SOR CONSULTING ENGINEERS, INC.
Geotechnical Engineering - Materials Testing - Forensic Studies

98 Sand Park Rd., Cedar Grove, NJ 07009
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SUBSURFACE INVESTIGATION REPORT
STILLWATER ELEMENTARY SCHOOL - SETTLEMENT
STILLWATER, NEW JERSEY

FOR

ENV
ENGLEWOOD CLIFFS, NEW JERSEY

Prepared by: **Sor Consulting Engineers, Inc.**
98 Sand Park Road
Cedar Grove, New Jersey 07009

Report No. 23-C-54
Job No. 23-C-50
December 12, 2023

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Kamil Sor, Ph.D.
Orhun Sor, P.E.
Atilla Sencar, P.E.

December 12, 2023
Job No. 23-C-50
Report No. 23-C-54

ENV
180 Sylvan Avenue, Suite 3
Englewood Cliffs, NJ 07632

Attention: Daniel Grant, Executive Director
E-Mail: dgrant@env-nj.com

Re: Subsurface Investigation Report
Stillwater Elementary School - Settlement
Stillwater, New Jersey

INTRODUCTION

Sor Consulting Engineers, Inc. (SCE) is pleased to present the results of a subsurface investigation performed for the existing gymnasium addition of Stillwater Township Elementary School located at 904 Stillwater Road in Stillwater, New Jersey.

Based on information provided to us, the entire building addition including gymnasium has experienced structural distress as evidenced by wall and slab cracking. The cracks were repaired some time ago, however, hairline cracks re-appeared.

We understand it is desired to investigate the subsurface soil conditions along the building walls and remediate the structural distress.

PURPOSE AND SCOPE OF WORK

The purpose of this study was to:

- perform a non-destructive utility survey around the building to attempt to locate any existing buried utilities and other subsurface features. The study concentrated at the boring locations.

- explore the subsurface conditions immediately adjacent to the gymnasium building addition area;
- estimate the geotechnical engineering properties of the encountered subsurface materials;
- determine the cause of the distress;
- determine the depth of existing footings and examine its support conditions; and
- present recommendations and guidelines regarding feasible solutions to stabilize the structure.

To accomplish this, a subsurface exploration program consisting of seven (7) standard test borings and two test pits, was conducted at the site on November 27, 28 and 29, 2023. The borings were advanced using small narrow gauge rubber track mounted drilling equipment and extended to a maximum 44 feet beneath the existing ground surface. Soil samples suitable for identification and laboratory testing purposes were extracted from the borings in accordance with the procedures of the Standard Penetration Test (ASTM-D1586). Two test pits were excavated with a rubber tire backhoe. The test pit exploration was performed along the gymnasium wall and exposed the existing wall and column foundation for measurements and examination of foundation support materials and conditions. The test pits extended to a maximum depth of 4 feet below existing grade. Upon completion, the boring and test pit explorations were backfilled so as not to leave any open holes.

The boring was performed by Environmental Technical Drilling, Inc. and the test pits by D. Willis Excavating Company under the direct technical observation of a licensed geotechnical engineer from Sor Consulting Engineers. Our representative located the borings and test pit at the site, prepared logs of the explorations as the drilling and excavation proceeded, measured the foundation dimensions, documented the foundation support materials and conditions and supervised the soil sampling and field testing operations so as to obtain the appropriate subsurface information. The locations of the

explorations are shown relative to the existing conditions shown on the Exploration Location Plan contained in Appendix I of this report. Detailed descriptions of the encountered subsurface conditions as well as foundation sketches are presented on the individual boring and test pit logs contained in Appendix II. The soils encountered in the borings and test pit were visually classified in accordance with the Burmeister Soil Classification System also included in Appendix II.

All soil samples were returned to our soil mechanics laboratory where they were further examined. Moisture content and mechanical grain size distribution tests were performed on selected samples to assist in soil identification and estimation of their engineering soil properties. Laboratory test results are presented in Appendix III.

The results of the subsurface exploration and laboratory testing programs as well as our observations of existing building conditions have provided the basis for our engineering analyses, conclusions and geotechnical recommendations. The following discussions of our findings and recommendations are subject to the limitations contained in Appendix IV of this report.

SITE CONDITIONS

Surface Features: At the area of the gymnasium the ground surface slopes down by approximately 10 feet from west to east towards the entrance to the gymnasium. Approximately 10 feet from the corner of the gymnasium a substantial grade change exists by approximately 20 feet downward. Based on the observed topography, it appears that the entire latest addition of the school had been filled to obtain the present grades.

Subsurface Conditions: The subsurface conditions encountered in the explorations performed for this study consisted of the following generalized strata in order of increasing depths and are illustrated on the subsurface profiles A-A, B-B and C-C as shown in Appendix I.

1. Topsoil: A thin layer of topsoil ranging from 4 to 6 inches was encountered in each of the explorations.

2. Fill: Fill consisting primarily of grayish brown silty sand with gravel was encountered beneath the topsoil. The fill extended to an approximate depths of 8 to 30 feet beneath the ground surface. In several of the borings, it was difficult to distinguish fill materials from the lower natural soils. Standard Penetration Test (N) values obtained from the borings indicate that the fill is in a medium compact to loose condition at the upper 4 to 6 feet and became loose to very loose below these depths.
3. Silty Sand: Grayish brown silty sand with varying amounts of gravel was encountered beneath the fill and extended to the maximum depths explored. N values obtained from the borings indicate that the silty sand is generally in a medium dense condition.

Groundwater was encountered at depths of 22 to 32 feet below surface in the borings performed for the study, at approximate elevation of +64 feet. Due to the substantial topographic relief at the site, it should be anticipated that groundwater levels will vary significantly and may experience fluctuations due to seasonal variations in precipitation, temperature and/or surface water runoff.

Existing Foundations: Two test pits were excavated along the side of the gymnasium to expose the existing foundations. The specific conditions encountered at the explored locations are presented on the individual test pit logs. In general, the test pits revealed that the side of the structure is supported on a continuous wall footing with column foundations. The wall footing was measured to be approximately 30 inches wide, 11 inches in thickness and establish at a depth of 38 inches below surface. The column footing was approximately 5'x5' and 11 inches thick and established at a depth of 44 inches below surface. The foundations were established on the loose to very loose fill soil.

Subsurface Utility Survey: The area around the structure within accessible areas of the proposed exploration area was scanned using ground penetrating radar (GPR) equipment. The scanning detected electric line, fuel line, roof drain, sanitary lines, well

water line and storm sewer lines. Approximate utility locations are shown on the attached utility drawings, in appendix V.

CONCLUSIONS AND RECOMMENDATIONS

Based on our findings, it appears that the building foundations and floor slabs in the area investigated are supported on fill material. N values obtained from the borings revealed that the fill is in a loose condition. The fill does not appear to have been placed and compacted in a controlled manner. We believe that the fill material has settled in an uneven manner causing the building distress. It is our opinion that the fill is not capable of providing adequate support for the building walls and floor slab without the potential for continued distress. In addition, we believe that as a result of ongoing settlement, support for sub-slab utilities such as sanitary sewer, electric and roof and other drainage pipes may have been compromised and causing these utilities to leak. Leaks in underground utilities may have further contributed to or exacerbated subsidence of the fill material.

Two methods of building stabilization were considered to remediate the subsoils and re-support the building foundations and slab; compaction grouting and helical piles. To this end, helical piles for foundation support or compaction grouting for floor slab support would be more appropriate since these solutions would either bypass the unsuitable bearing materials and re-support the existing building foundations/floor slab or would densify the existing soft soils. Detailed discussions of helical piles and compaction grouting are presented below.

Helical Piles for Foundation Support: This solution would consist of re-supporting the foundations on helical piles that extend through the unsuitable fill into the competent natural soils. The piles would be attached to the existing foundations by brackets. Helical auger piles are installed by screwing the pile in-place using smaller high torque specialty drilling equipment. It is our professional opinion that helical auger piles designed for an allowable axial capacity of up to 10 tons would be appropriate to support the existing foundations. We estimate that pile lengths would be approximately

20 to 35 feet beneath the existing foundations. Helical piles should have multiple helices with a minimum helix diameter of 10 inches and a minimum shaft diameter of 3½ inches. Helices should be structural quality steel conforming to ASTM-A36 and shaft pipe should conform to API 5CT Grade J55 pipe or ASTM-D252 Grade 2 requirements. Shaft pipe should be grouted solid with 4000 psi concrete upon pile completion and acceptance. Provided the auger piles extend at least 7 feet into the suitable bearing medium dense natural silty sand, they may be designed for a lateral capacity of up to 2 ton per pile and an uplift capacity of 5 tons per pile. The capacity of piles may be increased by a factor of 1/3 for temporary loads (e.g. wind, earthquake). The piles can be mechanically connected to the existing foundations with steel brackets. We estimate that post-construction settlements of the building foundations supported on piles would be negligible. Piles should be installed by a specialty contractor having demonstrated experience in the installation of helical auger piles. Helical pile installation should be by qualified manufacturer certified helical pile specialists using industry recognized equipment and means and methods.

In-Place Soil Stabilization of Slabs by Compaction Grouting: The in-place soil could be stabilized by a program of grouting. This would involve leaving the existing floor slab in-place and drilling a series of small diameter holes through the interior slab and at approximately 5 to 7 feet apart and extending down into the suitable bearing natural soil. Based on the subsurface data, drill depths are anticipated to be approximately 10 to 30 feet. The size of the stabilized area should be approximately 5 feet wider than the affected building area. Actual drill depths will vary depending on subsurface conditions. As with the deep support system option, obstructions may be encountered in the existing fill which may require special equipment or techniques to advance the grout pipes to the proper depths. A Portland cement based grout typically consisting of a high mobility mixture of Portland cement, fine aggregate, fly ash and water could be pressure injected into the soil under controlled pressure to fill any voids in the existing fill, and consolidate and densify the fill into a more uniform support material. The grout is injected into the fill under tightly controlled fluid pressures in

stages from the bottom of the drill hole up to the underside of the slab thus creating a continuous grout column surrounded by densified fill. Any voids that exist directly below the slab could also be filled with grout to re-establish direct contact between the bottom of the slab and the underlying subbase. The integrity of any sub-slab utilities would have to be verified and the utilities monitored to prevent loss of grout and possible plugging of the conduits. A monitoring system is recommended to measure and monitor potential slab movements and the potential movements of adjacent building elements and existing utilities. After stabilization of the fill and filling any sub-slab voids, the floor slab may be either re-leveled or reconstructed. It is our opinion that the grouting option would stabilize the existing fill in-place, allow the existing slab and foundations to remain during construction and cause the least amount of building disturbance and disruption. We recommend that the grouting be performed by a specialty contractor having demonstrated experience with such applications.

