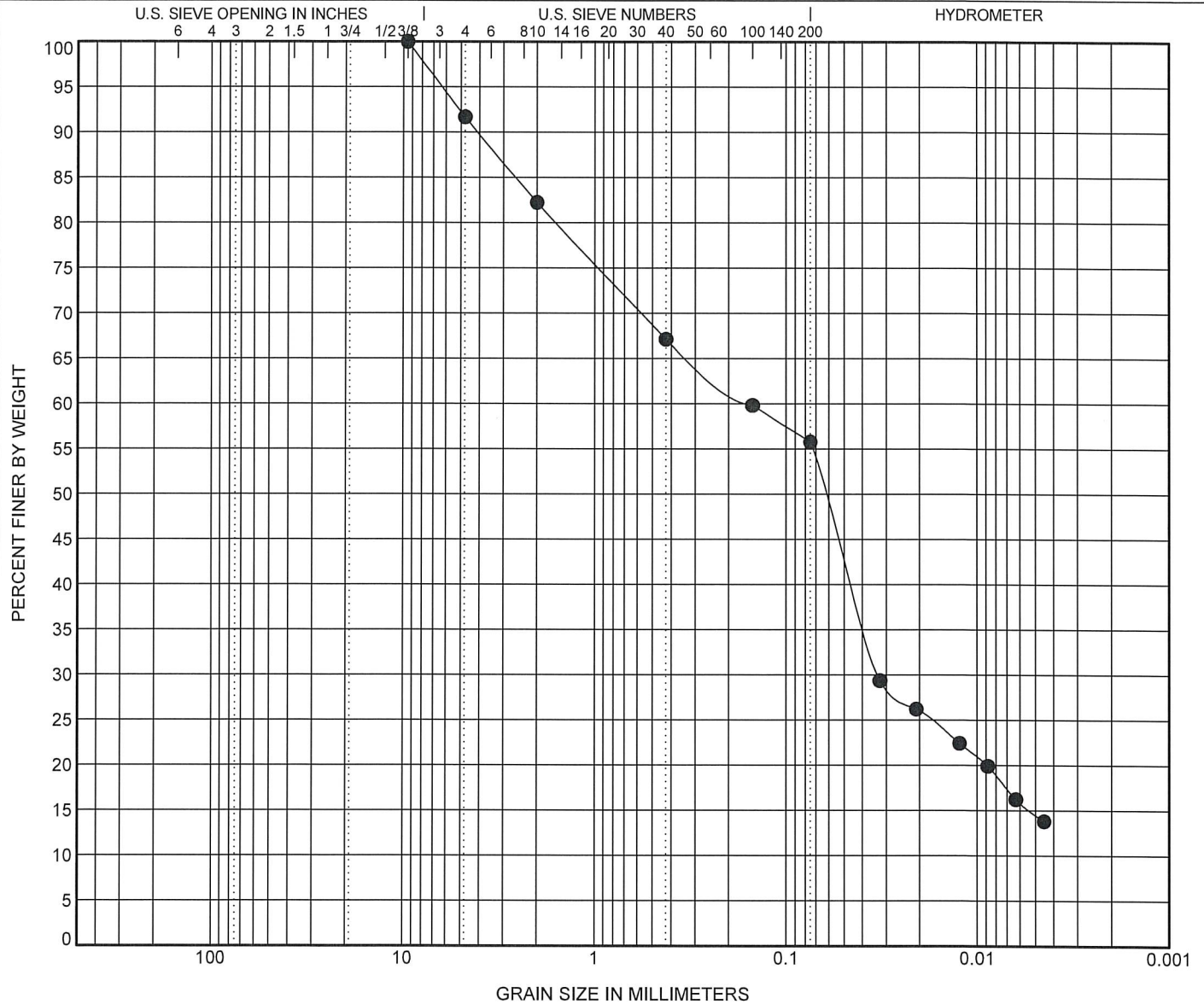
GRAIN SIZE DISTRIBUTION

CLIENT J.R Jurgensen

PROJECT NAME Costco P11-04

PROJECT NUMBER D21-053

PROJECT LOCATION Liberty Township, Butler County, Ohio



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
● Sample #1	1.0	SANDY LEAN CLAY(CL)	28	18	10		

BOREHOLE	DEPTH	D100	D90	D50	D10	%Gravel	%Sand	%Silt	%Clay
● Sample #1	1.0	9.5	4.067	0.062		8.3	35.9	41.2	14.6

