GOLDBERG · ZOINO & ASSOCIATES, INC.
GEOTECHNICAL - GEOHYDROLOGICAL CONSULTANTS

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THE GEO BUILDING • 320 NEEDHAM ST. • NEWTON UPPER FALLS, • MA 02164

PROPOSED CONTAINMENT WALL

DESIGN/CONSTRUCTION ISSUES

MITCHEL FIELD SITE

HEMPSTEAD, NEW YORK

Prepared for:
Camp, Dresser & McKee
Boston, Massachusetts

Prepared by:
Goldberg-Zoino & Associates, Inc.
Newton Upper Falls, Massachusetts

File No. A-3903.2
November 1984

GOLDBERG • ZOINO & ASSOCIATES, INC.
GEOTECHNICAL-GEOHYDROLOGICAL CONSULTANTS

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November 9, 1984
File No. A-3903.2

Camp, Dresser & McKee
One Center Plaza
Boston, Massachusetts 02108

Attention: Mr. George Rief

Re: Mitchel Field Site
Hempstead, New York

Gentlemen:

We have prepared this letter to address several issues which have been raised by the State of New York Department of Law relative to containment wall construction at the Mitchel Field site. These issues were raised after the State reviewed the conceptual design report, prepared by Camp, Dresser & McKee (CDM) and contract specifications, prepared by CDM and Goldberg-Zoino & Associates, Inc. (GZA). The issues in question include:

1. The depth and characteristics of the soil deposits forming the bottom aquiclude of the containment system.

2. The effect of organic leachate on bentonite (for soil/bentonite and cement/bentonite walls) and Aspemix (for thin-wall containment).

3. The viability of the vibrated beam technique for thin-wall containment installation.

At CDM's request, GZA has recently completed a limited program of supplementary field and laboratory studies aimed at resolving these issues. Our conclusions and recommendations are presented below, followed by the actual laboratory and field data included as Appendices A, B, and C.

THE GEO BUILDING • 320 NEEDHAM STREET • NEWTON UPPER FALLS, MASSACHUSETTS 02164 • (617) 969-0050
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BOTTOM AQUICLUDE

To allow efficient operation of the proposed contaminant flushing system, a cutoff wall has been incorporated into the overall design. Equal in importance to the hydraulic conductivity of the wall itself is the "keying" of the wall into a suitable bottom aquiclude. The hydraulic conductivity of this aquiclude needs to be sufficiently low so as to limit dispersion of the "plume" and/or incorporation of cleaner water from outside the "plume" during recirculation/treatment of the contaminated groundwater.

As based on the two Woodward Clyde borings (MW-5 and DW-6) and four GZA borings (B-101 through B-104) existing at the completion of GZA's preliminary cutoff wall design report, an aquiclude consisting of a thin layer of clayey silt (3-to 5-foot-thick) above a relatively large thickness of silty fine sand appeared confirmed. Subsequent testing indicated acceptably low hydraulic conductivities for each of these deposits. The silty fine sand exhibited an average hydraulic conductivity of 9×10^{-5} cm/sec and the clayey silt yielded an average value of 2×10^{-6} cm/sec (see testing results presented in Appendix B and GZA's letter dated 1/31/84). At the request of the state, an additional seven borings (B-105 through B-111 included as Appendix A) were completed to further investigate the possible variability of the clayey silt portion of the aquiclude. These borings indicated that:

1. The clayey silt deposit is thinner than initially indicated and layered with sand lenses in some areas; and

2. in some cases a thin deposit of medium to fine sand separates the clayey silt from the silty fine sand deposit.

The lack of complete continuity and uniformity of the clayey silt layer in no way jeopardizes the effectiveness of the bottom aquiclude with respect to system design. This reflects the contribution of the silty fine sand portion of the aquiclude. In fact, the hydrologic modelling upon which the design is based assumes a key into the silty fine sand deposit and ignores the contribution of the clayey silt layer altogether. This fact and utilization of the upper-bound value of 1×10^{-4} cm/sec for the hydraulic conductivity of the bottom aquiclude reflect the conservatism built into the overall design. Therefore, any contribution derived from the lower permeability clayey silt layer will serve to reduce the required pumpage relative to the design value.

In light of the additional information, however, it is recommended that a further restriction on the keying of the wall into the aquiclude be included in the specifications. This clause should indicate that the wall be carried to elevation 5 as before but must also penetrate the silty sand deposit a minimum of 5 feet to account for possible variation in its surface elevation. This addition reflects the somewhat increased reliance on the silty fine sand deposit for the bottom aquiclude in areas where the clayey silt layer may not be continuous.

DEGRADATION OF CUTOFF WALL BACKFILL

The question of long-term backfill degradation (increase in hydraulic conductivity) due to leachate permeation has remained one with no definitive answer to date. This is true for the Mitchel Field site as well as with respect to the state-of-the-art in cutoff wall technology in general. Over the past three to five years, various attempts have been made to simulate backfill response to permeation with organic and inorganic chemicals. These attempts have met with varying degrees of success depending on the investigators' understanding of the theory underlying hydraulic conductivity testing and how well in-situ conditions were modelled.

Soil/Bentonite Backfill

Based on the work to date, it appears that organic chemicals such as those existing at the Mitchel Field site can in fact alter soil/bentonite (S/B) backfills in a deleterious manner. This effect is most probably due to a reduction in the bentonitic double layer and thus a commensurate reduction in the "effective clay mineral particle size." However, the degree to which this increases the backfill permeability depends on the site specific compounds and their concentrations in the sense that additive, subtractive and/or synergistic behavior is possible.

The S/B mix specified as one of the possible backfills for the Mitchel Field site is similar to that of the Gilson Road site (Nashua, New Hampshire - First Cooperative Superfund Wall) with respect to gradation. Both are primarily granular with bentonite composing most of the clay fraction. This is a direct result of similarities in the in-situ soils. In addition, the contaminants present on both sites are similar in nature. Hence, the preliminary design assumed the Gilson Road S/B mix would be suitable at the Mitchel Field site with respect to chemical characteristics.

GZA

Subsequent work centered around testing the actual S/B mix specified for the Mitchel Field site under conditions of permeation with site leachate. The methodology used to rapidly permeate the two to three pore volumes of leachate needed to assess chemical effects and account for the required high consolidation stresses was developed by GZA in 1981 during design of the Gilson Road S/B backfill. This procedure utilizes superposition of data from low stress/clean water permeant tests and high stress, high permeation rate/leachate permeant tests to estimate the hydraulic conductivity of the wall under long-term leachate permeation. The validity of this procedure was verified for the Gilson Road backfill via long-term (two years) testing which simultaneously modelled both in-situ stress and leachate conditions.

The Mitchel Field testing indicated a 30 percent increase in hydraulic conductivity (from 2.6×10^{-9} cm/sec to 3.4×10^{-9} cm/sec) due to leachate permeation at high stresses. When applied to the initial low stress testing data, a projected long-term hydraulic conductivity for the S/B backfill of approximately 1×10^{-8} cm/sec is obtained. Although the 30 percent increase in hydraulic conductivity is unexpectedly low as compared to the 100 percent change experienced during the Gilson Road testing, the final estimated long-term value of 1×10^{-8} cm/sec is two orders of magnitude less than 1×10^{-6} cm/sec design value. This allows for a large margin of error to account for possible shortcomings of the procedures used.

Aspemix Backfill

The vibrated beam technique is also specified as a possible, and in fact preferred, method of cutoff wall installation. The proposed "backfill", or grout, is a patented formulation trademarked as Aspemix. This material is based on an asphaltic emulsion. As such, it is hydrophobic in nature. A number of attempts have been made to permeate aspemix with various leachates, one of which was performed by GZA using Gilson Road leachate. Values of less than 10^{-10} cm/sec are typically "measured". These "measured" values are most probably due to imperfections in the testing (evaporation in burrets, permeation through lines, boundary flow along the membrane, leakage, etc.) rather than a true measure of hydraulic conductivity as such. In fact, the actual hydraulic conductivity of this hydrophobic medium under permeation with aqueous fluids is expected to be essentially zero under the low gradient anticipated in-situ.

Conclusions

1. The state-of-the-art in backfill design has not yet progressed to the point where a definitive answer can be given with respect to long-term performance under leachate permeation. Hence, prudent use of engineering judgement and appropriate factors of safety are in order.

2. The projected long-term hydraulic conductivity under in-situ conditions for the S/B mix specified is 1×10^{-8} cm/sec. This value was derived using a design procedure developed and verified on the Gilson Road project (similar backfill and groundwater contaminants). A factor of safety of two orders of magnitude therefore exists with respect to the design value of 1×10^{-6} cm/sec to account for possible shortcomings of the procedure used.

3. The projected hydraulic conductivity of the Aspemix backfill used with the vibrated beam technique is less than 1×10^{-10} cm/sec. This allows for a factor of safety of three orders of magnitude with respect to the design value of 1×10^{-7} cm/sec (the lower design value relative to the S/B wall reflects the reduced thickness of the barrier; 4 versus 36 inches).

4. Additional conservatism can be ascribed to the design inasmuch as the five year design life is less than the projected time required to displace the two to three volumes required to manifest increases in hydraulic conductivity due to chemical degradation.

5. Finally, the hydrology of the containment shall be controlled to cause a gradient forcing water from the outside towards the inside in all cases. As such, the permeant moving through the wall will be the relatively clean water existing outside the containment rather than the much more concentrated leachate found inside. Hence, the wall will be subjected to lower leachate concentrations than used in the design testing.

VIABILITY OF VIBRATED BEAM CUTOFF INSTALLATION TECHNIQUE

As with the slurry trench installed cutoff wall, the vibrated beam technique has been used in Europe for many years as a method of dewatering control. Both techniques have only recently been used for the more critical application of hazardous waste containment. As such, the state-of-the-art in installation techniques is constantly evolving as differing problems are encountered and solved.

Recently, much attention has been given to the "inability" of American Foundation (Slurry Systems Inc.) to cost-efficiently install a cutoff at the G.E. Moreau site in New York. This instance of "failure" has been heavily exploited by the slurry trench contractors as a means of discrediting the beam technique. This state of affairs is as one would expect in a highly competitive market. It should be pointed out, however, that the slurry trench technique is not without its own particular problems and has had its share of failures. It suffices to say that each technique has its advantages and disadvantages and neither should be considered a panacea for containment construction.

As based on conversations with American Foundations, conversations with the State and an independent analysis of the problem by Geoengineering Inc. of Dennville, New Jersey, it appears that the problem at the Moreau site centered around very high "grout takes". This problem does not preclude the viability of the cutoff but renders it cost inefficient. The high grout takes were ascribed to a combination of densification of loose sands below clay layers causing arching and generation of voids with void propagation via hydraulic fracturing. Based on the available data, it is GZA's judgement that the same combination of conditions leading to the high grout take at the Moreau site do not exist at the Mitchel Field site. It can therefore be concluded that:

1. Both the vibrated beam and the slurry trench technique should prove viable with respect to cutoff installation at the Mitchel Field site.

2. The vibrated beam offers the advantages of requiring no soil removal, nearly immediate traffic access over the completed wall, railroad and street support during cutoff installation and minimum required staging areas.

3. Both techniques require that quality control testing and quality assurance procedures be implemented <u>during</u> construction so as to detect and rectify problems which may occur during progress of the project due to unforeseen conditions.

We trust this letter addresses the issues raised in a meaningful way. If you have any questions with respect to the information transmitted herewith, please do not hesitate to contact us.

Very truly yours,

GOLDBERG-ZOINO & ASSOCIATES, INC.

William E. Hadge
Geotechnical Engineer

Matthew J. Barvenik
Senior Geotechnical Engineer

John E. Ayres
Principal-in-Charge

WEH/MJB/JEA:slk
Attachments: Boring Logs
Laboratory Results
Gradation Results

GZA

APPENDIX A

BORING LOGS

BG-105 through BG-111

GOLDBERG-ZOINO & ASSOCIATES, INC.
320 NEEDHAM ST., NEWTON UPPER FALLS, MA.
GEOTECHNICAL/GEOHYDROLOGICAL CONSULTANTS

PROJECT: Mitchel Field Site, Hempstead, N.Y.