Remedial Construction Considerations

- There are numerous utility lines (electric, drainage and sewer) traversing the affected area. All existing subsurface utilities within the remedial work area should be located and clearly marked prior to the commencement of work.
- It is possible that subsurface piping, especially at joints and connections may have been damaged. It is essential that all floor drains, sanitary piping and any other subsurface conduits be tested, and if necessary, repaired prior to the remedial work to assure that they are functioning properly.

RECOMMENDED SERVICES

It will be necessary to prepare plans, specifications and contract documents for the project repairs and construction. These documents should be prepared by a structural engineer with the participation of a geotechnical engineer as consultant. The contract documents should be sufficiently descriptive and complete so that qualified contractors, experienced in this type of work, may submit reliable bids for the repairs.

The repair work will require close observation and oversight by an experienced engineer. We recommend that Sor Consulting Engineers, Inc. be retained to provide on-site geotechnical engineering observation services during the remediation phase of the work. This is to observe compliance with the geotechnical considerations and recommendations presented herein and to allow design changes in the event subsurface conditions differ from those anticipated prior to start of construction.

Sor Consulting Engineers appreciates the opportunity to be of assistance. Please do not hesitate to contact us if there are any questions concerning this report. The following appendices are attached and complete this report:

Appendix I	-	Exploration Location Plan
		Subsurface Profiles – Sections A-A, B-B and C-C
Appendix II	-	Test Boring Logs 1 through 7
		Test Pit Log 1 and 2
		Burmeister Soil Classification System
Appendix III	-	Laboratory Test Results
Appendix IV	-	Limitations
Appendix V	-	GPRS Job Summary Sheets

Respectfully submitted,

SOR CONSULTING ENGINEERS, INC

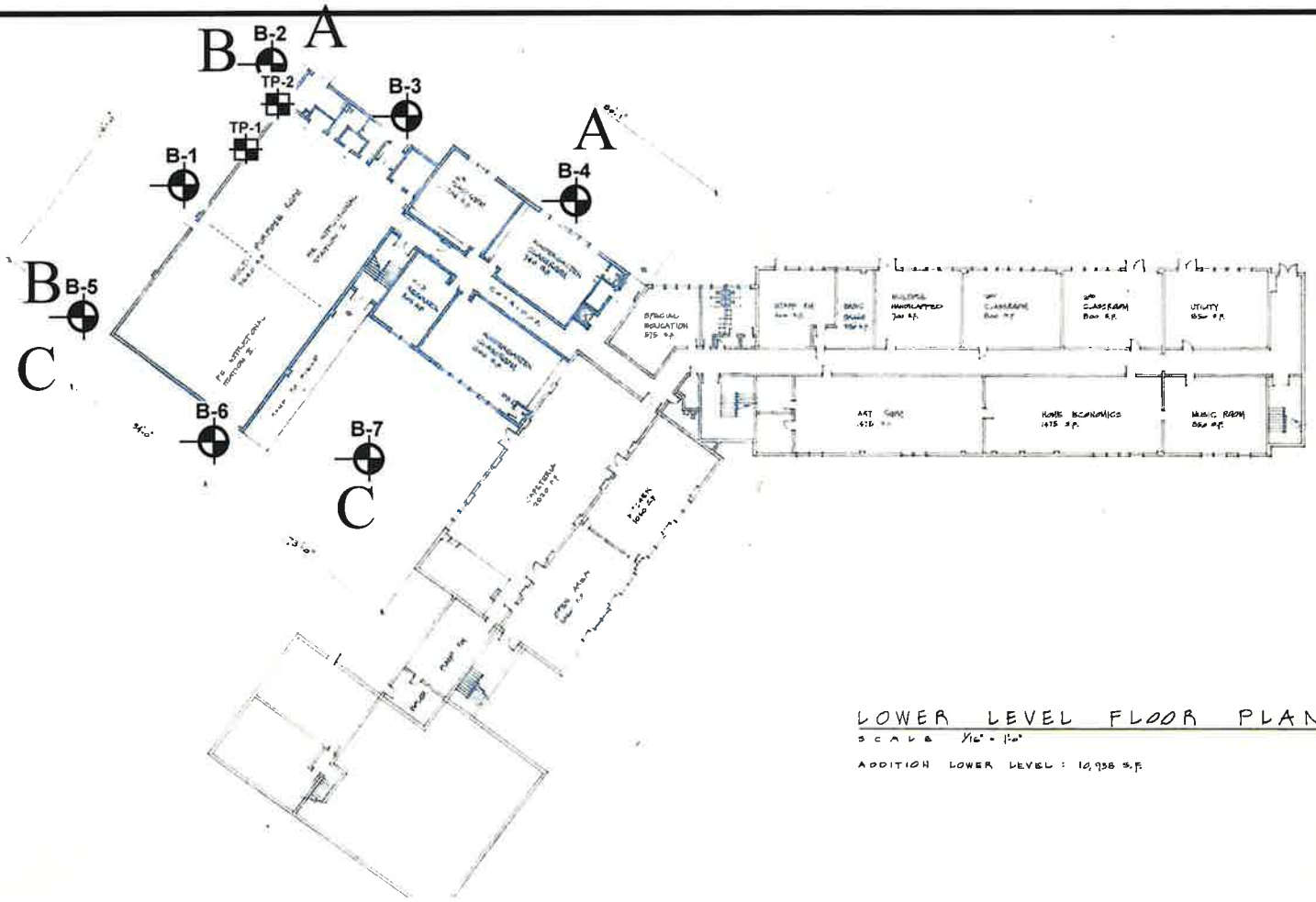
Atilla Sencar, P.E.
Senior Engineer

AS/gs

APPENDIX I

EXPLORATION LOCATION PLAN

SUBSURFACE PROFILES – SECTIONS A-A, B-B AND C-C



LEGEND

TP-1 — Number and approximate location of geotechnical test pit performed by SCE for this study.

B-1 — Number and approximate location of geotechnical boring performed by SCE for this study.

NOTES

1. This drawing is part of Sor Consulting Engineers, Inc. Report No. 23-C-54 and should be read together with the report for complete evaluation.
2. General Layout was obtained from a plan provided by the Client.

EXPLORATION LOCATION PLAN
ENV
STILLWATER ELEMENTARY SCHOOL-SETTLEMENT
STILLWATER, NEW JERSEY

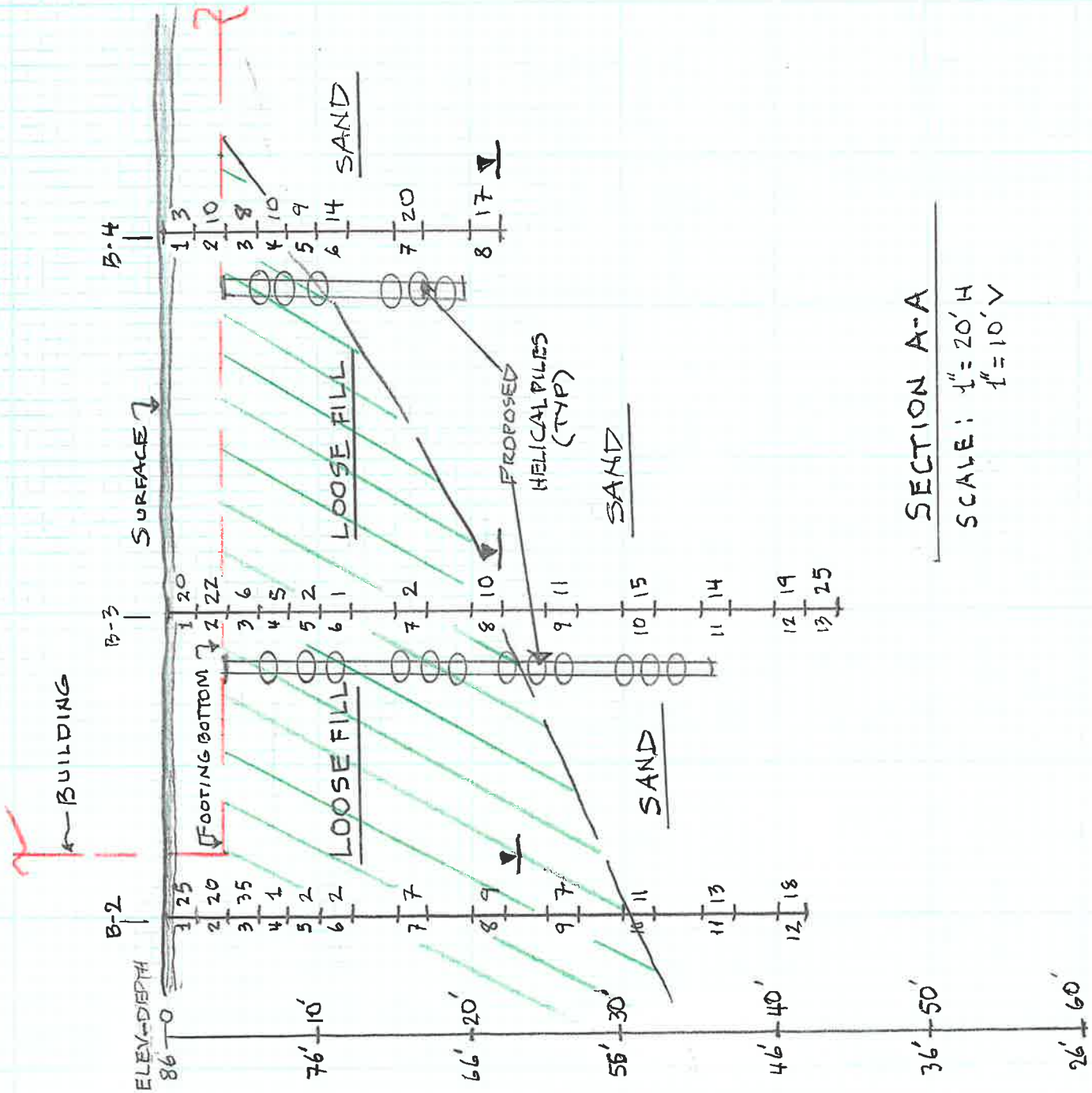
SOR CONSULTING ENGINEERS, INC.
Geotechnical Engineering – Materials Testing – Forensic Studies
98 Sand Park Road, Cedar Grove, New Jersey 07009

Prepared By : A.S..	Approved By :	DRAWING NO.
Date : 12/8/2023	Date :	23-C-50-1
Scale : NTS	Report No. : 23-C-54	Sheet No. 1 of 1

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Geotechnical Engineering – Materials Testing – Forensic Studies

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(973) 239-6001 Fax (973) 239-8380

CLIENT....ENV..... PROJECT..Stillwater Elem. School
SUBJECT ...Soil Profiles..... PROJECT NUMBER...23-C-50.....
BY .A.S. DATE 12/11/23 CHECKED BY ..... DATE ..... SHEET NUMBER .....1.... OF ..3....

