GEOTECHNICAL ENGINEERING REPORT

Wilf Campus for Senior Living – Proposed Residential Development

Franklin Township, Somerset County, New Jersey

January 2022

Prepared For:

MENLO ENGINEERING ASSOCIATES, INC.
261 Cleveland Avenue
Highland Park, New Jersey 08904

Attn: Mr. William A. Lane, P.E.

Prepared By:

GEO-TECHNOLOGY ASSOCIATES, INC.
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GTA Job No: 31211977

GEO-TECHNOLOGY ASSOCIATES, INC.

GEOTECHNICAL AND
ENVIRONMENTAL CONSULTANTS

A Practicing Geoprofessional Business Association Member Firm

January 7, 2022

Menlo Engineering Associates, Inc.
261 Cleveland Avenue
Highland Park, New Jersey 08904

Attn: Mr. William A. Lane, P.E.
Executive Vice President

Re: Geotechnical Engineering Report
Wilf Campus for Senior Living – Proposed Residential Development
Franklin Township, Somerset County, New Jersey

Dear Bill:

In accordance with our agreement dated August 13, 2021 and executed on October 15, 2021, Geo-Technology Associates, Inc. (GTA) has performed a geotechnical exploration for a proposed residential development to be constructed in Franklin Township, Somerset County, New Jersey. The exploration consisted of excavating 8 test pits throughout the site, visually classifying the encountered soils, and performing limited laboratory testing. The results of the field and laboratory testing and GTA's recommendations regarding design and construction of the proposed development are included in this report.

GTA appreciates the opportunity to have been of assistance to you on this project. Please contact our office at (732) 271-9301 if you have questions or require additional information.

Very truly yours,
GEO-TECHNOLOGY ASSOCIATES, INC.

allison Tether

Allison Tether, P.G.
Geotechnical Project Manager

Dennis C. Loh, P.E.
Vice President

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Attachments

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FRANKLIN TOWNSHIP
SOMERSET COUNTY, NEW JERSEY
JANUARY 2022

INTRODUCTION

This report presents the results of a geotechnical exploration performed by Geo-Technology Associates, Inc. (GTA) for a proposed residential development to be constructed in Franklin Township, Somerset County, New Jersey. The site is located at the western terminus of Berger Street and is identified as Lot 54.05 in Block 386.07 on the Franklin Township tax map. The general location of the site is shown on the Site Location Map, which is Figure 1 in Appendix A of this report.

GTA was provided with plans prepared by Menlo Engineering Associates, Inc. titled "Subdivision Plan" dated December 9, 2013 and a concept plan dated August 3, 2021. The plans indicate the site boundaries, existing site features and topography, and the layout and dimensions of 12 single-family residential lots and proposed stormwater management (SWM) basin areas. GTA was also provided with a marked-up version of the concept plan, which indicated a change to the location of the SWM basin in the northern portion of the site and showed the new location in roughly the same area as the cul-de-sac shown on the plan.

The scope of this study included a field exploration, laboratory testing, and geotechnical engineering analyses. The field exploration included 8 test pit excavations throughout the areas proposed for development. Limited laboratory testing was performed on soil samples obtained from the test pits to assist in characterizing the general subsurface conditions. The conclusions and recommendations presented in this report were derived from engineering analyses of field and laboratory data, and preliminary information for the proposed development as detailed herein.

SITE CONDITIONS

The site is bounded by residential properties along Cedar Brook Drive to the south, Lilac Lane and Buttonwood Drive to the east, and Terry Terrace to the north. Wooded land was present to the west of the site. At the time of our study, the subject site was densely wooded and contained underbrush consisting of bushes, low growing shrubs, and weeds. The site could be accessed by the dead end of Berger Street in the east-central portion of the site.

Based on our visual observations and review of the ground surface topography shown on the plan provided to us, the ground surface generally slopes moderately from about Elevation (EL) 96 feet in the southern portion of the site to about EL 76 feet along the northern and western site boundaries.

PROPOSED CONSTRUCTION

The plans provided to us indicate that the proposed residential development will include 12 single-family residential lots. Access to the development will be provided to the west from Berger Street, which will be extended through the development and form a cul-de-sac in the east-central portion of the site. Two proposed stormwater management (SWM) basins are sited in the southwestern and northwestern portions of the site.

Proposed grading plans were not provided to us; however, based on our visual observations and the existing topography as shown on the plans provided, we anticipate cuts and fills of up to about 4 to 5 feet could be required to achieve the proposed site grades. Cuts of about 8 to 10 feet below the finished site grades are anticipated to achieve the desired basement floor elevations, if feasible. Retaining walls are not indicated on the plans and are not anticipated to be required.

The structures are assumed to be of cast-in-place concrete and wood-frame construction. Based on our experience on projects of similar scope, we estimate that the structures will have maximum column loads of up to approximately 50 to 75 kips, and bearing wall loads of approximately 4 to 6 kips per linear foot. Maximum ground floor slab live loads of approximately 100 pounds per square foot are anticipated for the structures.

SITE GEOLOGY

The subject site is situated within the Piedmont physiographic province of New Jersey, which is characterized by a low rolling plain divided by a series of higher ridges, and mainly underlain by slightly folded and faulted sedimentary rocks. The site is underlain by the Passaic Formation of the Lower Jurassic and Upper Triassic Period of the Mesozoic Era, as shown on the *Bedrock Geologic Map of the Bound Brook Quadrangle (OFM 89, 2011)* published by the New Jersey Geological Survey. The formation is described as an interbedded sequence of reddish-brown, and less commonly maroon or purple, fine- to coarse-grained sandstone, siltstone, shaly siltstone, silty mudstone and mudstone, separated by olive-gray, dark-gray, or black siltstone, silty mudstone and shale. The unit is as much as 11,480 feet thick regionally, and generally about 5,800 feet thick in the mapped area.