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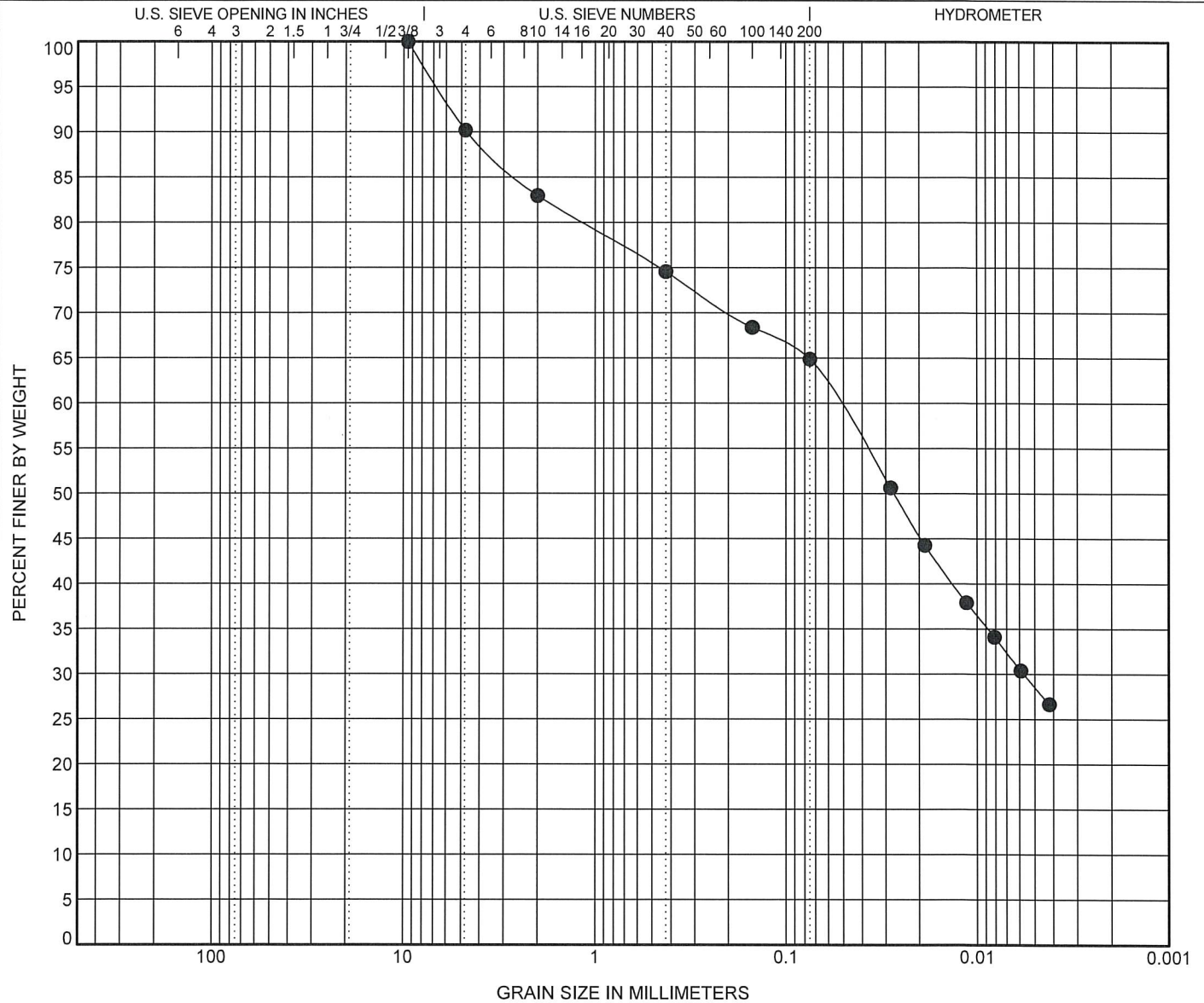
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PROJECT NUMBER D21-053

PROJECT LOCATION Liberty Township, Butler County, Ohio



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
● Sample #2	1.0	SANDY LEAN CLAY(CL)	35	21	14		

BOREHOLE	DEPTH	D100	D90	D50	D10	%Gravel	%Sand	%Silt	%Clay
● Sample #2	1.0	9.5	4.635	0.027		9.8	25.3	36.3	28.6