REPORT OF BORING No. BG-105
SHEET 1 OF 1
FILE No. A 3903.2
CHKD. BY WEH

BORING Co. Warren George
FOREMAN R. Gregory
GZA ENGINEER M. Marusich

BORING LOCATION Proposed Containment Wall
GROUND SURFACE ELEVATION ±77 DATUM
DATE START 7/26/84 DATE END 7/26/84

SAMPLER: UNLESS OTHERWISE NOTED, SAMPLER CONSISTS OF A 2" SPLIT SPOON DRIVEN USING A 140 lb. HAMMER FALLING 30 in.
CASING: UNLESS OTHERWISE NOTED, CASING DRIVEN USING 300 lb. HAMMER FALLING 24 in.
CASING SIZE: None; open hole with drilling mud
OTHER: 3" stationary piston sampler

GROUNDWATER READINGS

DATE	TIME	WATER AT	CASING AT	STABILIZATION TIME
				see Note 1

DEPTH (ft.)	CASING (bl/ft)	No.	PEN. (in) / REC.	DEPTH (ft.)	BLOWS/6"	SAMPLE DESCRIPTION (Burmister CLASSIFICATION)	REMARKS	STRATUM DESCRIPTION
0						No samples taken above 50 feet		
50		S-1	24/12	50-52	19-14-16-17	Medium dense, brown fine to medium SAND, trace Silt		Fine to Medium SAND
		S-2	24/14	52-54	9-14-14-18	Medium dense, brown fine to medium SAND, trace Silt		
55		S-3	24/12	54-56	18-12-16-16	Medium dense, brown fine to medium SAND, trace Silt		
		S-4	24/24	56-58	11-11-19-16	Medium dense, brown fine to medium SAND, trace Silt with ½" layers of clayey SILT in bottom 6"		
		S-4A						58.1'
		U-1	24/18	58-60	HYD. PUSH	Brown clayey SILT, trace to some fine Sand		59.4' Clayey SILT
60							2	
		S-5	24/18	60-62	11-10-28-36	Dense brown fine to medium SAND, trace fine Gravel; one ½" seam of silty CLAY		Fine to Medium SAND
		S-6	24/24	62-64	11-28-56-73	V. dense brown fine to medium SAND, trace fine Gravel		
65								Bottom of hole at 64.0'

GRANULAR SOILS BLOWS/FT.	DENSITY	COHESIVE SOILS BLOWS/FT.	DENSITY
0-4	V. LOOSE	<2	V. SOFT
4-10	LOOSE	2-4	SOFT
10-30	M. DENSE	4-8	M. STIFF
30-50	DENSE	8-15	STIFF
>50	V. DENSE	15-30	V. STIFF
		>30	HARD

REMARKS:

(1) No ground water reading taken since drilling mud used.
(2) Observed clayey SILT while sealing tube after removing several inches of fine to medium sand from top and bottom of tube.

NOTES: 1) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THE BORING LOGS. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

BORING No. BG-105

GOLDBERG-ZOINO & ASSOCIATES, INC.
320 NEEDHAM ST., NEWTON UPPER FALLS, MA.
GEOTECHNICAL/GEOHYDROLOGICAL CONSULTANTS

PROJECT: Mitchel Field Site, Hempstead, N.Y.

REPORT OF BORING No. BG-107
SHEET 1 OF 1
FILE No. A3903.2
CHKD. BY WEH

BORING Co. Warren George
FOREMAN R. Gregory
GZA ENGINEER M. Marusich

BORING LOCATION Within Containment Area
GROUND SURFACE ELEVATION ±78 DATUM
DATE START 7/25/84 DATE END 7/25/84

SAMPLER: UNLESS OTHERWISE NOTED, SAMPLER CONSISTS OF A 2" SPLIT SPOON DRIVEN USING A 140 lb. HAMMER FALLING 30 in.
CASING: UNLESS OTHERWISE NOTED, CASING DRIVEN USING 300 lb. HAMMER FALLING 24 in.
CASING SIZE: None; Open hole with drilling mud OTHER: 3" stationary piston sampler

GROUNDWATER READINGS

DATE	TIME	WATER AT	CASING AT	STABILIZATION TIME
				see Note 1

DEPTH (ft.)	CASING (bl/ft)	SAMPLE No.	PEN. (in)/REC.	DEPTH (ft.)	BLOWS/6"	SAMPLE DESCRIPTION Burmister CLASSIFICATION	REMARKS	STRATUM DESCRIPTION
						No Samples taken above 50 feet		
50		S-1	24/12	50-52	17-16-18-28	Dense brown fine to medium SAND, trace (-) Silt, trace (-) fine Gravel		Fine to Medium SAND
		S-2	24/14	52-54	10-9-8-21	Medium dense, brown fine to medium SAND, trace (-) Silt, trace (-) fine Gravel		
55		S-3	24/16	54-56	16-17-26-31	Dense, brown fine to medium SAND, trace (-) Silt		
		S-4	24/12	56-58	14-11-16-19	Medium dense, brown fine SAND, trace Silt		
		S-5	24/18	58-60	8-10-11-9	S-5: top 6"; alternating 2" layers of fine SAND and SILT; one ½" seam of silty Clay bottom 12": brown silty CLAY, trace (-) fine Sand		59.0 SILTY CLAY and CLAYEY SILT
60		U-1	24/24	60-62	HYD. PUSH	Brown clayey SILT, trace fine Sand to 60.9 feet changing to reddish-brown fine to medium Sand, trace Silt		60.9' Fine to Medium SAND
		S-6	24/12	62-64	5-3-10-27	Medium dense brown fine to medium SAND, little Gravel, trace Silt		Bottom of hole at 64.0'
65								

GRANULAR SOILS BLOWS/FT.	DENSITY	COHESIVE SOILS BLOWS/FT.	DENSITY
0-4	V. LOOSE	< 2	V. SOFT
4-10	LOOSE	2-4	SOFT
10-30	M. DENSE	4-8	M. STIFF
30-50	DENSE	8-15	STIFF
>50	V. DENSE	15-30	V. STIFF
		>30	HARD

REMARKS:

1. Drilling mud used in hole, no ground water reading taken.

GZA NOTES: 1) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THE BORING LOGS. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

BORING No. BG-107

GOLDBERG-ZOINO & ASSOCIATES, INC.
320 NEEDHAM ST., NEWTON UPPER FALLS, MA.
GEOTECHNICAL/GEOHYDROLOGICAL CONSULTANTS

PROJECT
Mitchel Field Site
Hempstead, N.Y.

REPORT OF BORING No. BG- 108
SHEET 1 OF 1
FILE No. A3903
CHKD. BY WEH

BORING Co. Warren George
FOREMAN R. Gregory
GZA ENGINEER M. Marusich

BORING LOCATION Within Containment Area
GROUND SURFACE ELEVATION ±77 DATUM
DATE START 7/25/84 DATE END 7/25/84

SAMPLER: UNLESS OTHERWISE NOTED, SAMPLER CONSISTS OF A 2" SPLIT SPOON DRIVEN USING A 140 lb. HAMMER FALLING 30 in.
CASING: UNLESS OTHERWISE NOTED, CASING DRIVEN USING 300 lb. HAMMER FALLING 24 in.
CASING SIZE: None: Open hole with drilling mud
OTHER: 3" stationary piston sampler

GROUNDWATER READINGS

DATE	TIME	WATER AT	CASING AT	STABILIZATION TIME
				See Note 1

DEPTH (ft.)	CASING (bl/ft)	No.	PEN.(in)/REC.	DEPTH (ft.)	BLOWS/6"	SAMPLE DESCRIPTION Burmister CLASSIFICATION	REMARKS	STRATUM DESCRIPTION
						No samples taken above 50 feet		
50		S-1	24/12	50-52	12-16-21-28	Dense, brown fine to medium SAND, trace Silt		Fine TO Medium SAND
		S-2	24/14	52-54	10-23-23-19	Dense, brown fine to medium SAND, trace fine-medium Gravel, trace (-) Silt		
55		S-3	24/6	54-56	15-21-17-14	Dense, brown clayey SILT and fine SAND	2	55.5'
		U-1	24/24	56-58	HYD. PUSH	Brown clayey SILT, trace fine Sand with 6" layer of fine SAND, little Silt		Clayey SILT with silty fine SAND layer 57.8'
		U-2	18/6	58-59.5	HYD. PUSH	Brown fine to medium SAND, trace clayey Silt	3	Fine to Medium SAND
60		S-4	18/12	60-61.5	8-41-100/..	V. dense brown fine to medium SAND, little fine-medium Gravel, trace Silt		
								Bottom of hole at 61.5'
65								

GRANULAR SOILS BLOWS/FT.	DENSITY	COHESIVE SOILS BLOWS/FT.	DENSITY
0-4	V. LOOSE	<2	V. SOFT
4-10	LOOSE	2-4	SOFT
10-30	M. DENSE	4-8	M. STIFF
30-50	DENSE	8-15	STIFF
>50	V. DENSE	15-30	V. STIFF
		>30	HARD

REMARKS:
1. Drilling mud used in hole, no ground water reading taken.
2. Assumed change at 55.5' since only 6 inches recovered (may be higher).
3. Sample slid from tube during recovery, placed in jars.

GZA NOTES: 1) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THE BORING LOGS. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

BORING No. BG-108

GOLDBERG-ZOINO & ASSOCIATES, INC.
320 NEEDHAM ST, NEWTON UPPER FALLS, MA.

GEOTECHNICAL/GEOHYDROLOGICAL CONSULTANTS

PROJECT: Mitchel Field Site, Hempstead, N.Y.

REPORT OF BORING No. BG-109
SHEET 1 OF 1
FILE No. A-3903.2
CHKD. BY WEH

BORING Co. Warren George
FOREMAN R. Gregory
GZA ENGINEER M. Marusich

BORING LOCATION Within Containment Area
GROUND SURFACE ELEVATION ±80 DATUM
DATE START 7/24/84 DATE END 7/24/84

SAMPLER: UNLESS OTHERWISE NOTED, SAMPLER CONSISTS OF A 2" SPLIT SPOON DRIVEN USING A 140 lb. HAMMER FALLING 30 in.
CASING: UNLESS OTHERWISE NOTED, CASING DRIVEN USING 300 lb. HAMMER FALLING 24 in.
open hole
CASING SIZE: None; with drilling mud OTHER: 3" stationary piston sampler

GROUNDWATER READINGS

DATE	TIME	WATER AT	CASING AT	STABILIZATION TIME
				See Note 1

DEPTH (ft.)	CASING (bl/ft)	No.	PEN. (in)/REC.	DEPTH (ft.)	BLOWS/6"	SAMPLE DESCRIPTION Burmister CLASSIFICATION	REMARKS	STRATUM DESCRIPTION
						No samples taken above 50 feet		
50		S-1	24/8	50-52	13-18-13-14	Dense, brown fine to medium SAND, little fine to coarse Gravel, trace (-) Silt		Fine to Medium SAND
		S-2	24/8	52-54	11-9-13-18	Medium dense, brown, fine to coarse SAND, some (-) fine to coarse Gravel, trace (-) Silt		
55		S-3	24/8	54-56	16-20-26-47	Dense, brown fine to medium SAND, trace Silt		
		S-4	24/6	56-58	15-13-22-22	Dense, brown fine to medium SAND, trace (-) Silt		
		S-5	24/14	58-60	20-22-20-24	Dense, brown fine SAND, trace (+) Silt; one ¼" seam of Clayey SILT; in tip of spoon, fine SAND, some Silt		60.0'
60		U-1	24/11	60-62	HYD. PUSH	Brown Clayey SILT, trace fine Sand with layers of fine Sand, little Silt		CLAYEY SILT layered with silty fine SAND
		S-6	24/12	62-64	11-17-16-15	Dense, fine SAND, little (+) Silt, one 2½" layer of clayey Silt		64.0'
65		U-2	24/0	64-66	HYD. PUSH	No recovery, tube damaged		(No Recovery) 66.0
		S-7	24/12	66-68	8-22-43-69	V. dense, brown fine to medium SAND, little fine to medium Gravel, trace (-) Silt		Fine to Medium SAND
		S-8	18/12	68-69.5	50-48-50	V. dense brown fine-medium SAND, little (-) Gravel, trace Silt		70.0'
70		S-9	24/12	70-72	20-38-38-29	V. dense, brown fine SAND, trace Silt		Silty Fine SAND
		S-10	24/10	72-74	17-16-19-28	Dense, brown fine SAND, little Silt		
75		S-11	24/10	74-76	20-23-20-22	Dense, brown to tan fine SAND, little Silt		
		S-12	24/12	76-78	17-14-15-17	Medium dense, brown to tan fine SAND, little Silt		
		S-13	24/18	78-80	13-14-20-21	Dense, grey and brown silty fine SAND, little Silt		
80								