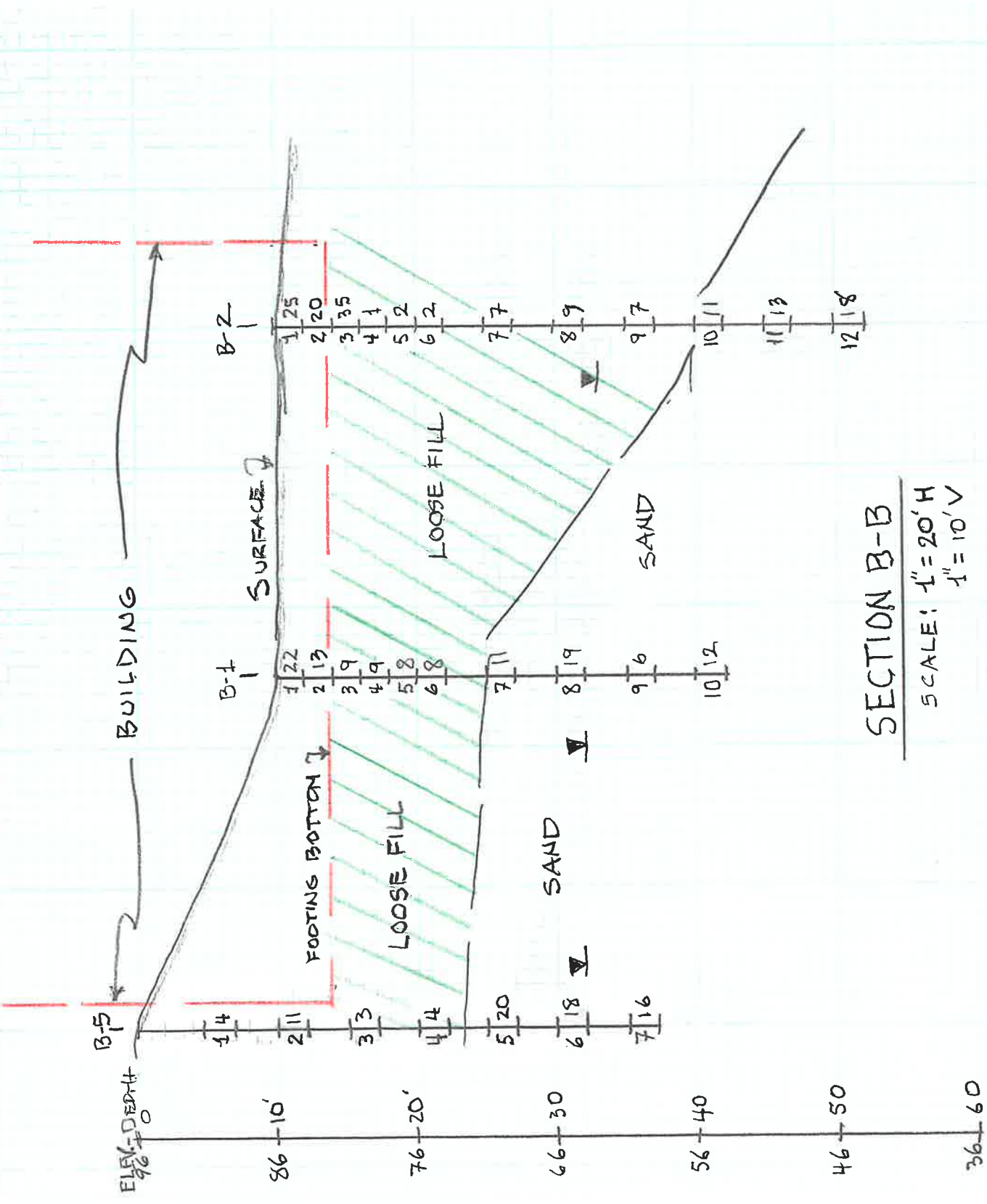


SECTION A-A
SCALE: 1"=20'H
1"=10'V

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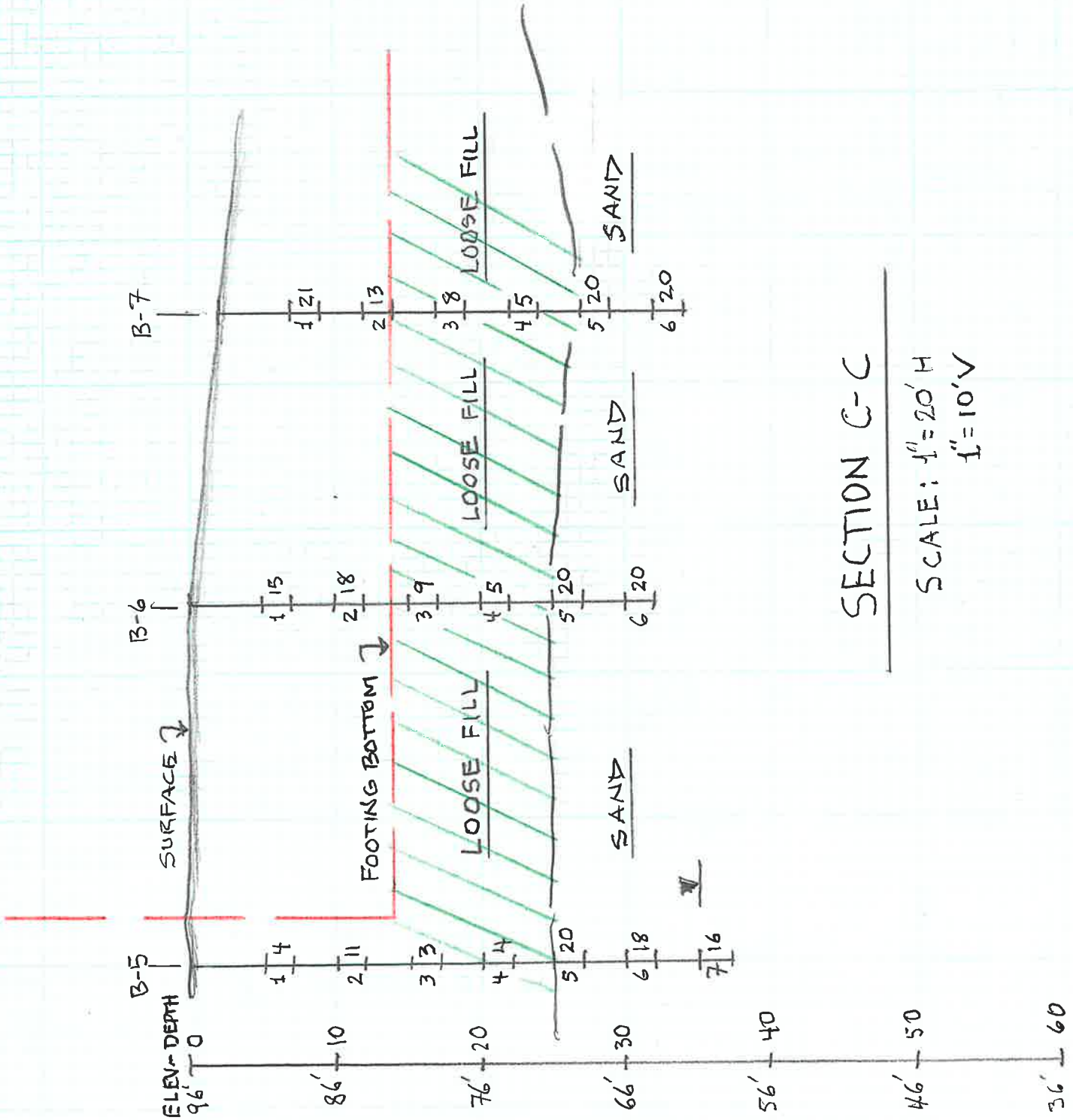
CLIENT ENV PROJECT Stillwater Elem. School
SUBJECT SOIL PROFILE PROJECT NUMBER 23-C-50
BY A.S. DATE 12/11/23 CHECKED BY ..... DATE ..... SHEET NUMBER 2 OF 3



SOR CONSULTING ENGINEERS, INC.
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Geotechnical Engineering – Materials Testing – Forensic Studies

98 Sand Park Road, Cedar Grove, NJ 07009
(973) 239-6001 Fax (973) 239-8380

CLIENT ENV PROJECT Stillwater Elem. School
SUBJECT Soil PROFILES PROJECT NUMBER 23-C-50
BY A.S DATE 12/11/23 CHECKED BY ..... DATE ..... SHEET NUMBER 3 OF 3



SECTION C-C
SCALE: 1"=20' H
1"=10' V

APPENDIX II

TEST BORING LOGS 1 THROUGH 7

TEST PIT LOG 1 AND 2

BURMEISTER SOIL CLASSIFICATION SYSTEM

SOR CONSULTING ENGINEERS, INC.	TEST BORING LOG	BORING	B-1
CLIENT	ENV	GSE	+ 86' (±)
PROJECT	Stillwater Elementary School - Settlement	DATUM	Ground Surface
LOCATION	Stillwater, New Jersey	DATE START	11/28/23
		DATE FINISH	11/28/23
		JOB NO.	23-C-50
		REPORT NO.	23-C-54
			Sheet 1 of 2

GROUND WATER					CAS.	SAMP.	CORE	TUBE
DATE	TIME	DEPTH	CASING	TYPE	HAS	SS		
28-Nov		22'-0"		DIA.	4 1/4"	2" OD		
				WT.		140 lb.		
				FALL		30"		

DEPTH (ft.)	CASING BLOWS	SAMPLE TYPE/NO.	DEPTH	SAMPLER BLOWS PER 6"	N VALUE	DESCRIPTION	REMARKS
1		S-1	0-2'	3 7 15 14	22	Topsoil 4" Grayish brown coarse to fine Sand, little Silt, and medium to fine Gravel (Probable Fill)	
2							
3		S-2	2'-4'	6 6 7 8	13	Same	
4							
5		S-3	4'-6'	6 5 4 7	9	Same	W=5.2%
6							
7		S-4	6'-8'	10 3 6 9	9	Same	
8							
9		S-5	8'-10'	9 4 4 7	8	Same	
10							
11		S-6	10'-12'	6 5 3 7	8		
12							
13							
14							
15						15'-0"	
16		S-7	15'-17'	10 6 5 7	11	Grayish brown coarse to fine SAND, little Silt, some coarse to fine Gravel	
17							
18							
19							
20							
21		S-8	20'-22'	9 10 9 8	19	Same	
22							
23							
24							
25							
26		S-9	25'-27'	5 2 4 4	6	Same (wet)	
27							