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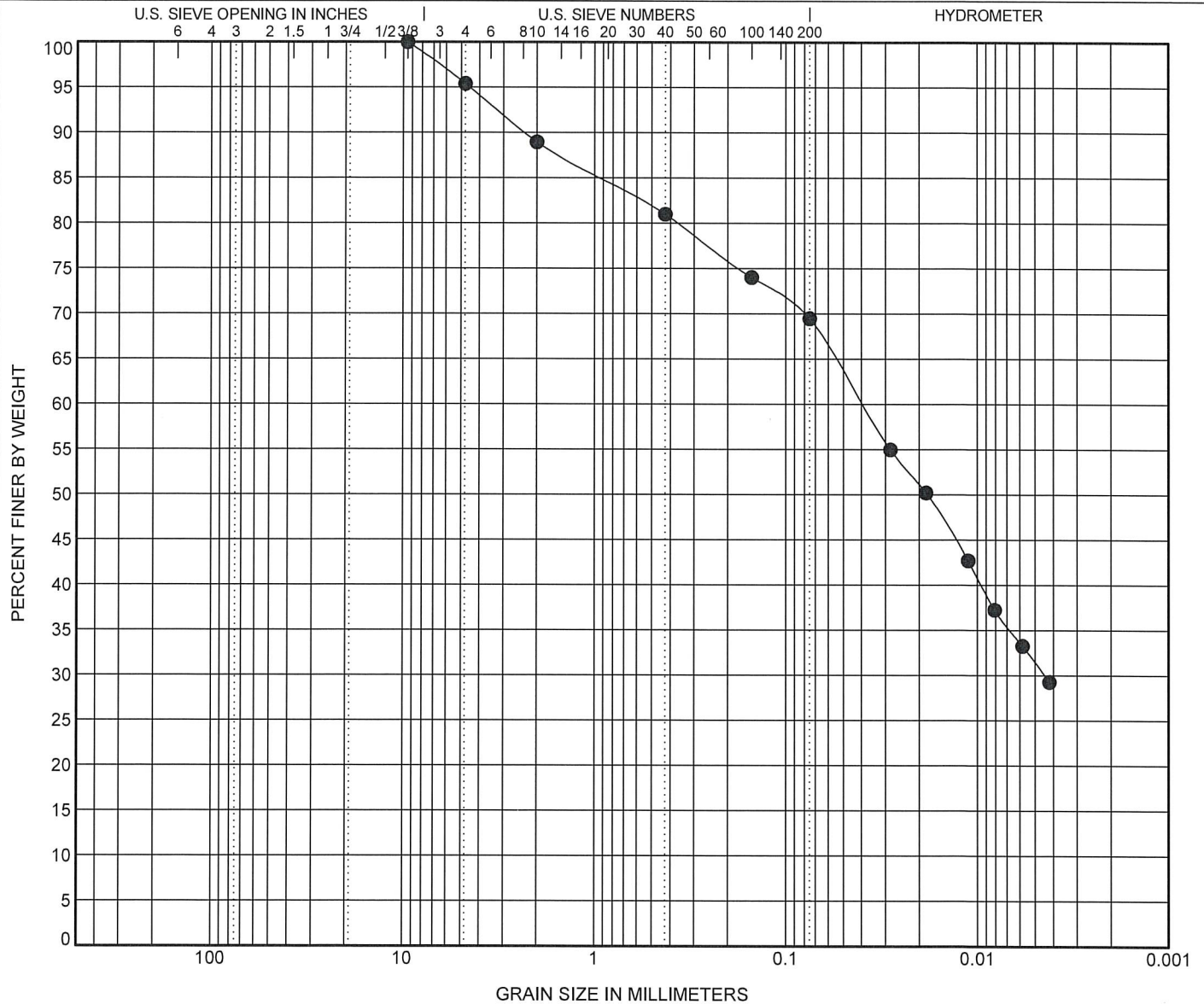
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PROJECT NUMBER D21-053

PROJECT LOCATION Liberty Township, Butler County, Ohio



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
● Sample #3	1.0	SANDY LEAN CLAY(CL)	36	21	15		

BOREHOLE	DEPTH	D100	D90	D50	D10	%Gravel	%Sand	%Silt	%Clay
● Sample #3	1.0	9.5	2.3	0.018		4.6	25.9	38.0	31.4