GRANULAR SOILS BLOWS/FT.	DENSITY	COHESIVE SOILS BLOWS/FT.	DENSITY
0-4	V. LOOSE	<2	V. SOFT
4-10	LOOSE	2-4	SOFT
10-30	M. DENSE	4-8	M. STIFF
30-50	DENSE	8-15	STIFF
>50	V. DENSE	15-30	V. STIFF
		>30	HARD

REMARKS:

Bottom of hole @ 80.0

1. Drilling mud used in hole, no ground water readings taken.

GZA

NOTES: 1) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THE BORING LOGS. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

BORING No. BG109

GOLDBERG-ZOINO & ASSOCIATES, INC.
320 NEEDHAM ST, NEWTON UPPER FALLS, MA.

GEOTECHNICAL/GEOHYDROLOGICAL CONSULTANTS

PROJECT: Mitchel Field Site, Hempstead, N.Y.

REPORT OF BORING No. BG-110
SHEET 1 OF 1
FILE No. A3903.2
CHKD. BY WEH

BORING Co. Warren George
FOREMAN G. Gregory
GZA ENGINEER M. Marusich

BORING LOCATION Within Containment Area
GROUND SURFACE ELEVATION ±80 DATUM
DATE START 7/26/84 DATE END 7/26/84

SAMPLER: UNLESS OTHERWISE NOTED, SAMPLER CONSISTS OF A 2" SPLIT SPOON DRIVEN USING A 140 lb. HAMMER FALLING 30 in.
CASING: UNLESS OTHERWISE NOTED, CASING DRIVEN USING 300 lb. HAMMER FALLING 24 in.
CASING SIZE: NONE: open hole with drilling mud OTHER: 3" stationary piston sample

GROUNDWATER READINGS

DATE	TIME	WATER AT	CASING AT	STABILIZATION TIME
				See Note 1

DEPTH (ft.)	CASING (bl/ft)	No.	PEN.(in)/REC.	DEPTH (ft.)	BLOWS/6"	SAMPLE DESCRIPTION (Burmister CLASSIFICATION)	REMARKS	STRATUM DESCRIPTION
						No sample tanken above 50 feet		
50		S-1	24/12	50-52	12-19-38-32	V. dense, brown fine to medium SAND, trace Silt		Fine to Medium SAND
		S-2	24/10	52-54	14-17-29-31	Dense brown fine to medium SAND, trace Silt		
55		S-3	24/12	54-56	20-21-22-17	Dense, brown, fine to medium SAND, trace Silt		
		S-4	24/14	56-58	12-14-14-17	Dense, brown fine to medium SAND, trace Silt. 1½± layer of clayey Silt in tip of spoon		57.9'
		U-1	24/20	58-60	HYD. PUSH	Brown ~~Clayey~~ SILT, trace fine Sand with 2 layers of fine to medium Sand, 4" thick each		~~Clayey~~ SILT
60								60.0'
		S-5	24/16	60-62	5-8-27-60	Dense brown fine to medium SAND, trace Silt		Fine to Medium SAND
								Bottom of hole at 62.0'

GRANULAR SOILS BLOWS/FT.	DENSITY	COHESIVE SOILS BLOWS/FT.	DENSITY
0-4	V. LOOSE	< 2	V. SOFT
4-10	LOOSE	2-4	SOFT
10-30	M. DENSE	4-8	M. STIFF
30-50	DENSE	8-15	STIFF
>50	V. DENSE	15-30	V. STIFF
		>30	HARD

REMARKS:
1. Drilling mud used in hole, no ground water reading taken.

GZA NOTES: 1) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THE BORING LOGS. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

BORING No. BG-110

GOLDBERG-ZOINO & ASSOCIATES, INC.
320 NEEDHAM ST., NEWTON UPPER FALLS, MA.
GEOTECHNICAL/GEOHYDROLOGICAL CONSULTANTS

PROJECT: Mitchel Field Site, Hempstead, N.Y.

REPORT OF BORING No. BG-111
SHEET 1 OF 1
FILE No. A3903.2
CHKD. BY WEH

BORING Co. Warren George
FOREMAN R. Gregory
GZA ENGINEER M. Marusich

BORING LOCATION Within Containment Area
GROUND SURFACE ELEVATION ______ DATUM ______
DATE START 7/27/84 DATE END 7/27/84

SAMPLER: UNLESS OTHERWISE NOTED, SAMPLER CONSISTS OF A 2" SPLIT SPOON DRIVEN USING A 140 lb. HAMMER FALLING 30 in.
CASING: UNLESS OTHERWISE NOTED, CASING DRIVEN USING 300 lb. HAMMER FALLING 24 in.
CASING SIZE: None: open hole with drilling mud OTHER:

GROUNDWATER READINGS				
DATE	TIME	WATER AT	CASING AT	STABILIZATION TIME
				See Note 1

DEPTH (ft.)	CASING (bl/ft)	SAMPLE No.	PEN. (in) / REC.	DEPTH (ft.)	BLOWS/6"	SAMPLE DESCRIPTION (Burmister CLASSIFICATION)	REMARKS	STRATUM DESCRIPTION
						No sample taken above 50 feet		
50		S-1	24/12	50-52	18-28-31-27	V. dense brown fine to coarse SAND and GRAVEL trace Silt		Fine to Coarse SAND
		S-2	24/10	52-54	17-25-29-32	V. dense brown fine to coarse SAND, trace Gravel, trace Silt		
55		S-3	24/18	54-56	23-32-45-53	V. dense brown fine to coarse SAND, little fine to medium Gravel, trace Silt		
		S-4	24/12	56-58	21-36-38-37	V. dense, brown fine to medium SAND, little (-) fine to coarse gravel, trace Silt		
								Bottom of hole 58.0 ?
60								Hole terminated at consent of Camp, Dresser & McKee due to high levels of organic vapors released from borehole.
65								

GRANULAR SOILS		COHESIVE SOILS	
BLOWS/FT.	DENSITY	BLOWS/FT.	DENSITY
0-4	V. LOOSE	<2	V. SOFT
4-10	LOOSE	2-4	SOFT
10-30	M. DENSE	4-8	M. STIFF
30-50	DENSE	8-15	STIFF
>50	V. DENSE	15-30	V. STIFF
		>30	HARD

REMARKS:

1. Drilling mud used in hole, no ground water reading taken.

GZA

NOTES: 1) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THE BORING LOGS. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE.

BORING No. BG-111

APPENDIX B

LABORATORY RESULTS

Mitchell Field

LABORATORY TESTING DATA SUMMARY

Reviewed by ____________
Date ____________

Project No. A 3903.2 Project Engr. WEH Assigned By WEH Date Assigned Aug 84 Required ____________

Boring No.	Sample No.	Depth ft.	Laboratory or Test No.	IDENTIFICATION TESTS: Water Content %	LL %	PL %	Sieve -200 %	Hyd -2μ %	G_s	γ_d pcf	Permeability cm/sec	STRENGTH TESTS: Torvane or Type Test	σ_c or $\bar{\sigma}_c$ or σ psf	Failure Criteria	$\sigma_1 - \sigma_3$ or τ psf	Strain %	CONSOL. C_c / e_o	Laboratory Log and Soil Description
BG102		73'-74'	10															Light brown, fine SAND, little (+) silt.
				22.9			18			98.2	3.2×10^{-5}	K	$\bar{\sigma}_c$ = 6050					
BG105	U1	58.0-60.0	1	Average total UNIT WEIGHT (58.0-59.3')=117.0 pcf														Light brown, clayey SILT, trace (-) fine sand
		58.4-58.9		save														
		58.9-59.2		36.4			99	12										
BG106	U1	58.0-60.0	4	Average total UNIT WEIGHT (58.0-59.9')=117.4 pcf														Light brown, fine SAND little SILT. @58.3' change to-
		58.1		29.7														
		58.3-58.5		35.5			98	11										Light brown, clayey SILT. @ 59.1' change to-
		58.6		34.6														
		58.6-59.1		save														Brown, fine SAND, some silt. @ 59.4' change to -
		59.1		30.4														
		59.7		34.4														Grey/brown, fine to medium SAND, little (-) silt

SUMMARY OF LAB TESTS TABLE NUMBER ____

LABORATORY TESTING DATA SUMMARY

Reviewed by ______
Date ______

Project No. A 3903.2 Project Engr. ______ Assigned By ______ Date Assigned ______ Required ______

Boring No.	Sample No.	Depth ft.	Laboratory or Test No.	IDENTIFICATION TESTS: Water Content %	LL %	PL %	Sieve -200 %	Hyd -2μ %	G_s	γ_d pcf	Permeability cm/sec	STRENGTH TESTS: Torvane or Type Test	σ_c or $\bar{\sigma}_c$ or σ psf	Failure Criteria	$\sigma_1 - \sigma_3$ or τ psf	Strain %	CONSOL. C_c / e_o	Laboratory Log and Soil Description
BG107		60-62	6		Average total UNIT WEIGHT (60.0-61.7')=123.2 pcf													Brown, clayey SILT, trace fine sand. @ 60.9' change to -
		60.7		31.2														
		60.7-60.9		30.7			94	12										Brown, mottled, reddish brown, fine to medium SAND, trace silt.
		61.2		24.8														
		61.2-61.6		save														
		61.6		21.7														
BG108		56-58	7		Average total UNIT WEIGHT (56.0-57.8')=119.6 pcf													Brown, clayey SILT, trace fine sand @ 56.9' change to -
		56.1-56.5		save														
		56.5		32.4														
		56.5-56.7		32.8			93	13										Brown, fine SAND, little silt @ 57.4' change to -
		57.0		27.3														
		57.0-57.4		save														Brown, clayey SILT, trace fine sand.
		57.5		30.6														
BG109		74-76	8	22.3			18			99.6	3.0×10^{-5}	K	$\bar{\sigma}_c$ = 6050					Brown, fine SAND, little (+) silt.