S - SPLIT SPOON SAMPLER
U - UNDISTURBED SAMPLE
C - CORE DRILLED

DRILLING CONTRACTOR: ETD, Inc.
DRILLING EQUIPMENT: Geoprobe 7822 DT
SCE REPRESENTATIVE: A. Sencar

SOR CONSULTING ENGINEERS, INC.	TEST BORING LOG	BORING	B-1
CLIENT	ENV	GSE	+ 86' (±)
PROJECT	Stillwater Elementary School - Settlement	DATUM	Ground Surface
LOCATION	Stillwater, New Jersey	DATE START	11/28/23
		DATE FINISH	11/28/23
		JOB NO.	23-C-50
		REPORT NO.	23-C-54
			Sheet 2 of 2

GROUND WATER					CAS.	SAMP.	CORE	TUBE
DATE	TIME	DEPTH	CASING	TYPE	HAS	SS		
28-Nov		22'		DIA.	4 1/4"	2" OD		
				WT.		140 lb.		
				FALL		30"		

DEPTH (ft.)	CASING BLOWS	SAMPLE TYPE/NO.	DEPTH	SAMPLER BLOWS PER 6"	N VALUE	DESCRIPTION	REMARKS
28							
29							
30							
31		S-10	30'-32'	5 6 6 6	12	Grayish brown coarse to fine Sand, little Silt some medium to fine Gravel (wet)	
32							
33						Test Boring Completed at 32'-0"	
34							
35							
36							
37							
38							
39							
40							
41							
42							
43							
44							
45							
46							
47							
48							
49							
50							
51							
52							
53							
54							

S - SPLIT SPOON SAMPLER
U - UNDISTURBED SAMPLE
C - CORE DRILLED

DRILLING CONTRACTOR: ETD, Inc.
DRILLING EQUIPMENT: Geoprobe 7822 DT
SCE REPRESENTATIVE: A. Sencar

SOR CONSULTING ENGINEERS, INC.	TEST BORING LOG	BORING B-2

CLIENT	ENV	GSE	+ 86' (±)
PROJECT	Stillwater Elementary School - Settlement	DATUM	Ground Surface
LOCATION	Stillwater, New Jersey	DATE START	11/28/23
		DATE FINISH	11/28/23
		JOB NO.	23-C-50
		REPORT NO.	23-C-54
			Sheet 1 of 2

GROUND WATER					CAS.	SAMP.	CORE	TUBE
DATE	TIME	DEPTH	CASING	TYPE	HAS	SS		
28-Nov		23'		DIA.	4 1/4"	2" OD		
				WT.		140 lb.		
				FALL		30"		

DEPTH (ft.)	CASING BLOWS	SAMPLE TYPE/NO.	DEPTH	SAMPLER BLOWS PER 6"	N VALUE	DESCRIPTION	REMARKS
1		S-1	0-2'	5 12 13 6	25	Topsoil 5" Grayish brown coarse to fine SAND, little Silt, and coarse to fine Gravel (Fill)	
2							
3		S-2	2'-4'	7 9 11 14	20	Same	
4							
5		S-3	4'-6'	10 22 13 7	35	Same wit boulders	
6							
7		S-4	6'-8'	7 1 0 0	1	Same	
8							
9		S-5	8'-10'	2 1 1 0	2	Same	
10							
11		S-6	10'-12'	2 1 1 1	2	Same	
12							
13							
14							
15							
16		S-7	15'-17'	3 4 3 3	7	Same with wood	
17							
18							
19							
20							
21		S-8	20'-22'	5 5 4 5	9	Same	
22							
23							
24							
25							
26		S-9	25'-27'	3 3 4 3	7	Same (wet)	
27							

S - SPLIT SPOON SAMPLER
U - UNDISTURBED SAMPLE
C - CORE DRILLED

DRILLING CONTRACTOR	ETD, Inc.
DRILLING EQUIPMENT	Geoprobe 7822 DT
SCE REPRESENTATIVE	A. Sencar

SOR CONSULTING ENGINEERS, INC.	TEST BORING LOG	BORING B-2

CLIENT	ENV	GSE	+ 86' (±)
PROJECT	Stillwater Elementary School - Settlement	DATUM	Ground Surface
LOCATION	Stillwater, New Jersey	DATE START	11/28/23
		DATE FINISH	11/28/23
		JOB NO.	23-C-50
		REPORT NO.	23-C-54
			Sheet 2 of 2

GROUND WATER					CAS.	SAMP.	CORE	TUBE
DATE	TIME	DEPTH	CASING	TYPE	HAS	SS		
28-Nov		23'		DIA.	4 1/4"	2" OD		
				WT.		140 lb.		
				FALL		30"		

DEPTH (ft.)	CASING BLOWS	SAMPLE TYPE/NO.	DEPTH	SAMPLER BLOWS PER 6"	N VALUE	DESCRIPTION	REMARKS
28							
29						29'-0"	
30							
31		S-10	30'-32'	5 5 6 8	11	Gray coarse to fine SAND, and coarse to fine Gravel (wet)	
32							
33							
34							
35							
36		S-11	35'-37'	6 6 7 9	13	Same	
37							
38							
39							
40							
41		S-12	40'-42'	7 9 9 11	18	Same	
42							
43						Test Boring Completed at 42'-0"	
44							
45							
46							
47							
48							
49							
50							
51							
52							
53							
54							

S - SPLIT SPOON SAMPLER
U - UNDISTURBED SAMPLE
C - CORE DRILLED

DRILLING CONTRACTOR	ETD, Inc.
DRILLING EQUIPMENT	Geoprobe 7822 DT
SCE REPRESENTATIVE	A. Sencar

SOR CONSULTING ENGINEERS, INC.	TEST BORING LOG	BORING B-3

CLIENT	ENV	GSE	+ 86' (±)
PROJECT	Stillwater Elementary School - Settlement	DATUM	Ground Surface
LOCATION	Stillwater, New Jersey	DATE START	11/28/23

GROUND WATER					CAS.	SAMP.	CORE	TUBE		
DATE	TIME	DEPTH	CASING	TYPE	HAS	SS				
28-Nov		22'		DIA.	4 1/4"	2" OD			JOB NO.	23-C-50
				WT.		140 lb.			REPORT NO.	23-C-54
				FALL		30"			*Sheet 1 of 2*	

DEPTH (ft.)	CASING BLOWS	SAMPLE TYPE/NO.	DEPTH	SAMPLER BLOWS PER 6"	N VALUE	DESCRIPTION	REMARKS
1		S-1	0-2'	1 8 12 18	20	Topsoil 6" Grayish brown coarse to fine SAND, little Silt, and coarse to fine Gravel Probable Fill)	
2							
3		S-2	2'-4'	16 10 12 9	22	Same	
4							
5		S-3	4'-6'	5 3 3 3	6	Same	
6							
7		S-4	6'-8'	3 3 2 2	5	Same	
8							
9		S-5	8'-10'	2 1 1 1	2	Same	
10							
11		S-6	10'-12'	0 0 1 1	1		
12							
13							
14							
15							
16		S-7	15'-17'	2 1 1 1	2	Same	
17							
18							
19							
20							
21		S-8	20'-22'	4 5 5 8	10	Same 21'-0" Grayish brown coarse to fine SAND, little Silt, some fine Gravel	
22							
23							
24							
25							
26		S-9	25'-27'	5 6 5 5	11	Same (wet)	
27							

S - SPLIT SPOON SAMPLER
U - UNDISTURBED SAMPLE
C - CORE DRILLED

DRILLING CONTRACTOR: ETD, Inc.
DRILLING EQUIPMENT: Geoprobe 7822 DT
SCE REPRESENTATIVE: A. Sencar

SOR CONSULTING ENGINEERS, INC.	TEST BORING LOG	BORING	B-3
CLIENT	ENV	GSE	+ 86' (±)
PROJECT	Stillwater Elementary School - Settlement	DATUM	Ground Surface
LOCATION	Stillwater, New Jersey	DATE START	11/28/23
		DATE FINISH	11/28/23
		JOB NO.	23-C-50
		REPORT NO.	23-C-54
			Sheet 2 of 2

GROUND WATER					CAS.	SAMP.	CORE	TUBE
DATE	TIME	DEPTH	CASING	TYPE	HAS	SS		
28-Nov		22'		DIA.	4 1/4"	2" OD		
				WT.		140 lb.		
				FALL		30"		

DEPTH (ft.)	CASING BLOWS	SAMPLE TYPE/NO.	DEPTH	SAMPLER BLOWS PER 6"	N VALUE	DESCRIPTION	REMARKS
28							
29							
30							
31		S-10	30'-32'	9 9 6 6	15	Grayish brown coarse to fine SAND, little Silt, and medium to fine Gravel	
32							
33							
34							
35							
36		S-11	35'-37'	5 6 8 9	14	Same	W=14.3%
37							
38							
39							
40							
41		S-12	40'-42'	8 8 11 13	19	Same	
42							
43		S-13	42'-44'	10 12 13 12	25	Same	
44							
45						Test Boring Completed at 44'-0"	
46							
47							
48							
49							
50							
51							
52							
53							
54							

S - SPLIT SPOON SAMPLER
U - UNDISTURBED SAMPLE
C - CORE DRILLED

DRILLING CONTRACTOR: ETD, Inc.
DRILLING EQUIPMENT: Geoprobe 7822 DT
STL REPRESENTATIVE: A. Sencar

SOR CONSULTING ENGINEERS, INC.	TEST BORING LOG	BORING	B-4
CLIENT	ENV	GSE	+ 86' (±)
PROJECT	Stillwater Elementary School - Settlement	DATUM	Ground Surface
LOCATION	Stillwater, New Jersey	DATE START	11/29/23
		DATE FINISH	11/29/23
		JOB NO.	23-C-50
		REPORT NO.	23-C-54
			Sheet 1 of 1

GROUND WATER					CAS.	SAMP.	CORE	TUBE
DATE	TIME	DEPTH	CASING	TYPE	HAS	SS		
29-Nov		22'		DIA.	4 1/4"	2" OD		
				WT.		140 lb.		
				FALL		30"		

DEPTH (ft.)	CASING BLOWS	SAMPLE TYPE/NO.	DEPTH	SAMPLER BLOWS PER 6"	N VALUE	DESCRIPTION	REMARKS
1		S-1	0-2'	1 2 1 2	3	Topsoil 6" Grayish brown coarse to fine SAND, little Silt, some coarse to fine Gravel (Fill)	
2							
3		S-2	2'-4'	3 4 6 4	10	Same	
4							
5		S-3	4'-6'	4 4 4 6	8	Same	
6							
7		S-4	6'-8'	6 5 5 7	10	Same	
8						8'-0"	
9		S-5	8'-10'	5 4 5 8	9	Grayish brown coarse to fine SAND, trace Silt little medium to fine Gravel	W=7.9%
10							
11		S-6	10'-12'	8 7 7 8	14	Same	
12							
13							
14							
15							
16		S-7	15'-17'	10 10 10 10	20	Same	
17							
18							
19							
20							
21		S-8	20'-22'	5 9 8 10	17	Same (wet at tip)	
22							
23						Test Boring Completed at 22'-0"	
24							
25							
26							
27							