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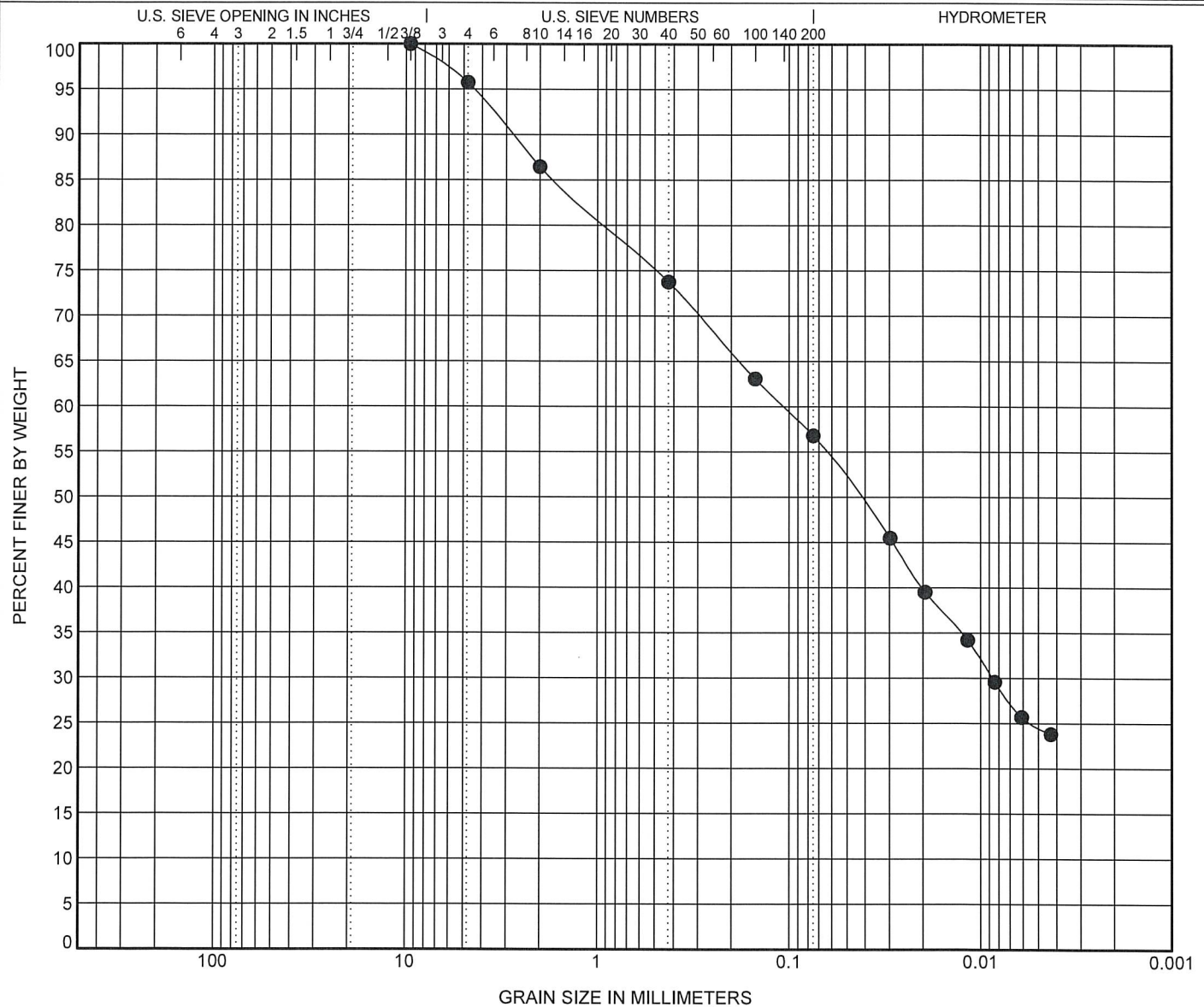


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PROJECT NAME Costco P11-04

PROJECT NUMBER D21-053

PROJECT LOCATION Liberty Township, Butler County, Ohio



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
● Sample #4	1.0	SANDY LEAN CLAY(CL)	35	20	15		

BOREHOLE	DEPTH	D100	D90	D50	D10	%Gravel	%Sand	%Silt	%Clay
● Sample #4	1.0	9.5	2.779	0.043		4.3	38.9	32.2	24.6