SUMMARY OF LAB TESTS
TABLE NUMBER ______

GOLDBERG-ZOINO & ASSOCIATES, INC.
GEOTECHNICAL-GEOHYDROLOGICAL CONSULTANTS

LABORATORY TESTING DATA SUMMARY

Reviewed by ______________

Date ______________

Project No. A 3903.2 Project Engr. ______________ Assigned By ______________ Date Assigned ______________ Required ______________

Boring No.	Sample No.	Depth ft.	Laboratory or Test No.	Water Content %	LL %	PL %	Sieve -200 %	Hyd -2μ %	G_s	γ_d pcf	Permeability	Torvane or Type Test	σ_c or $\overline{\sigma}_c$ or σ psf	Failure Criteria	$\sigma_1 - \sigma_3$ or τ psf	Strain %	CONSOL. C_c / e_o	Laboratory Log and Soil Description
BG109		60-61.5	3															Light brown, clayey, SILT, trace fine sand, little (+) layers of brown fine sand throughout.
		60.2-60.5		save														
		60.5-60.7		34.1			94	9										
BG110		58-60	2		Average total UNIT WEIGHT (58.0-59.7')=118.5 pcf													Light brown, clayey SILT, some (-) layers (3-4" thick) of light brown banded orange brown, fine sand, trace silt.
		58.1-58.3		34.1			97	15										
		58.3-58.6		save														
		58.6-59.0		save														

SUMMARY OF LAB TESTS
TABLE NUMBER ______

GOLDBERG-ZOINO & ASSOCIATES, INC.
GEOTECHNICAL-GEOHYDROLOGICAL CONSULTANTS

SM

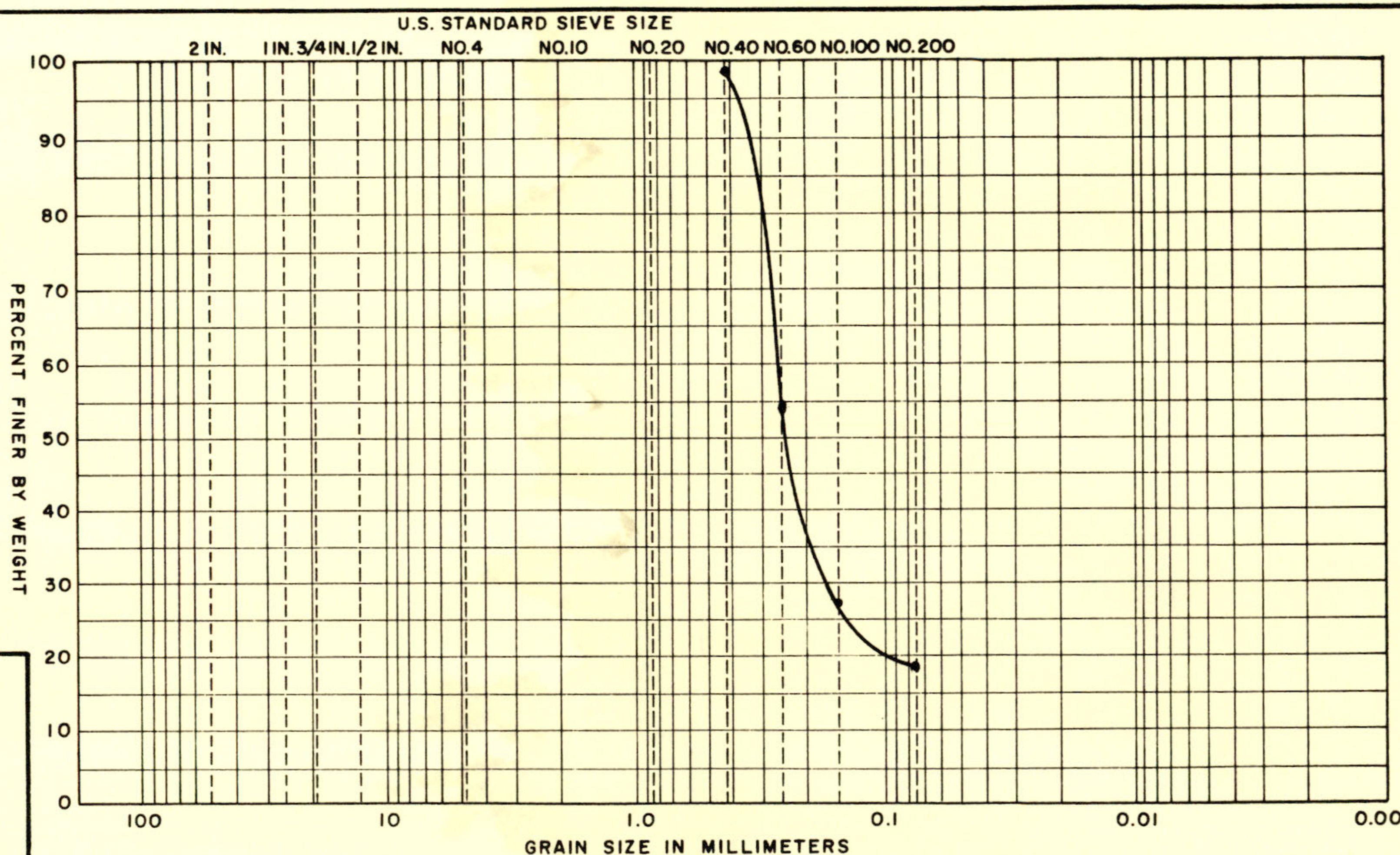
GOLDBERG-ZOINO & ASSOCIATES, INC.
GEOTECHNICAL-GEOHYDROLOGICAL CONSULTANTS

GRADATION TESTS

Mitchel Field

BORING NO. BG102   TEST SERIES
SAMPLE NO. 10
DEPTH 73.0-74.0   DATE Aug 84
TECH. ____
REVIEWER ____   FILE A3903.2

APPENDIX E-9



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

UNIFIED SOIL CLASSIFICATION SYSTEM

TEST NO.	SYM.	MATERIAL SOURCE	REMARKS
S10.1		Boring BG102 Depth 73.0-74.0	Light brown, fine SAND, little (+) SILT.

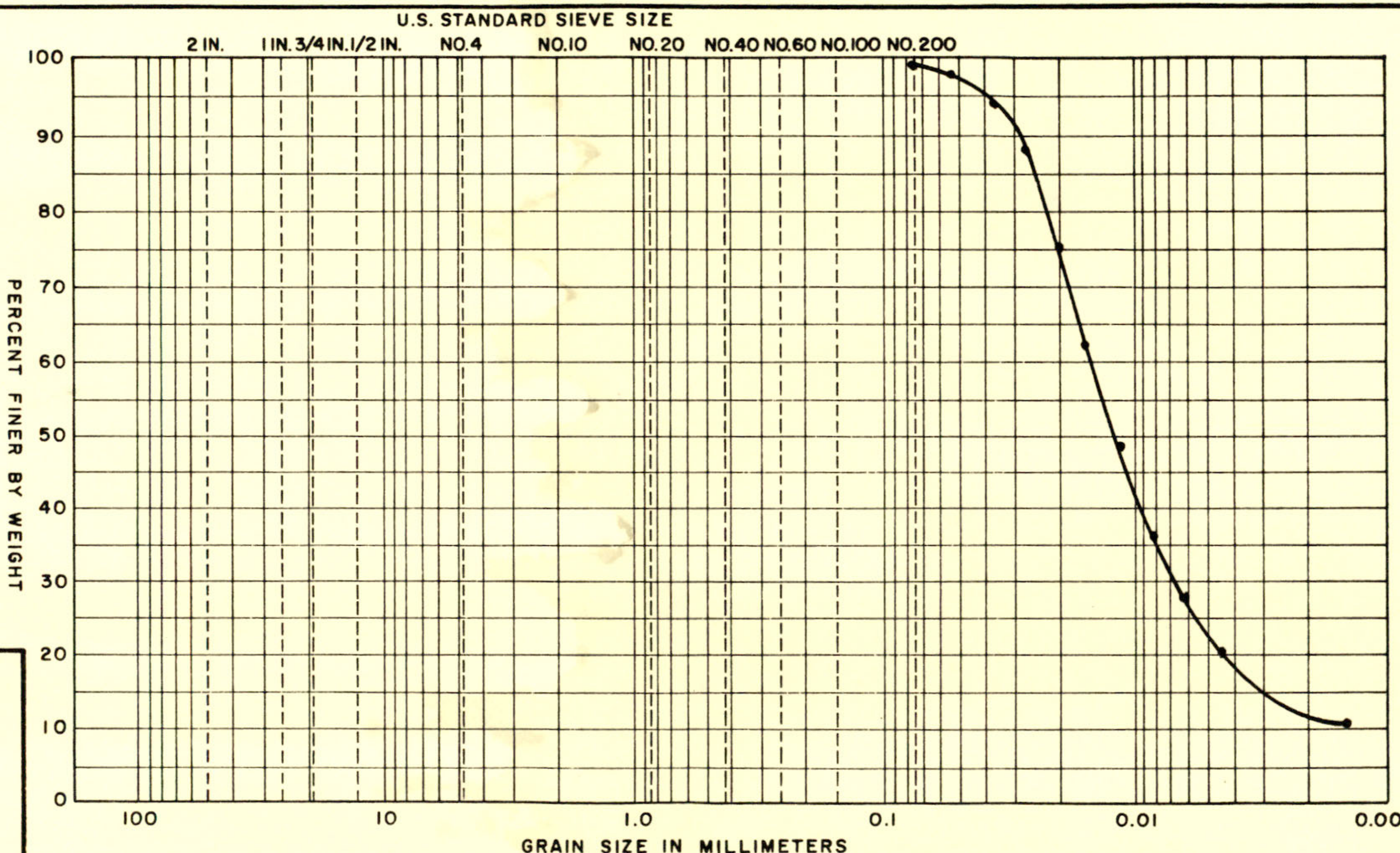
GOLDBERG-ZOINO & ASSOCIATES, INC.
GEOTECHNICAL-GEOHYDROLOGICAL CONSULTANTS

GRADATION TESTS

Mitchel Field

BORING NO. BG105 — TEST SERIES NO. 1
SAMPLE U1 — DATE Aug 84
DEPTH 58.9-59.2
TECH. ____
REVIEWER ____ — FILE A3903.2 S3

APPENDIX F-9

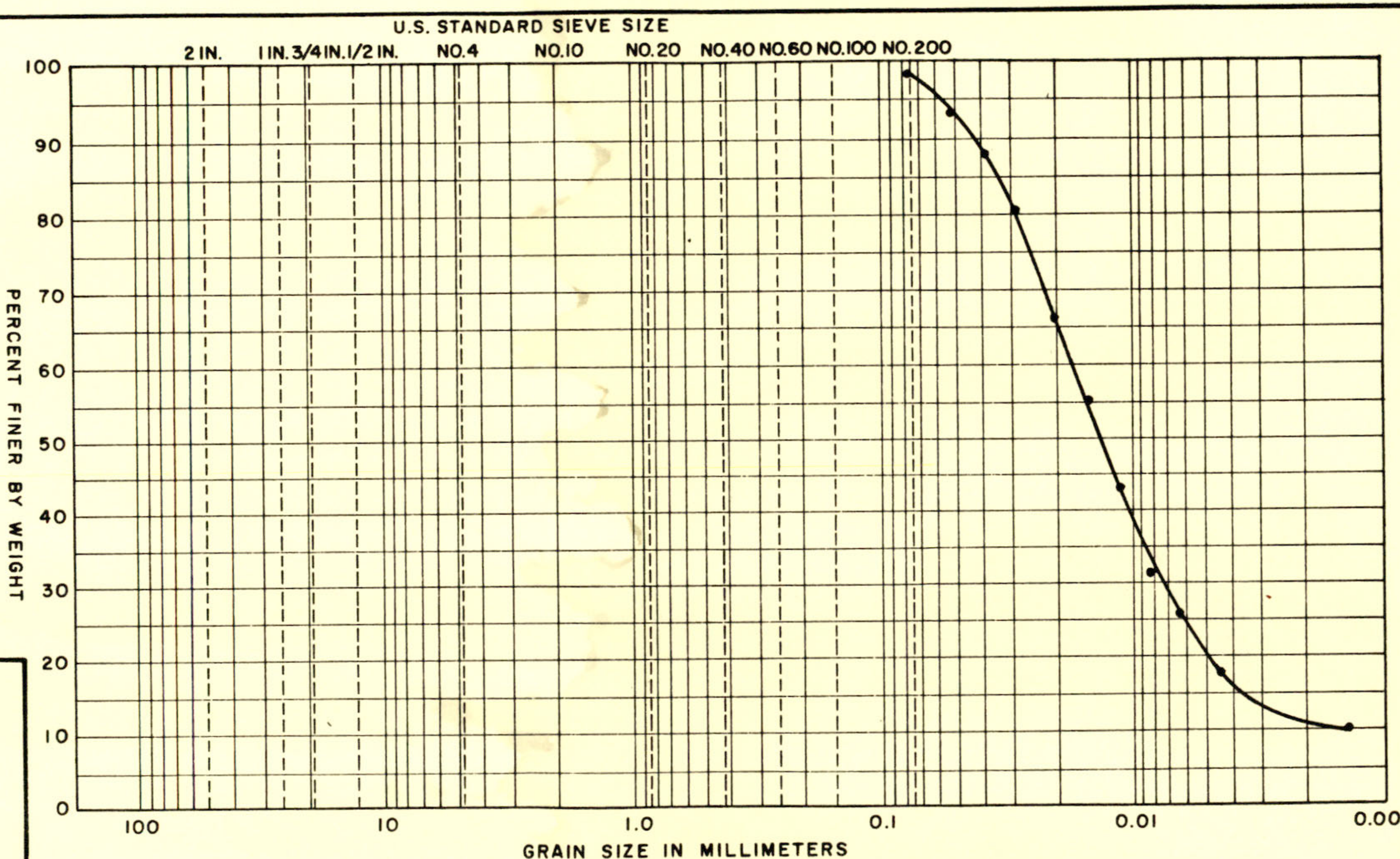


COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

UNIFIED SOIL CLASSIFICATION SYSTEM

TEST NO.	SYM.	MATERIAL SOURCE	REMARKS
H1.1		Boring BG105 Sample U1 Depth 58.9-59.2	Light brown, clayey SILT.