S - SPLIT SPOON SAMPLER
U - UNDISTURBED SAMPLE
C - CORE DRILLED

DRILLING CONTRACTOR: ETD, Inc.
DRILLING EQUIPMENT: Geoprobe 7822 DT
SCE REPRESENTATIVE: A. Sencar

SOR CONSULTING ENGINEERS, INC.	TEST BORING LOG	BORING B-5

CLIENT	ENV	GSE	+ 96' (±)
PROJECT	Stillwater Elementary School - Settlement	DATUM	Ground Surface
LOCATION	Stillwater, New Jersey	DATE START	11/29/23
		DATE FINISH	11/29/23
		JOB NO.	23-C-50
		REPORT NO.	23-C-54
			Sheet 1 of 2

GROUND WATER					CAS.	SAMP.	CORE	TUBE
DATE	TIME	DEPTH	CASING	TYPE	HAS	SS		
29-Nov				DIA.	4 1/4"	2" OD		
				WT.		140 lb.		
				FALL		30"		

DEPTH (ft.)	CASING BLOWS	SAMPLE TYPE/NO.	DEPTH	SAMPLER BLOWS PER 6"	N VALUE	DESCRIPTION	REMARKS
1						Topsoil 6"	
2						Grayish brown coarse to fine SAND, little Silt, and medium to fine Gravel (Fill)	
3							
4							
5							
6		S-1	5'-7'	1 3 1 2		Same	
7							
8							
9							
10							
11		S-2	10'-12'	2 8 3 3	11	Same	
12							
13							
14							
15							
16		S-3	15'-17'	1 2 1 2	3	Same	W=9.6%
17							
18							
19							
20							
21		S-4	20'-22'	1 2 2 2	4	Same	
22							
23						23'-0"	
24							
25							
26		S-5	25'-27'	10 11 9 14	20	Grayish brown coarse to fine SAND, little Silt, some medium to fine Gravel	
27							

S - SPLIT SPOON SAMPLER
U - UNDISTURBED SAMPLE
C - CORE DRILLED

DRILLING CONTRACTOR	ETD, Inc.
DRILLING EQUIPMENT	Geoprobe 7822 DT
SCE REPRESENTATIVE	A. Sencar

SOR CONSULTING ENGINEERS, INC.	TEST BORING LOG	BORING B-5

CLIENT	ENV	GSE	+ 96' (±)
PROJECT	Stillwater Elementary School - Settlement	DATUM	Ground Surface
LOCATION	Stillwater, New Jersey	DATE START	11/29/23
		DATE FINISH	11/29/23
		JOB NO.	23-C-50
		REPORT NO.	23-C-54
			Sheet 2 of 2

GROUND WATER					CAS.	SAMP.	CORE	TUBE
DATE	TIME	DEPTH	CASING	TYPE	HAS	SS		
29-Nov		32'		DIA.	4 1/4"	2" OD		
				WT.		140 lb.		
				FALL		30"		

DEPTH (ft.)	CASING BLOWS	SAMPLE TYPE/NO.	DEPTH	SAMPLER BLOWS PER 6"	N VALUE	DESCRIPTION	REMARKS
28							
29							
30							
31		S-6	30'-32'	6 9 9 8	18	Grayish brown coarse to fine SAND, little Silt, and coarse to fine Gravel	
32							
33							
34							
35							
36		S-7	35'-37'	7 8 8 7	16	Same (wet)	
37							
38						Test Boring Completed at 37'-0"	
39							
40							
41							
42							
43							
44							
45							
46							
47							
48							
49							
50							
51							
52							
53							
54							

S - SPLIT SPOON SAMPLER
U - UNDISTURBED SAMPLE
C - CORE DRILLED

DRILLING CONTRACTOR: ETD, Inc.
DRILLING EQUIPMENT: Geoprobe 7822 DT
SCE REPRESENTATIVE: A. Sencar

SOR CONSULTING ENGINEERS, INC.	TEST BORING LOG	BORING B-6

CLIENT	ENV	GSE	+ 96' (±)
PROJECT	Stillwater Elementary School - Settlement	DATUM	Ground Surface
LOCATION	Stillwater, New Jersey	DATE START	11/29/23
		DATE FINISH	11/29/23
		JOB NO.	23-C-50
		REPORT NO.	23-C-54
			Sheet 1 of 2

GROUND WATER					CAS.	SAMP.	CORE	TUBE
DATE	TIME	DEPTH	CASING	TYPE	HAS	SS		
29-Nov		32'-0"		DIA.	4 1/4"	2" OD		
				WT.		140 lb.		
				FALL		30"		

DEPTH (ft.)	CASING BLOWS	SAMPLE TYPE/NO.	DEPTH	SAMPLER BLOWS PER 6"	N VALUE	DESCRIPTION	REMARKS
1						Topsoil 6"	
2						Grayish brown coarse to fine SAND, little Silt, some coarse to fine Gravel (Fill)	
3							
4							
5							
6		S-1	5'-7'	5 7 8 9	15	Same	
7							
8							
9							
10							
11		S-2	10'-12'	8 8 10 13	18	Same	
12							
13							
14							
15							
16		S-3	15'-17'	8 6 3 12	9	Same	
17							
18							
19							
20							
21		S-4	20'-22'	4 3 2 6	5	Gray medium to fine SAND, trace Silt	
22						24'-0"	
23							
24							
25							
26		S-4	25'-27'	8 9 11 13	20	Gray coarse to fine SAND, ltle Silt, and coarse to fine Gravel	
27							

S - SPLIT SPOON SAMPLER
U - UNDISTURBED SAMPLE
C - CORE DRILLED

DRILLING CONTRACTOR	ETD, Inc.
DRILLING EQUIPMENT	Geoprobe 7822 DT
SCE REPRESENTATIVE	A. Sencar

SOR CONSULTING ENGINEERS, INC.	TEST BORING LOG	BORING B-6

CLIENT	ENV								GSE	+ 96' (±)
PROJECT	Stillwater Elementary School - Settlement								DATUM	Ground Surface
LOCATION	Stillwater, New Jersey								DATE START	11/29/23
GROUND WATER					CAS.	SAMP.	CORE	TUBE	DATE FINISH	11/29/23
DATE	TIME	DEPTH	CASING	TYPE	HAS	SS				
29-Nov				DIA.	4 1/4"	2" OD			JOB NO.	23-C-50
				WT.		140 lb.			REPORT NO.	23-C-54
				FALL		30"			Sheet 2 of 2	

DEPTH (ft.)	CASING BLOWS	SAMPLE TYPE/NO.	DEPTH	SAMPLER BLOWS PER 6"	N VALUE	DESCRIPTION	REMARKS
28							
29							
30							
31		S-6	30'-32'	10 9 11 14	20	Gray medium to fine Sand, little Silt, and medium to fine Gravel	
32							
33						Test Boring Completed at 32'-0"	
34							
35							
36							
37							
38							
39							
40							
41							
42							
43							
44							
45							
46							
47							
48							
49							
50							
51							
52							
53							
54							

S - SPLIT SPOON SAMPLER
U - UNDISTURBED SAMPLE
C - CORE DRILLED

DRILLING CONTRACTOR: ETD, Inc.
DRILLING EQUIPMENT: Geoprobe 7822 DT
SCE REPRESENTATIVE: A. Sencar

SOR CONSULTING ENGINEERS, INC.	TEST BORING LOG	BORING B-7

CLIENT	ENV	GSE	+ 95' (±)
PROJECT	Stillwater Elementary School - Settlement	DATUM	Ground Surface
LOCATION	Stillwater, New Jersey	DATE START	11/29/23
		DATE FINISH	11/29/23
		JOB NO.	23-C-50
		REPORT NO.	23-C-54
			Sheet 1 of 2

GROUND WATER					CAS.	SAMP.	CORE	TUBE
DATE	TIME	DEPTH	CASING	TYPE	HAS	SS		
29-Nov		NE		DIA.	4 1/4"	2" OD		
				WT.		140 lb.		
				FALL		30"		

DEPTH (ft.)	CASING BLOWS	SAMPLE TYPE/NO.	DEPTH	SAMPLER BLOWS PER 6"	N VALUE	DESCRIPTION	REMARKS
1						Topsoil 5"	
2						Grayish brown coarse to fine SAND, little Silt, and coarse to fine Gravel (Fill)	
3							
4							
5							
6		S-1	5'-7'	10 10 11 11	21	Same	
7							
8							
9							
10							
11		S-2	10'-12'	4 6 7 9	13	Same	
12							
13							
14							
15							
16		S-3	15'-17'	3 4 4 5	8	Grayish brown fine SAND, some Silt	W=5.6%
17							
18							
19							
20							
21		S-4	20'-22'	1 2 3 4	5	Same	
22							
23							
24						23'-6"	
25							
26		S-5	25'-27'	5 8 12 15	20	Gray coarse to fine SAND, little Silt, and coarse to fine Gravel	
27							

S - SPLIT SPOON SAMPLER
U - UNDISTURBED SAMPLE
C - CORE DRILLED

DRILLING CONTRACTOR	ETD, Inc.
DRILLING EQUIPMENT	Geoprobe 7822 DT
SCE REPRESENTATIVE	A. Sencar

SOR CONSULTING ENGINEERS, INC.	TEST BORING LOG	BORING B-7

CLIENT	ENV	GSE	+ 95' (±)
PROJECT	Stillwater Elementary School - Settlement	DATUM	Ground Surface
LOCATION	Stillwater, New Jersey	DATE START	11/29/23
		DATE FINISH	11/29/23
		JOB NO.	23-C-50
		REPORT NO.	23-C-54
			Sheet 2 of 2

GROUND WATER					CAS.	SAMP.	CORE	TUBE
DATE	TIME	DEPTH	CASING	TYPE	HAS	SS		
29-Nov		NE		DIA.	4 1/4"	2" OD		
				WT.		140 lb.		
				FALL		30"		

DEPTH (ft.)	CASING BLOWS	SAMPLE TYPE/NO.	DEPTH	SAMPLER BLOWS PER 6"	N VALUE	DESCRIPTION	REMARKS
28							
29							
30							
31		S-6	30'-32'	7 10 10 14	20	Grayish brown medium to fine Sand, little Silt, some medium to fine Gravel	
32							
33						Test Boring Completed at 32'-0"	
34							
35							
36							
37							
38							
39							
40							
41							
42							
43							
44							
45							
46							
47							
48							
49							
50							
51							
52							
53							
54							