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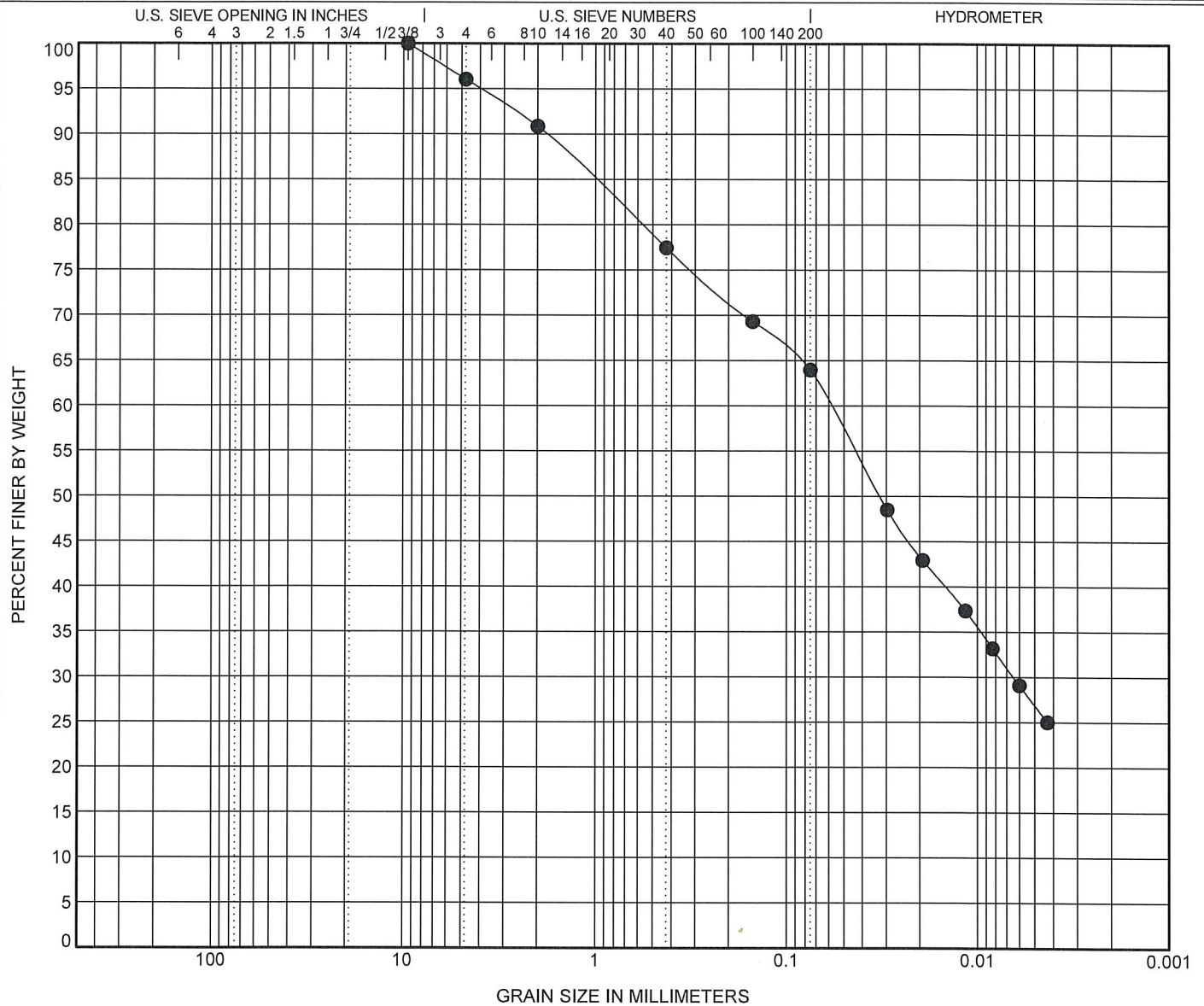
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PROJECT NAME Costco P11-04

PROJECT NUMBER D21-053

PROJECT LOCATION Liberty Township, Butler County, Ohio



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
● Sample #5	1.0	SANDY LEAN CLAY (CL)	34	19	15		

BOREHOLE	DEPTH	D100	D90	D50	D10	%Gravel	%Sand	%Silt	%Clay
● Sample #5	1.0	9.5	1.808	0.032		4.0	32.1	37.1	26.9