GOLDBERG-ZOINO & ASSOCIATES, INC.
GEOTECHNICAL-GEOHYDROLOGICAL CONSULTANTS



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

UNIFIED SOIL CLASSIFICATION SYSTEM

TEST NO.	SYM.	MATERIAL SOURCE	REMARKS
H4.1		Boring BG106 Sample U2 Depth 58.3-58.5'	Light brown, clayey SILT.

Mitchel Field

GRADATION TESTS

BORING NO. BG106
SAMPLE U2
DEPTH 58.3-58.5
TECH. ____
REVIEWER ____
APPENDIX E-9

TEST SERIES
NO. 4
DATE Aug 84

FILE A3903.2
S.3

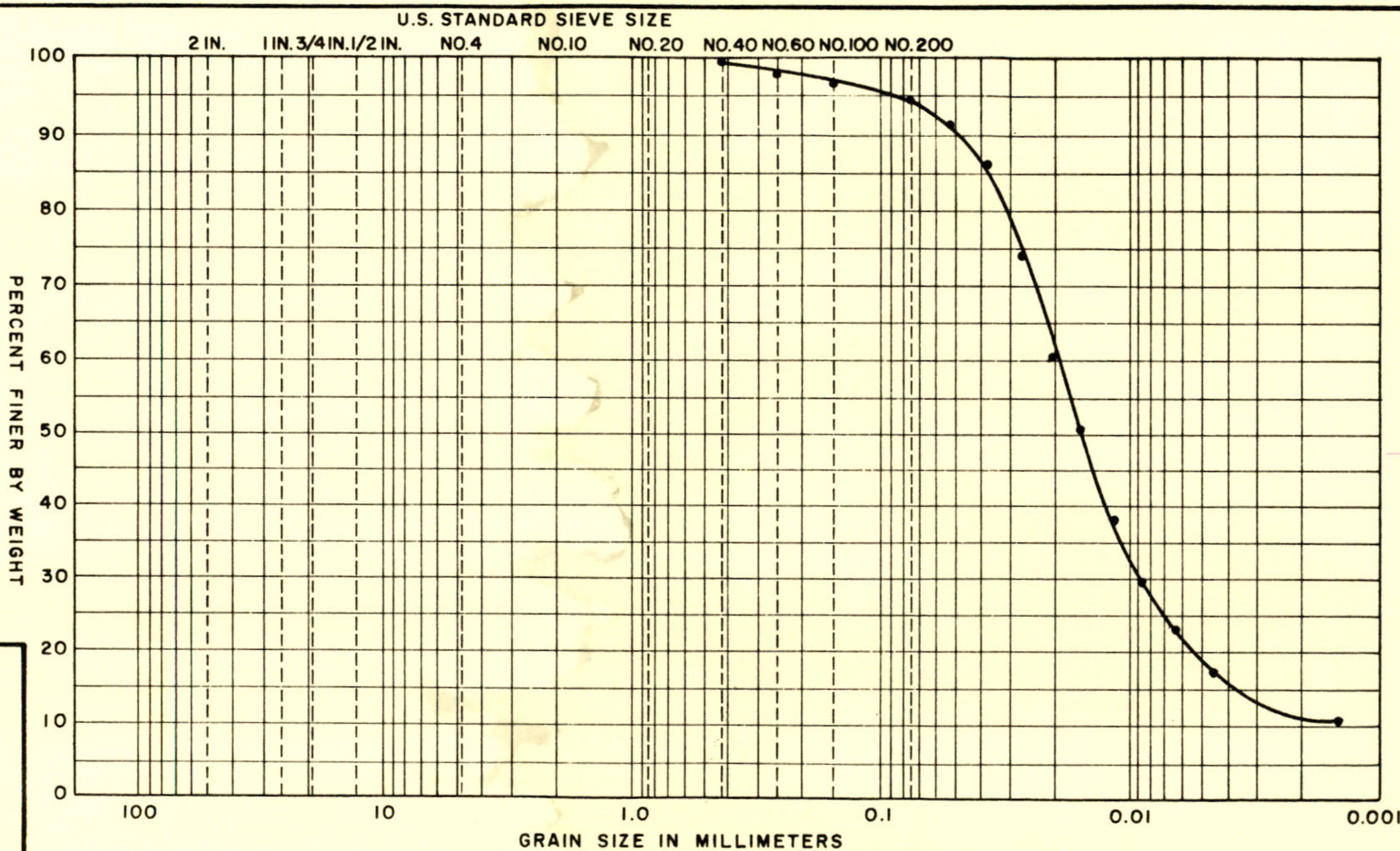
GOLDBERG-ZOINO & ASSOCIATES, INC.
GEOTECHNICAL-GEOHYDROLOGICAL CONSULTANTS

GRADATION TESTS

Mitchel Field

BORING NO. BG107 TEST SERIES
SAMPLE NO. 6
DEPTH 60.7-60.9 DATE Aug 84
TECH.
REVIEWER FILE A3903.2

APPENDIX F-9



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

UNIFIED SOIL CLASSIFICATION SYSTEM

TEST NO.	SYM.	MATERIAL SOURCE	REMARKS
S/H 6.1		Boring BG107 Depth 60.7-60.9'	Brown, clayey SILT, trace fine sand.