S - SPLIT SPOON SAMPLER
U - UNDISTURBED SAMPLE
C - CORE DRILLED

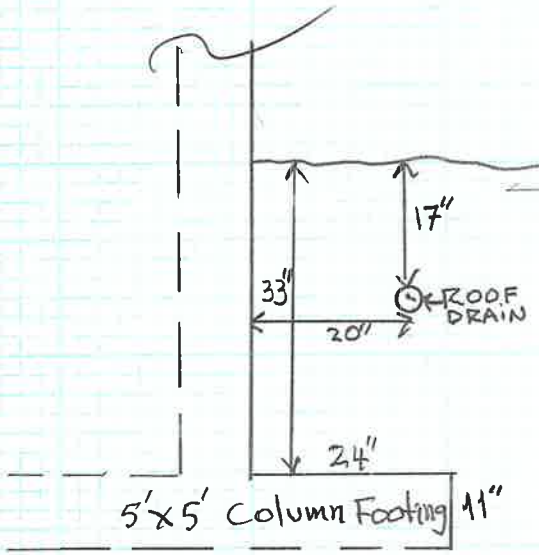
DRILLING CONTRACTOR: ETD, Inc.
DRILLING EQUIPMENT: Geoprobe 7822 DT
SCE REPRESENTATIVE: A. Sencar

SOR CONSULTING ENGINEERS, INC.
SOR TESTING LABORATORIES, INC.
Geotechnical Engineering – Materials Testing – Forensic Studies

98 Sand Park Road, Cedar Grove, NJ 07009
(973) 239-6001 Fax (973) 239-8380

CLIENT ENV PROJECT Stillwater Elem. School
SUBJECT Test Pit 1 PROJECT NUMBER 23-C-50
BY A.S. DATE 11/27/23 CHECKED BY ..... DATE ..... SHEET NUMBER 1 OF 1

TP-1



Grayish brown silty gravelly Sand with cobbles and boulders (Fill)

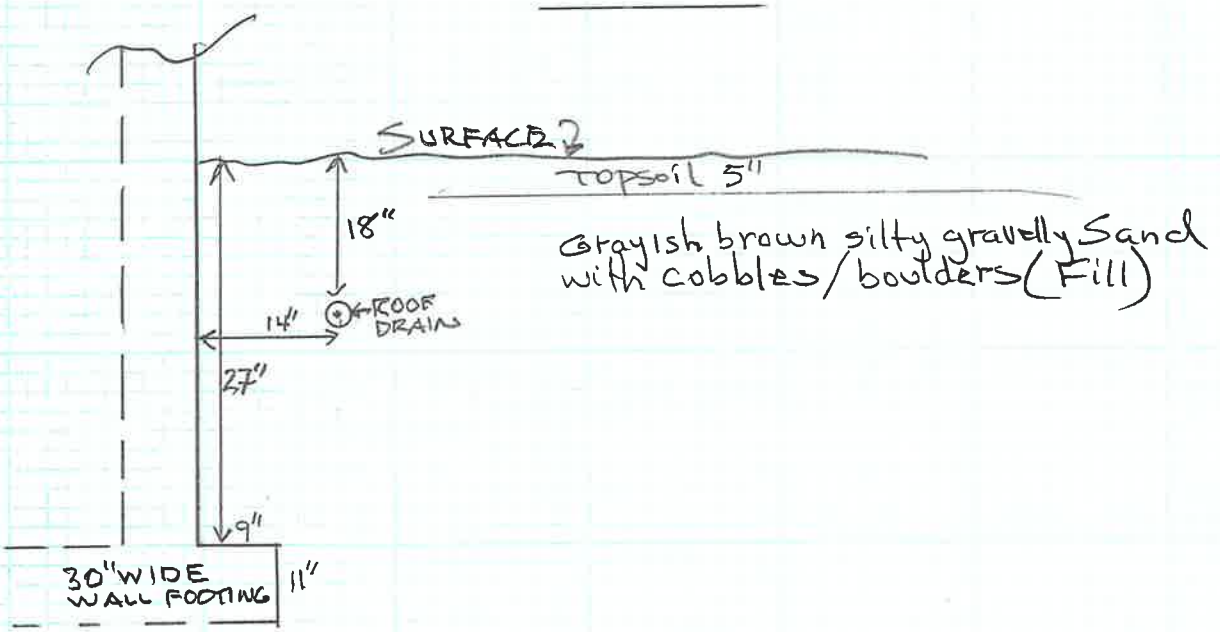
Test Pit Completed at 4'-0"

SOR CONSULTING ENGINEERS, INC.
SOR TESTING LABORATORIES, INC.
Geotechnical Engineering – Materials Testing – Forensic Studies

98 Sand Park Road, Cedar Grove, NJ 07009
(973) 239-6001 Fax (973) 239-8380

CLIENT ENV PROJECT Stillwater Elem. School
SUBJECT Test Pit 2 PROJECT NUMBER 23-C-50
BY A.S. DATE 11/27/23 CHECKED BY ..... DATE ..... SHEET NUMBER 1 OF 1

TP-2



Test Pit Completed at 4'-0"

APPENDIX III

LABORATORY TEST RESULTS

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PARTICLE SIZE DISTRIBUTION TEST REPORT

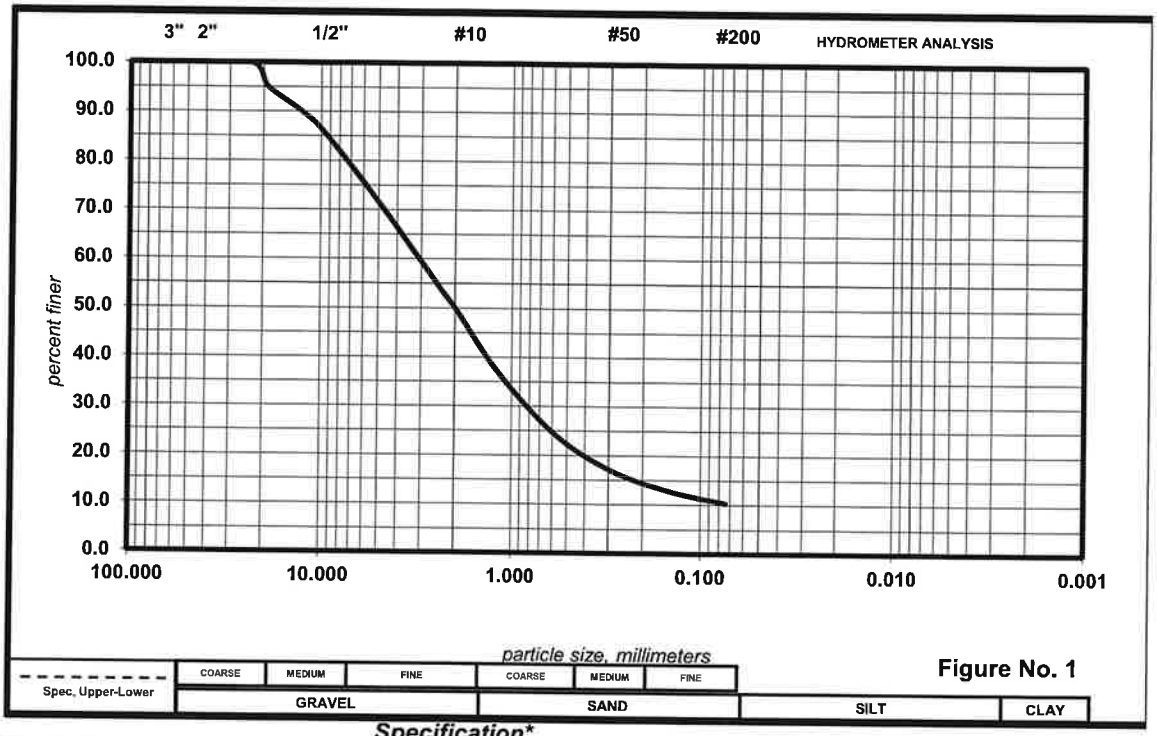


Figure No. 1

Specification*

Sieve Size	% Finer	Min.(%)	Max.(%)
3" (75 mm)			
2 1/2" (63 mm)			
2" (50 mm)			
1 1/2" (38.1 mm)			
1" (25 mm)	100.0		
3/4" (19 mm)	95.0		
5/8" (16 mm)			
1/2" (12.5 mm)	90.1		
3/8" (9.5 mm)	85.6		
5/16" (8 mm)			
1/4" (6.3 mm)			
#4 (4.75 mm)	70.4		
#6 (3.35 mm)			
#8 (2.36 mm)	53.9		
#10 (2 mm)			
#14 (1.4 mm)			
#16 (1.18 mm)	37.0		
#20 (850 µm)			
#30 (600 µm)	24.5		
#40 (425 µm)			
#50 (300 µm)	17.1		
#60 (250 µm)			
#100 (150 µm)	12.9		
#200 (75 µm)	10.4		

Sample Identification

Sample No.: B-1, S-3
Lab No.: A23-154-01
Source/Location: 4'-6'
Description: Gray.Br. cf Sand, little Silt, and mf Gravel

sample description in accordance with Burmister System

LL :	PL :	PI :

As received Moisture Content: 5.2 %

Classification:
USCS: [SW-SM]
AASHTO:

Remarks:
Sample received in lab on November 30, 2023

Client: ENV
Project: Stillwater Elementary School Settlement
Location: Stillwater, New Jersey
Date: 4-Dec-23
Job No.: 23-C-50 **Report No.:** 23-C-54

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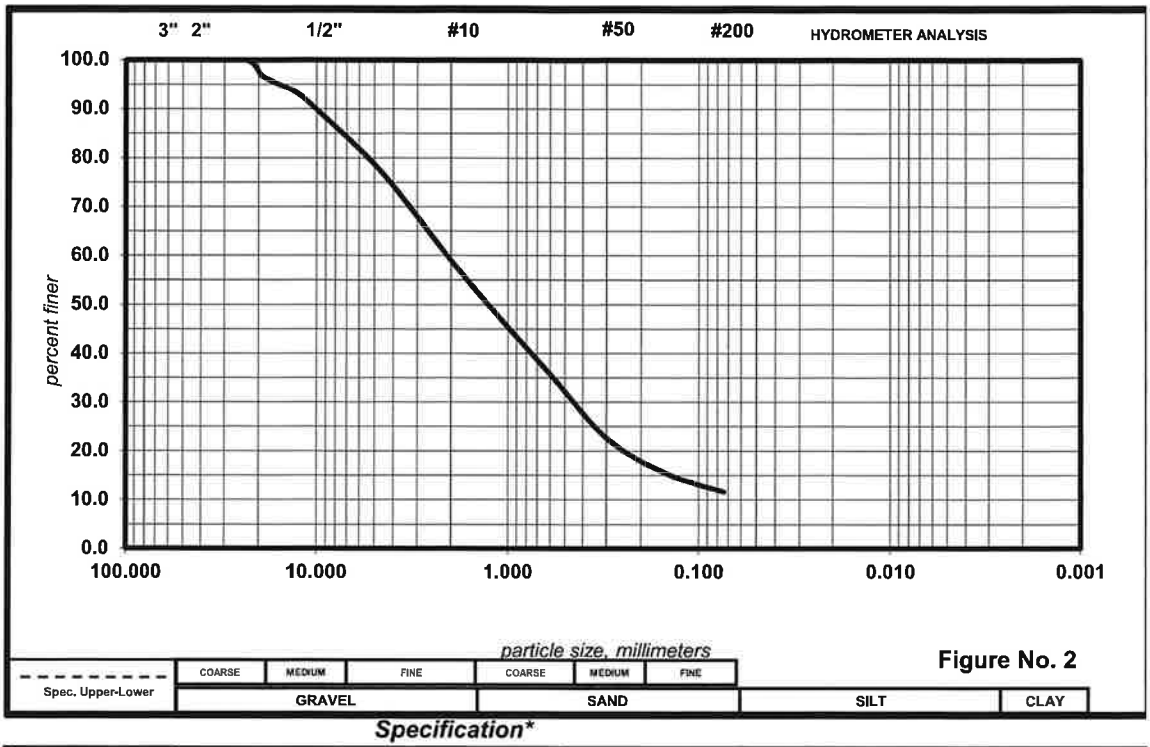