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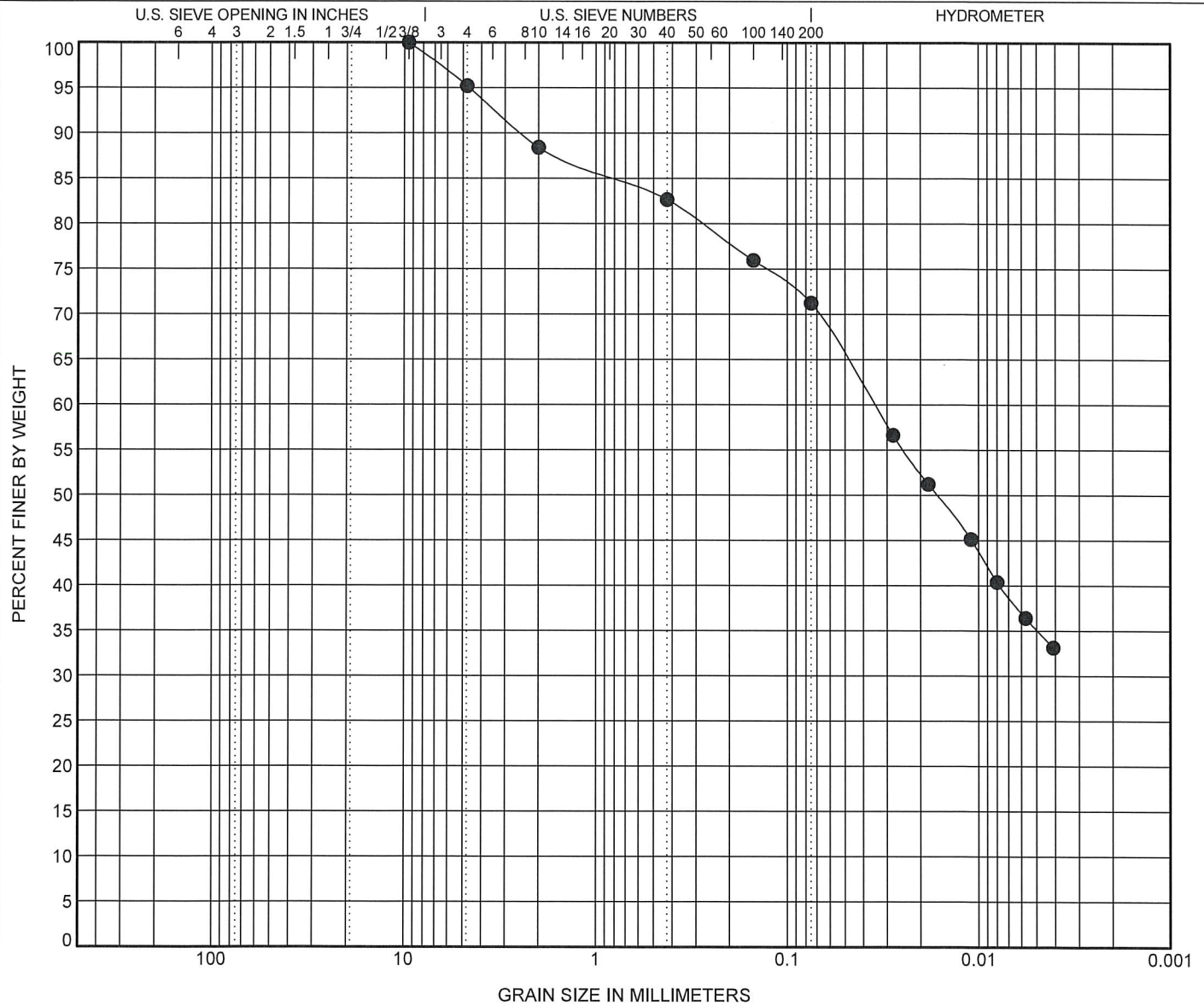
GRAIN SIZE DISTRIBUTION

CLIENT J.R Jurgensen

PROJECT NAME Costco P11-04

PROJECT NUMBER D21-053

PROJECT LOCATION Liberty Township, Butler County, Ohio



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
● Sample #6	1.0	LEAN CLAY with SAND(CL)	39	22	17		

BOREHOLE	DEPTH	D100	D90	D50	D10	%Gravel	%Sand	%Silt	%Clay
● Sample #6	1.0	9.5	2.445	0.016		4.8	24.0	36.1	35.1

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