S3

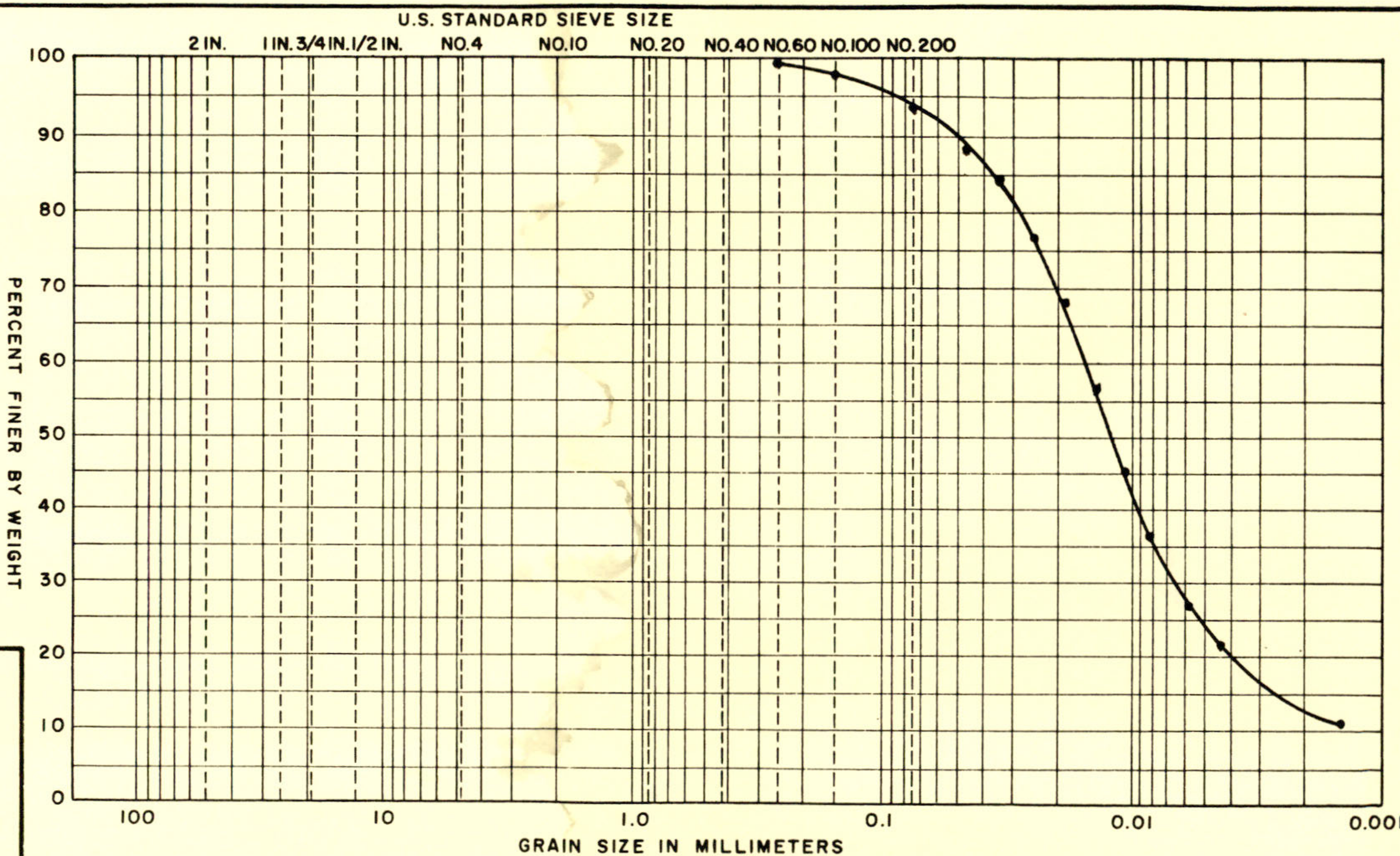
GOLDBERG-ZOINO & ASSOCIATES, INC.
GEOTECHNICAL-GEOHYDROLOGICAL CONSULTANTS

GRADATION TESTS

Mitchel Field

BORING NO. BG108
SAMPLE
DEPTH 56.5-56.7
TECH.
REVIEWER
APPENDIX F-9

TEST SERIES NO. 7
DATE Aug 84
FILE A3903.2



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

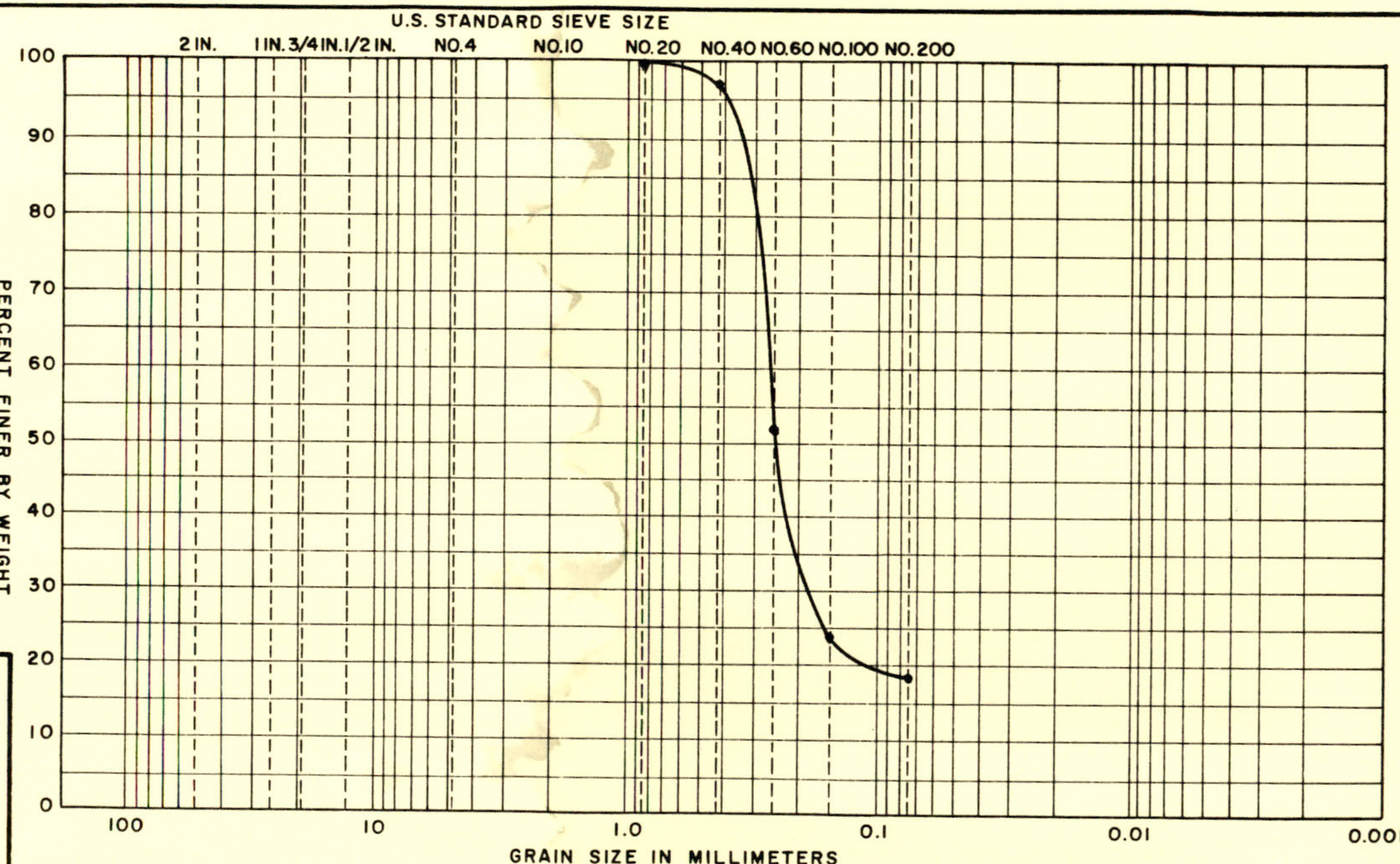
UNIFIED SOIL CLASSIFICATION SYSTEM

TEST NO.	SYM.	MATERIAL SOURCE	REMARKS
S/H 7.1		Boring BG108 Depth 56.5-56.7	Brown clayey SILT, trace fine sand.

GOLDBERG-ZOINO & ASSOCIATES, INC.
GEOTECHNICAL-GEOHYDROLOGICAL CONSULTANTS

GRADATION TESTS

Mitchel Field



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

UNIFIED SOIL CLASSIFICATION SYSTEM

TEST NO.	SYM.	MATERIAL SOURCE	REMARKS
S8.1		Boring BG109 Sample S11 Depth 74.0-76.0	Brown, fine SAND, little (+) SILT.

BORING NO. BG109
SAMPLE S11
DEPTH 74.0-76.0
TECH. ______
REVIEWER ______

TEST SERIES NO. 8
DATE Aug 84
FILE A3903.2

APPENDIX E-9

S3

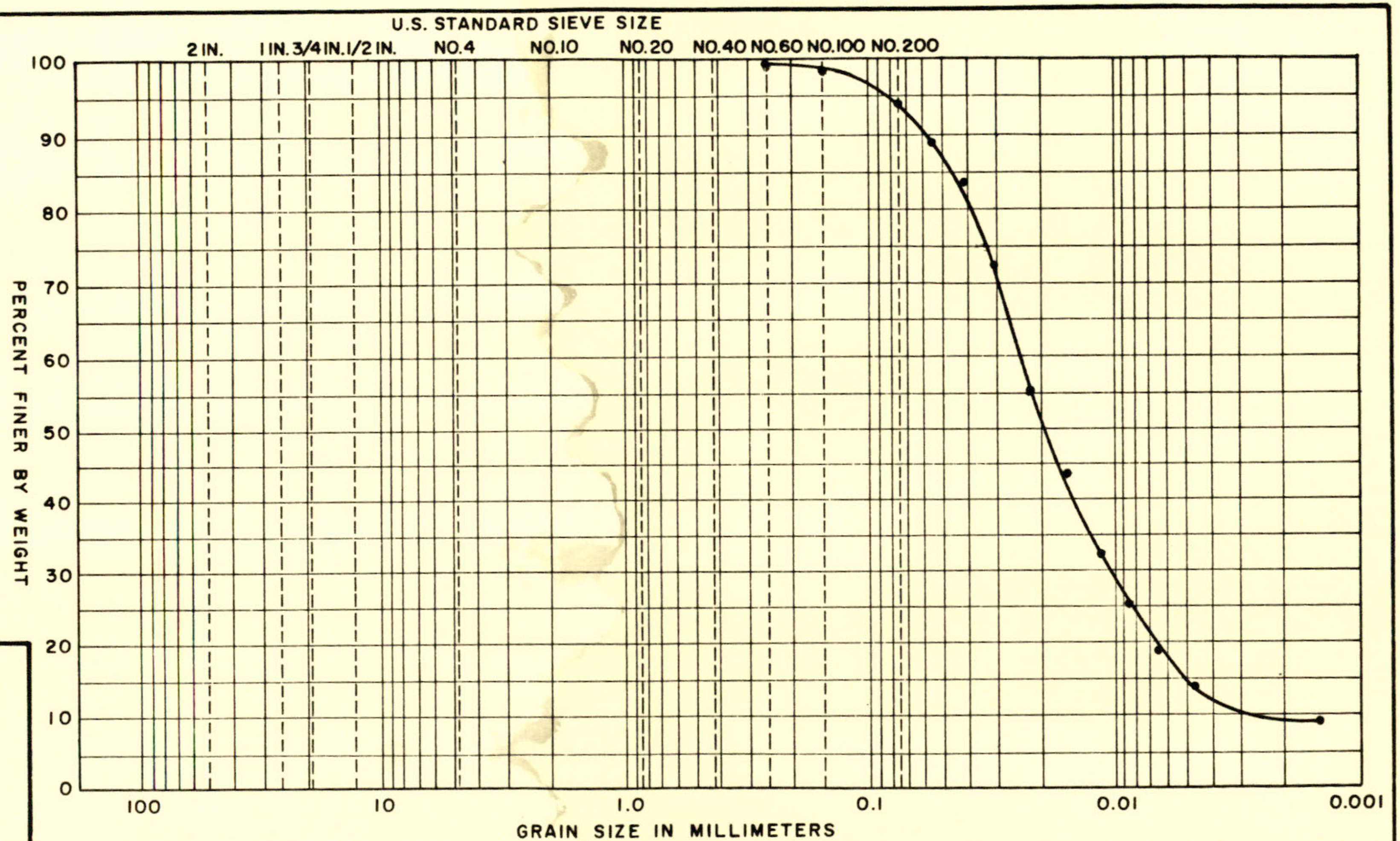
GOLDBERG-ZOINO & ASSOCIATES, INC.
GEOTECHNICAL-GEOHYDROLOGICAL CONSULTANTS

Mitchel Field

GRADATION TESTS

BORING NO. BG109 TEST SERIES
SAMPLE 1 NO. 3
DEPTH 60.5-60.7 DATE Aug 84
TECH.
REVIEWER FILE A3903.2

APPENDIX E-9 S.3



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

UNIFIED SOIL CLASSIFICATION SYSTEM

TEST NO.	SYM.	MATERIAL SOURCE	REMARKS
S/H 3.1		Boring BG109 Depth 60.5-60.7	Light brown, clayey SILT, trace fine sand.

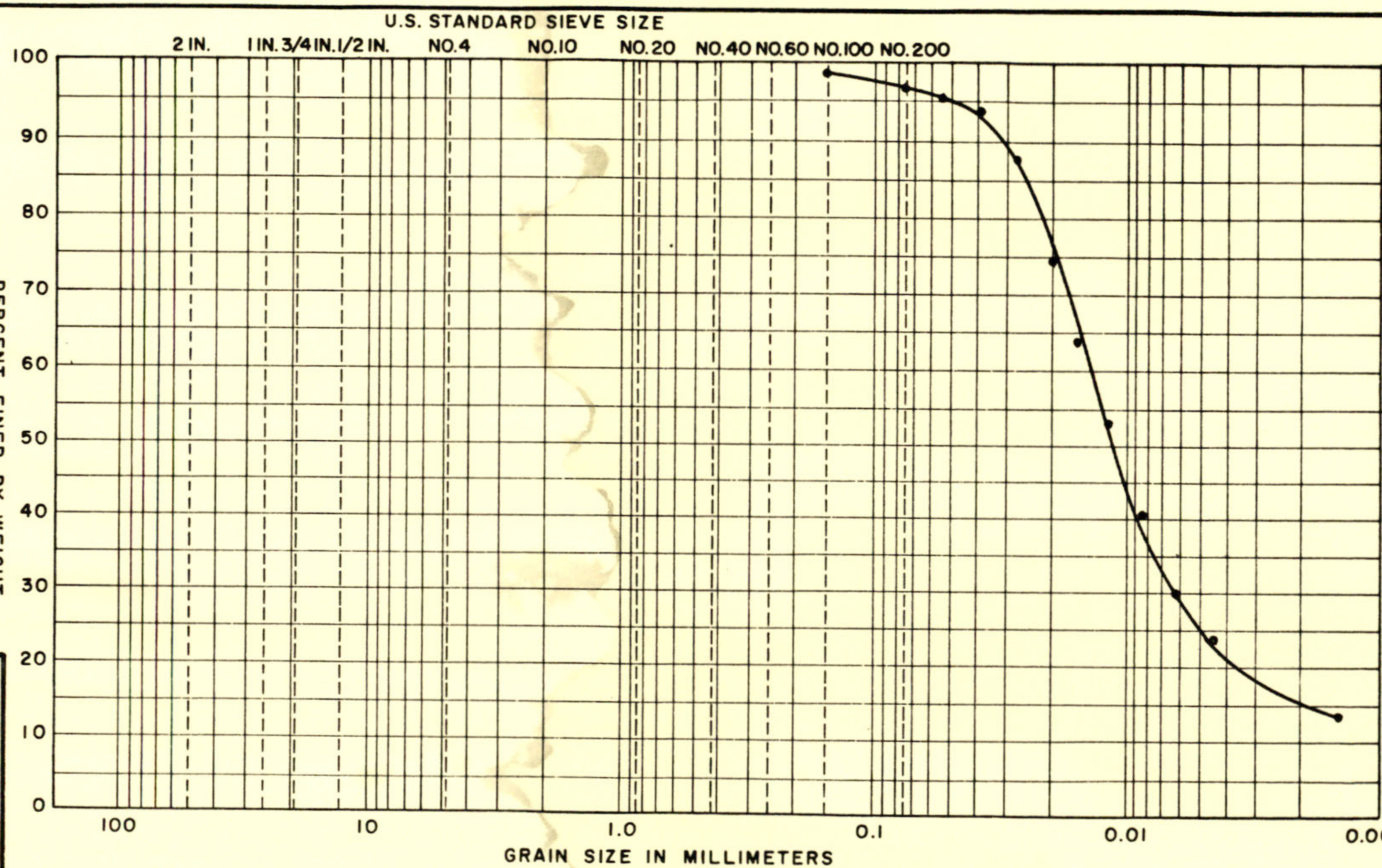
GOLDBERG-ZOINO & ASSOCIATES, INC.
GEOTECHNICAL-GEOHYDROLOGICAL CONSULTANTS

GRADATION TESTS

Mitchel Field

BORING NO. BG110
SAMPLE
DEPTH 58.1-58.3
TECH.
REVIEWER
APPENDIX E-9

TEST SERIES
NO. 2
DATE Aug 84
FILE A3903.2
S.3



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

UNIFIED SOIL CLASSIFICATION SYSTEM

TEST NO.	SYM.	MATERIAL SOURCE	REMARKS
H2.1		Boring BG110 Depth 58.1-58.3	Light brown, clayey SILT.