Figure No. 2

Specification*

Sieve Size	% Finer	Min.(%)	Max.(%)
3" (75 mm)			
2 1/2" (63 mm)			
2" (50 mm)			
1 1/2" (38.1 mm)			
1" (25 mm)	100.0		
3/4" (19 mm)	96.5		
5/8" (16 mm)			
1/2" (12.5 mm)	93.3		
3/8" (9.5 mm)	89.1		
5/16" (8 mm)			
1/4" (6.3 mm)			
#4 (4.75 mm)	77.7		
#6 (3.35 mm)			
#8 (2.36 mm)	62.8		
#10 (2 mm)			
#14 (1.4 mm)			
#16 (1.18 mm)	48.7		
#20 (850 µm)			
#30 (600 µm)	35.4		
#40 (425 µm)			
#50 (300 µm)	22.5		
#60 (250 µm)			
#100 (150 µm)	15.4		
#200 (75 µm)	11.7		
-			

Sample Identification

Sample No.: B-3, S-11
Lab No.: A23-154-02
Source/Location: 35'-37'
Description:
Brown.Gray cf Sand, little Silt, and mf Gravel

sample description in accordance with Burmister System

LL :	PL :	PI :

As received Moisture Content: 14.3 %

Classification:
USCS: [SW-SM]
AASHTO:

Remarks:
Sample received in lab on November 30, 2023

Client: ENV
Project: Stillwater Elementary School Settlement
Location: Stillwater, New Jersey
Date: 4-Dec-23
Job No.: 23-C-50 **Report No.:** 23-C-54

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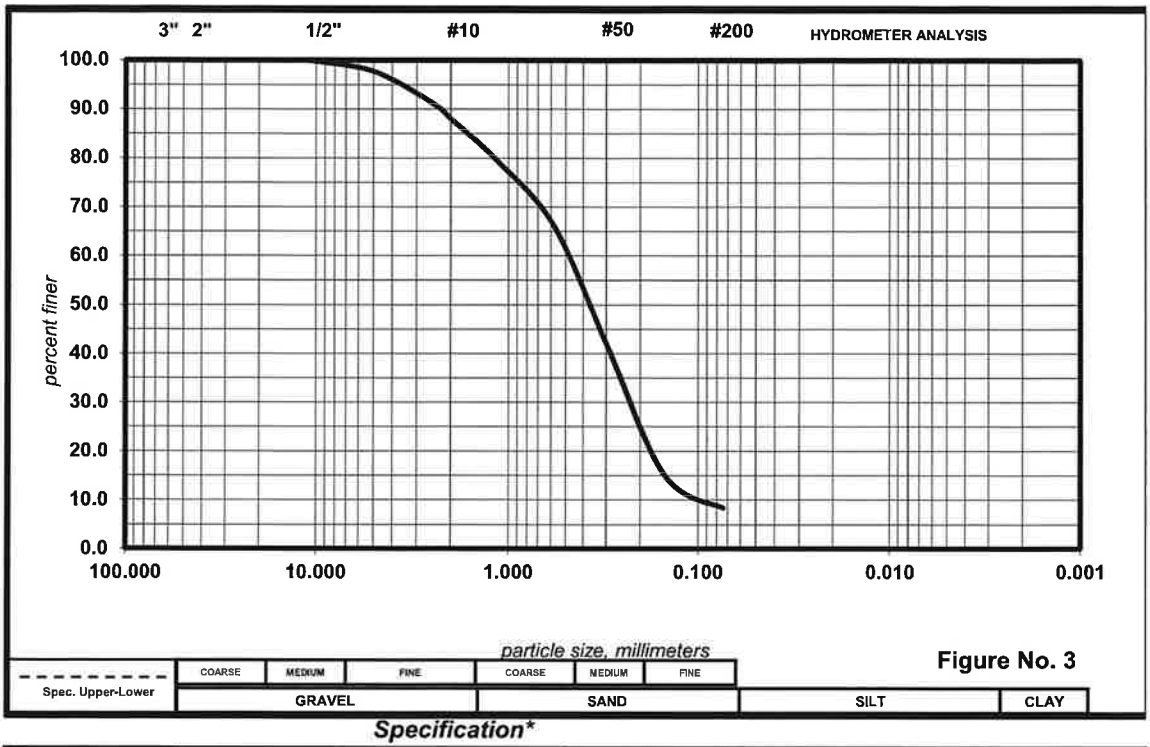


Figure No. 3

Specification*

Sieve Size	% Finer	Min.(%)	Max.(%)
3" (75 mm)			
2 1/2" (63 mm)			
2" (50 mm)			
1 1/2" (38.1 mm)			
1" (25 mm)			
3/4" (19 mm)			
5/8" (16 mm)			
1/2" (12.5 mm)	100.0		
3/8" (9.5 mm)	99.6		
5/16" (8 mm)			
1/4" (6.3 mm)			
#4 (4.75 mm)	97.4		
#6 (3.35 mm)			
#8 (2.36 mm)	90.7		
#10 (2 mm)			
#14 (1.4 mm)			
#16 (1.18 mm)	80.0		
#20 (850 µm)			
#30 (600 µm)	66.7		
#40 (425 µm)			
#50 (300 µm)	41.6		
#60 (250 µm)			
#100 (150 µm)	15.1		
#200 (75 µm)	8.4		
-			

Sample Identification

Sample No.: B-4, S-5
Lab No.: A23-154-03
Source/Location: 8'-10'
Description:
Lt.Br. cf SAND, trace Silt, little mf Gravel

sample description in accordance with Burmister System

LL :	PL :	PI :

As received Moisture Content: 7.9 %

Classification:
USCS: [SP-SM]
AASHTO:

Remarks:
Sample received in lab on November 30, 2023

Client: ENV
Project: Stillwater Elementary School Settlement
Location: Stillwater, New Jersey
Date: 4-Dec-23
Job No.: 23-C-50 **Report No.:** 23-C-54

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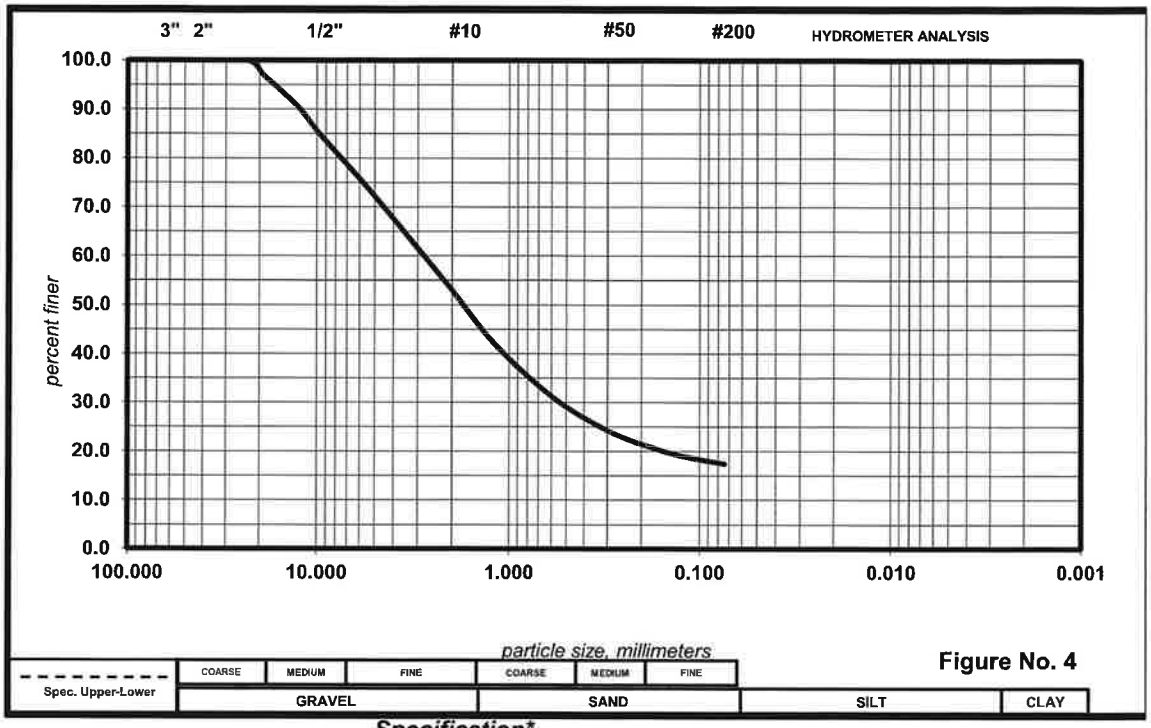


Figure No. 4

Specification*

Sieve Size	% Finer	Min.(%)	Max.(%)
3" (75 mm)			
2 1/2" (63 mm)			
2" (50 mm)			
1 1/2" (38.1 mm)			
1" (25 mm)	100.0		
3/4" (19 mm)	96.9		
5/8" (16 mm)			
1/2" (12.5 mm)	90.7		
3/8" (9.5 mm)	84.6		
5/16" (8 mm)			
1/4" (6.3 mm)			
#4 (4.75 mm)	71.2		
#6 (3.35 mm)			
#8 (2.36 mm)	56.6		
#10 (2 mm)			
#14 (1.4 mm)			
#16 (1.18 mm)	42.0		
#20 (850 µm)			
#30 (600 µm)	31.1		
#40 (425 µm)			
#50 (300 µm)	24.2		
#60 (250 µm)			
#100 (150 µm)	19.9		
#200 (75 µm)	17.4		

-

Sample Identification

Sample No.: B-5, S-3
Lab No.: A23-154-04
Source/Location: 15'-17'
Description:
Dark Br. cf Sand, little Silt, and mf Gravel

sample description in accordance with Burmister System

LL :	PL :	PI :