APPENDIX C

GRADATION RESULTS

SILTY FINE SAND

BG-101 through BG-104

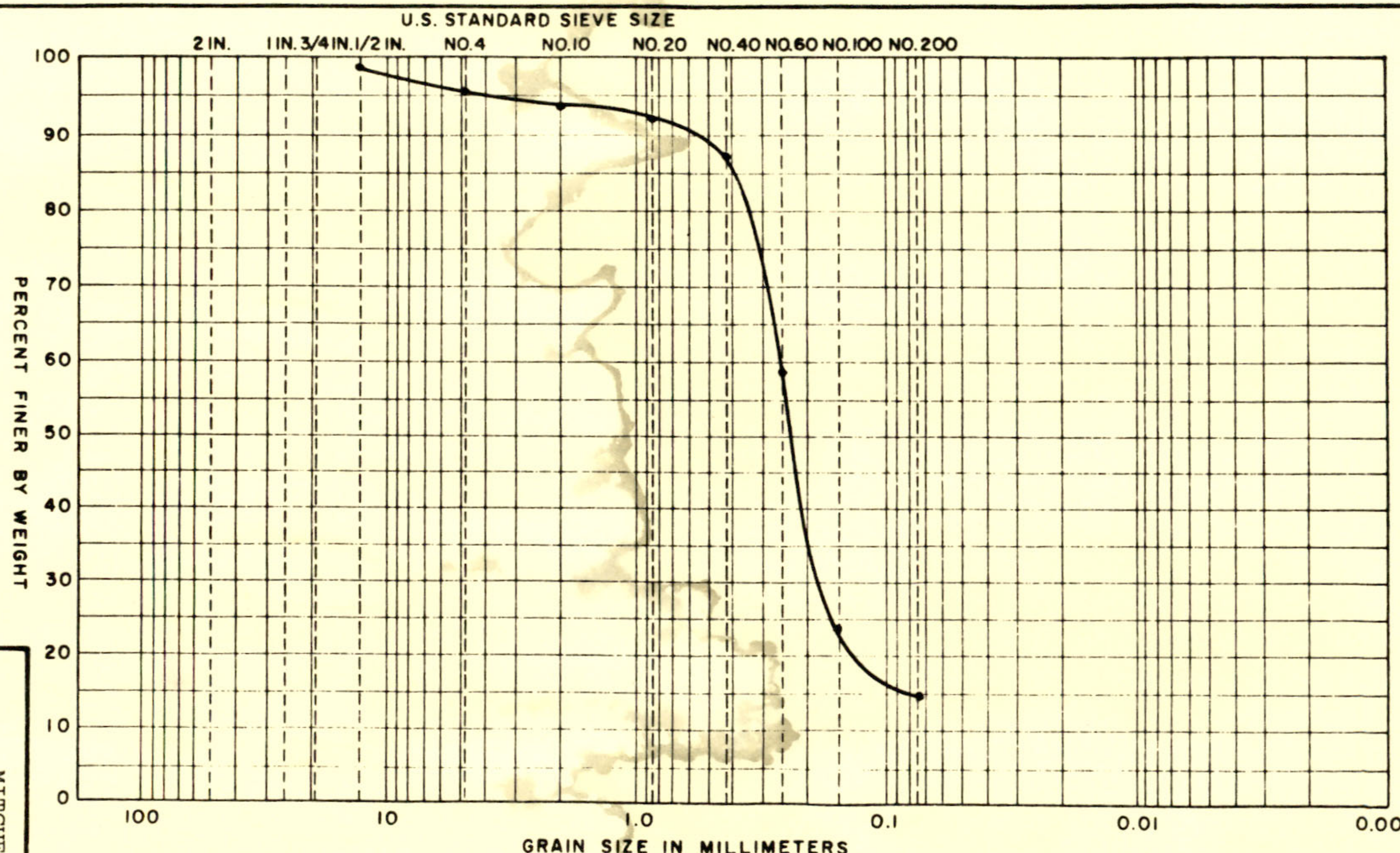
GOLDBERG-ZOINO & ASSOCIATES, INC.
GEOTECHNICAL-GEOHYDROLOGICAL CONSULTANTS

GRADATION TESTS

MITCHEL FIELD SITE
LONG ISLAND, NEW YORK

BORING NO. BG-101 TEST SERIES NO. 13
SAMPLE S13 DATE Dec 83
DEPTH 65.0-65.9
TECH.
REVIEWER
FILE A3903

APPENDIX E-9

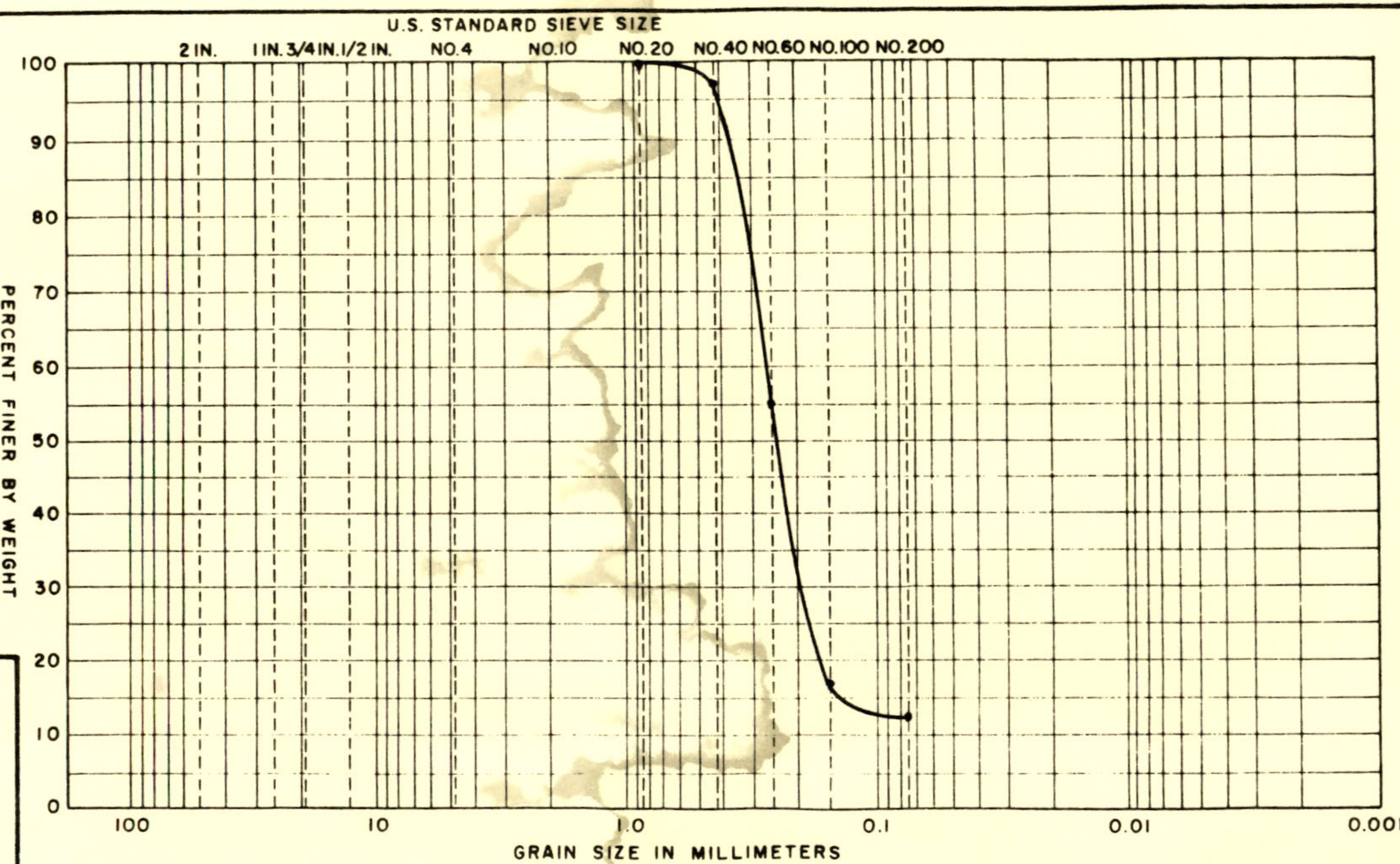


COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

UNIFIED SOIL CLASSIFICATION SYSTEM

TEST NO.	SYM.	MATERIAL SOURCE	REMARKS
S13.1		Boring BG-101 Sample 13 Depth 65.0-65.9	yellow orange fine SAND, little Silt, trace fine Gravel.

GOLDBERG-ZOINO & ASSOCIATES, INC.
GEOTECHNICAL-GEOHYDROLOGICAL CONSULTANTS



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

UNIFIED SOIL CLASSIFICATION SYSTEM

TEST NO.	SYM.	MATERIAL SOURCE	REMARKS
S3.1		Boring BG-102 Sample U2 Depth 68.7-69.2	Brown fine SAND, little Silt

GRADATION TESTS

MITCHEL FIELD SITE
LONG ISLAND, NEW YORK

BORING NO. BG-102
SAMPLE U2
DEPTH 68.7-69.1
TECH.
REVIEWER

TEST SERIES
NO. 3
DATE Dec. 83

FILE A-3903

APPENDIX E-9

GOLDBERG-ZOINO & ASSOCIATES, INC.
GEOTECHNICAL-GEOHYDROLOGICAL CONSULTANTS

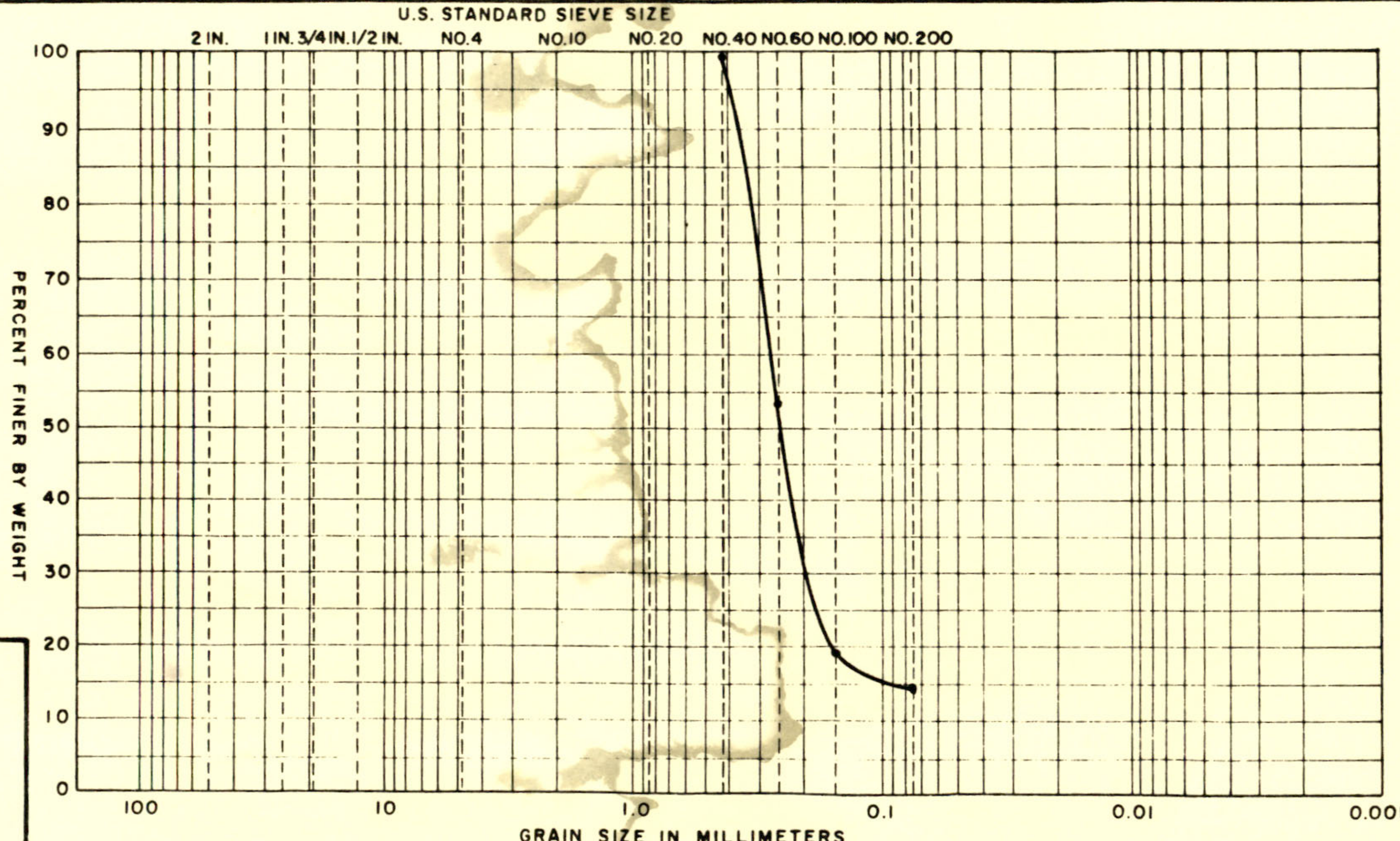
GRADATION TESTS

MITCHEL FIELD SITE
LONG ISLAND, NEW YORK

BORING NO. BG-103 TEST SERIES
SAMPLE U1 NO. 6
DEPTH 68.3-68.5 DATE Dec 83
TECH.
REVIEWER FILE A3903

APPENDIX E-9

S.3

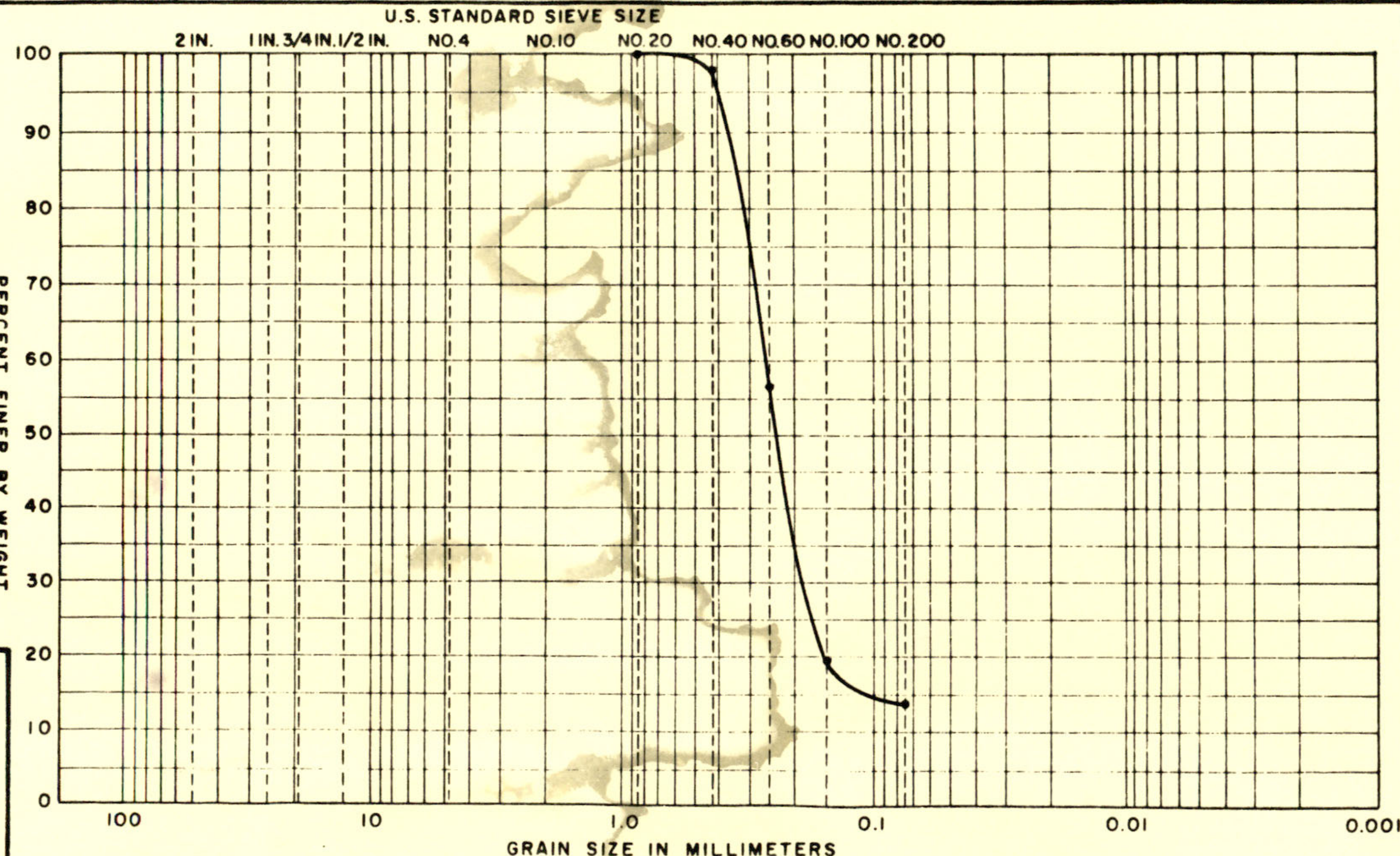


COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

UNIFIED SOIL CLASSIFICATION SYSTEM

TEST NO.	SYM.	MATERIAL SOURCE	REMARKS
S6.1		Boring BG-103 Sample U1 Depth 68.3-68.5'	Orange brown fine SAND, little Silt

GOLDBERG-ZOINO & ASSOCIATES, INC.
GEOTECHNICAL-GEOHYDROLOGICAL CONSULTANTS



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

UNIFIED SOIL CLASSIFICATION SYSTEM

TEST NO.	SYM.	MATERIAL SOURCE	REMARKS
S18.1		Boring BG-103 Sample 16 Depth 73.0-75.0	Yellow brown fine SAND, little Silt.

GRADATION TESTS

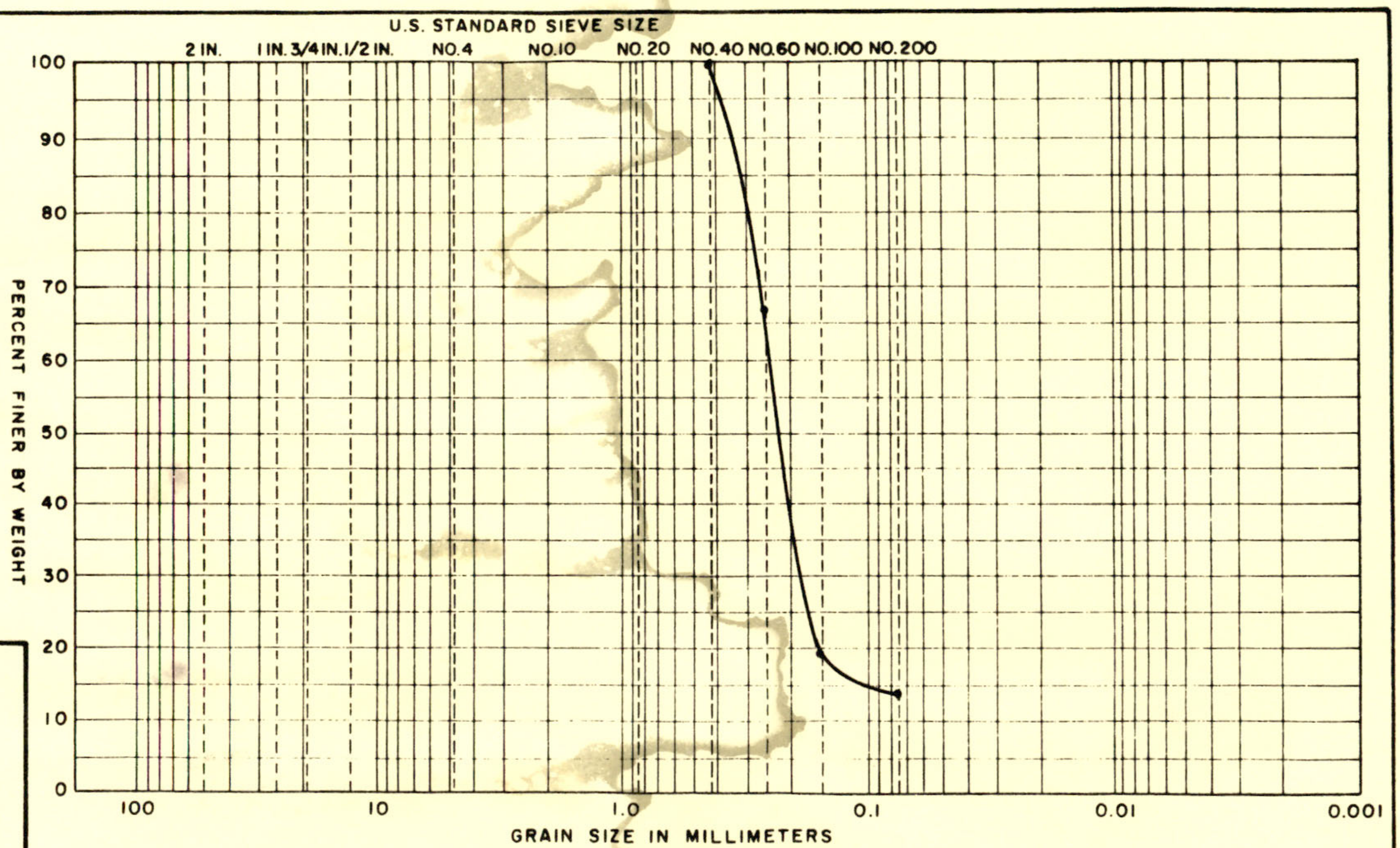
MITCHEL FIELD SITE
LONG ISLAND, NEW YORK

BORING NO. BG-103
SAMPLE S16
DEPTH 73.0-75.0
TECH. ______
REVIEWER ______

TEST SERIES
NO. 18
DATE Dec 83
FILE A3903

APPENDIX E-9

GOLDBERG-ZOINO & ASSOCIATES, INC.
GEOTECHNICAL-GEOHYDROLOGICAL CONSULTANTS



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

UNIFIED SOIL CLASSIFICATION SYSTEM

TEST NO.	SYM.	MATERIAL SOURCE	REMARKS
S9.1		Boring BG-104 Sample U2 Depth 73.7-74.0	Yellow orange fine SAND, little Silt.

MITCHEL' FIELD SITE
LONG ISLAND, NEW YORK

GRADATION TESTS

BORING NO. BG-104 TEST SERIES
SAMPLE U2 NO. 9
DEPTH 73.7-74.0' DATE Jan 84
TECH. ______
REVIEWER ______ FILE A3903