As received Moisture Content: 9.6 %

Classification:
USCS: [SM]
AASHTO:

Remarks:
Sample received in lab on November 30, 2023

Client: ENV
Project: Stillwater Elementary School Settlement
Location: Stillwater, New Jersey
Date: 4-Dec-23
Job No.: 23-C-50 **Report No.:** 23-C-54

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PARTICLE SIZE DISTRIBUTION TEST REPORT

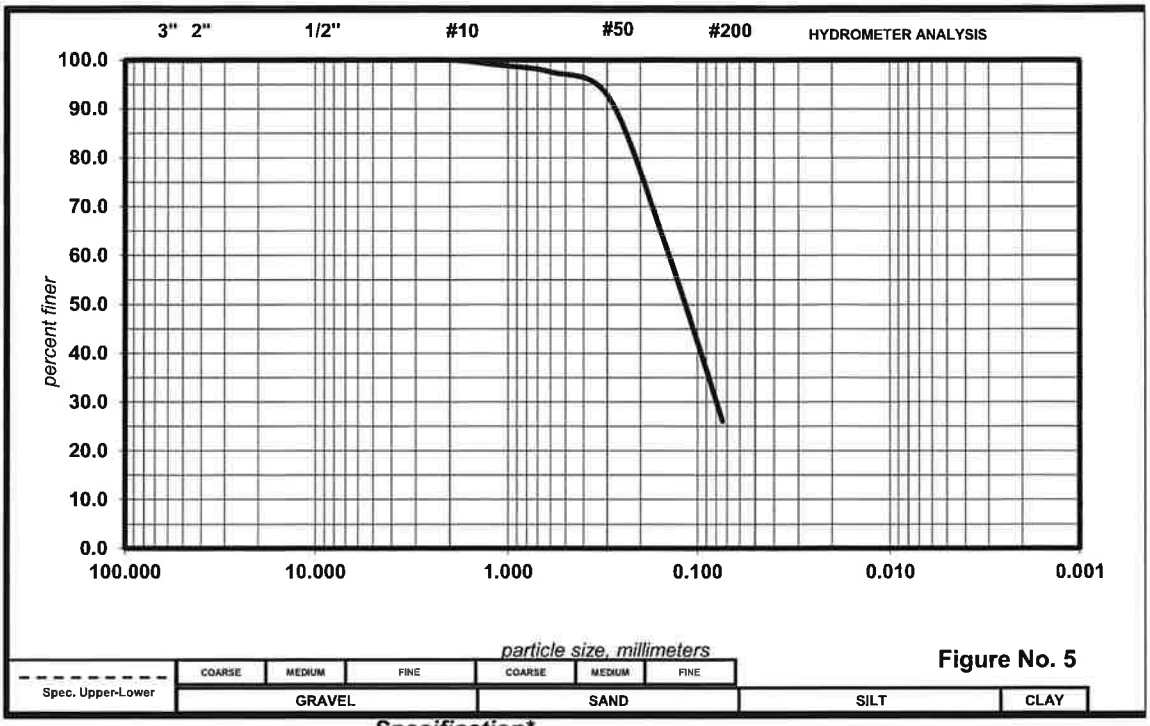


Figure No. 5

*Specification**

Sieve Size	% Finer	Min.(%)	Max.(%)
3" (75 mm)			
2 1/2" (63 mm)			
2" (50 mm)			
1 1/2" (38.1 mm)			
1" (25 mm)			
3/4" (19 mm)			
5/8" (16 mm)			
1/2" (12.5 mm)			
3/8" (9.5 mm)			
5/16" (8 mm)			
1/4" (6.3 mm)			
#4 (4.75 mm)			
#6 (3.35 mm)			
#8 (2.36 mm)			
#10 (2 mm)	100.0		
#14 (1.4 mm)			
#16 (1.18 mm)	99.0		
#20 (850 µm)			
#30 (600 µm)	97.5		
#40 (425 µm)			
#50 (300 µm)	92.5		
#60 (250 µm)			
#100 (150 µm)	63.0		
#200 (75 µm)	26.0		

Sample Identification

Sample No.: B-7, S-3
Lab No.: A23-154-05
Source/Location: 15'-17'
Description: Yel.Br. fine SAND, some Silt,

sample description in accordance with Burmister System

LL :	PL :	PI :

As received Moisture Content: 5.6 %

Classification:
USCS: [SC]
AASHTO:

Remarks:
Sample received in lab on November 30, 2023

Client: ENV
Project: Stillwater Elementary School Settlement
Location: Stillwater, New Jersey
Date: 4-Dec-23
Job No.: 23-C-50 **Report No.:** 23-C-54

APPENDIX IV

LIMITATIONS

LIMITATIONS

The conclusions and recommendations contained in this geotechnical report no. 23-C-54 are based upon the applicable standards of our profession at the time this report was prepared.

The analyses and recommendations submitted in this report are based in part upon the data obtained from seven widely-spaced test borings, and two test pits performed for this study. The stratification lines shown on the individual logs of the subsurface explorations represent the approximate boundaries between soil types. However, the transition between soil types may be gradual.

In our opinion, the number of explorations performed for this study are adequate for a general understanding of the site subsurface conditions. However, the nature and extent of variations between the explorations may not become evident until construction. If, during construction, variations become evident, it will be necessary to re-evaluate the recommendations of this report.

This report may be referred to or included in the project specifications for general information purposes only, but should not be solely used as the technical specifications for the work.

This geotechnical engineering report was prepared for the project by Sor Consulting Engineers, Inc. for design purposes only, and may not be sufficient to prepare an accurate bid. Contractors utilizing the information in the report should do so with the express understanding that its scope is limited to design considerations. Prospective bidders should obtain the owner's permission to perform whatever additional explorations or data gathering they deem necessary to prepare their bid accurately.

This report has been prepared in accordance with generally accepted geotechnical engineering practices for the exclusive use of ENV and/or their authorized representatives for specific application to the gymnasium building addition of the Stillwater Elementary School located at 904 Stillwater Road in Stillwater, New Jersey. No other warranty, expressed or implied, is made.

APPENDIX V

GPRS JOB SUMMARY SHEETS

JOB SUMMARY

Service Completed Date: 11/28/2023

Customer: ENVIRONMENTAL TECHNICAL DRILLING INC

Phone Number:

Billing Address	City	State	Zip
408 CRANBERRY RD	FARMINGDALE	NJ	07727

Job Details

Jobsite Location	City	State	Zip
904 Stillwater Road	Stillwater Township	NJ	07860

Work Order Number 614019-117031 **Customer Service Phone Num**

Job Num **PO Num**

Project Manager: Beau Braun **Email:** Beau.Braun@gprsinc.com

Thank you for using GPRS on your project. We appreciate the opportunity to work with you. If you have questions regarding the results of this scanning, please contact the lead GPRS technician on this project.

EQUIPMENT USED

The following equipment was used on this project:

- **Underground GPR Antenna:** This GPR Antenna uses frequencies ranging from 250 MHz to 450 MHz and is mounted in a stroller frame that rolls over the surface. Data is displayed on a screen and marked in the field in real-time. The surface needs to be reasonably smooth and unobstructed to obtain readable scans. Obstructions such as curbs, landscaping, and vegetation will limit the efficacy of GPR. The total effective scan depth can be as much as 8' or more with this antenna but can vary widely depending on the soil conditions and composition. Some soil types, such as clay, may limit maximum depths to 3' or less. As depth increases, targets must be larger to be detected, and non-metallic targets can be challenging to locate. The depths provided should always be treated as estimates as their accuracy can be affected by multiple factors. For more information, please visit: Link
- **EM Pipe Locator:** Electromagnetic Pipe and Cable Locator. Detects electromagnetic fields. Used to actively trace conductive pipes and tracer wires, or passively detect power and radio signals traveling along conductive pipes and utilities. For more information, please visit: Link
- **GPS:** This handheld unit offers accuracy down to 4 inches; however, the accuracy achieved will depend on the satellite environment at the time of collection and is not considered survey-grade. Features can be collected as points, lines, or areas and then exported as a KML/KMZ or overlaid on a CAD drawing. For more information, please visit: Link
- **Traceable Rodder:** The rodder has a copper wire encased in fiberglass. The device is pushed through accessible pipes before placing a current on the wire, and the signal is then traced from the surface. The maximum traceable depth is 10' depending on the soil conditions, and the maximum distance is 200'. The line can be pushed through a pipe with direct access, such as a sewer line at a cleanout or a storm drain catch basin. It may not be able to be pushed through deeper pipes within manholes. GPRS will not access electrical conduits. The signal cannot be located through metallic pipes. For more information, please visit:

JOB SUMMARY

WORK PERFORMED

GPRS performed the following work on this project:

UNDERGROUND UTILITY

- The total area scanned was approximately 2000 square feet.
- The effective depth of GPR will vary throughout a site depending on a variety of factors such as surface type, surface conditions, soil type, and moisture content. At this site, the maximum effective GPR depth was approximately 2-4 feet.

RESULTS AND NOTES

Located Utilities	Electric, Water, Storm Sewer, Sanitary Sewer, Other Gas
Client's Scope of Work	Scan for all utilities inside multiple scopes of work. And also Marc main waterline from the well and the waterline that branches out of the side of the building running to the garden.
Additional Notes	Inside of the scope of work multiple utilities were found. All utilities that were found were marked with corresponding colors. Red for electric, blue for water, Green for storm sanitary sewer, and yellow for gas. When depths were found they were written inside of the line. Arrows at the end of lines mean the lines continue and "EOI" at the end of lines means end of information and I was unable to locate that utility past that point. Near the oil tank I was able to locate the two oil lines entering the building as well as the electric feeding the oil tank. Near the corner of the building I was able to find the electric that feeds the shed behind the oil tank. That line is running to the left of the tank straight into the corner of the shed. I was unable to locate storm lines around the oil tank because of my traceable rodder getting stuck once I entered the pipe and I was unable to see them with GPR because of them being PVC and close to the building. Near the bathrooms in the second location that was scanned I was able to trace storm lines coming from the catch basin to multiple roof drains. Near the same location I was unable to trace the sanitary line running out to the septic tank we were unable to open up clean outs inside of the bathroom and was unable to see the line with GPR. Client will avoid this area because we were unable to find the septic line. In the third area near the other oil tanks I was able to find the septic line running straight into the school and was also able to find the roof drains running to the catch basin. On the side of the school was able to locate the waterline running out to the street to the trench there's a conduit that is ran with it but contains no wires inside. Near the front of the school I was able to locate the word wind branching from the well into the side of the school. Please say 2 to 3 feet off all marks and drill with caution.

Client performed 811 Location Request:	No	Limitations Encountered:	Surface Obstructions
		Marking Medium:	Spray Paint
Findings Walkthrough done with client:	Yes	Client Provided Drawings:	No

JOB SUMMARY

Image 1



Image 2



Image 3



Image 4