The surficial geology of the site, as shown on the *Surficial Geology of the Bound Brook Quadrangle, Somerset and Middlesex Counties, New Jersey (OFM 4, 1992)* published by the New Jersey Geological Survey, consists of weathered shale and mudstone residual soils. Residual soils are formed by the decomposition of the underlying parent rock, and typically consist of reddish-brown, red, and reddish-yellow silty clay to clayey silt with some to many angular chips of shale, and are typically less than 10 feet thick in the site locale.

Please refer to the referenced publications for more detailed descriptions of the geologic members.

SUBSURFACE EXPLORATION

The subsurface exploration program consisted of performing 8 test pits across the site. The test pits were performed on November 10, 2021 by Heritage Contracting Company, Inc. using a Kobelco 135SR track-mounted excavator and extended to depths ranging from approximately 3 to 5 feet below the existing surface grades, where refusal was encountered on highly-weathered sedimentary rock.

The exploration locations were selected by GTA, and located in the field using a hand-held GPS unit and existing site features as reference. The approximate locations of the explorations performed by GTA for this study are shown on the Test Pit Location Plan, which is included as Figure 2 in Appendix A. Detailed descriptions of the subsurface conditions encountered in the test pits observed by GTA are indicated on the Logs of Test Pits, which are included in Appendix B.

The ground surface elevations indicated on the test pit logs were obtained by interpolating between topographic contours shown on the plan provided to us and should be considered approximate.

The soil samples retrieved from the test pits were delivered to GTA's laboratory for visual classification by a geotechnical engineer and limited laboratory testing. The soil descriptions indicated on the logs are based on visual observations of the individual soil samples as summarized in the Notes for Exploration Logs included in Appendix B, supplemented by the laboratory test results.

LABORATORY TESTING

Laboratory testing performed for this study included grain size distribution of the soils in accordance with the Unified Soil Classification System (USCS), and natural moisture content determinations. Classification of soils in accordance with the USCS provides information regarding the engineering properties of the on-site soils that will likely support the proposed foundations, slabs, and pavements, and be used as controlled compacted fill and backfill. Detailed results of the laboratory testing performed for this study are shown on the Particle Size Distribution Reports included in Appendix C. The results of the laboratory tests are summarized in the following table:

SUMMARY OF LABORATORY TEST RESULTS

TEST PIT LOCATION	DEPTH (ft.)	USCS CLASSIFICATION	NMC (%)	Fines (%)
TP-2	1	Poorly-graded GRAVEL with silt (GP-GM)	14.6	10.2
TP-5	1	Poorly-graded GRAVEL with silt (GP-GM)	15.8	9.6
TP-8	1	Silty GRAVEL with sand (GM)	17.8	15.2

Note: NMC=Natural Moisture Content

SUBSURFACE CONDITIONS

In general, an approximately 8- to 10-inch-thick layer of topsoil was encountered at the ground surface in the explorations performed for this study. The natural soils encountered below the topsoil appear consistent with the geologic mapping and generally consisted of residual soils, which graded into highly-weathered shale bedrock. The residual soils typically consisted of silty gravels and poorly-graded gravels with silt, which became more competent (shaley) with depth.

The surface of highly-weathered shale bedrock was encountered at depths ranging from about 2 to 3 feet below the ground surface. When excavated, the shale generally presented as silty gravel or poorly-graded gravel. The test pits were typically able to penetrate a few feet below the initial weathered rock surface. Refusal to further excavation with the Kobelco 135SR excavator was encountered in all of the test pits at depths ranging from approximately 3½ to 5 feet below the existing surface grades.

Groundwater seepage was not observed in the test pits performed for this study. Long-term groundwater readings were not obtained because the test pits were backfilled upon completion for safety considerations. Perched water seepage was observed in Test Pit TP-6 at a depth of about 2 feet below the ground surface, which was at the soil/rock interface. It should be anticipated that seepage of perched or trapped water may occur in construction excavations at varying depths throughout the site.

INFILTRATION TEST RESULTS

In-situ infiltration tests were performed adjacent to Test Pits TP-3, TP-5, TP-7, and TP-8, which were located within the proposed SWM basin areas using a double-ring infiltrometer in accordance with the ASTM D 3385 test procedure. The tests were performed at depths of approximately 1 foot below the ground surface within the residual soils. An infiltration test was attempted at TP-3 at a depth of 2 feet below the ground surface; however, due to the presence of shallow rock, the double-ring infiltrometer could not be properly seated, which resulted in water visibly leaking out of the bottom of the test apparatus. The results of the infiltration tests performed for this study are summarized in the following table.

SUMMARY OF INFILTRATION TEST RESULTS

Test Pit Location	Approximate Test Depth* (ft)	Final Water Level Drop (in)	Time Interval (min)	USCS Soil Type	Measured Infiltration Rate (in/hr)
TP-3	2	N/A	N/A	Highly-weathered ROCK	-
TP-5	1	1	2	Poorly-graded GRAVEL with silt (GP-GM)	30

Test Pit Location	Approximate Test Depth* (ft)	Final Water Level Drop (in)	Time Interval (min)	USCS Soil Type	Measured Infiltration Rate (in/hr)
TP-7	1	1	1	Silty GRAVEL (GM)	60
TP-8	1	1	1	Silty GRAVEL (GM)	60

*Beneath the existing ground surface.

The primary conditions that affect the capacity to infiltrate water are the soil gradation and density properties and the presence of hydraulically restrictive layers such as silt or clay (fines), rock, or groundwater, each of which would restrict the flow of water into the underlying aquifer. Groundwater seepage was not observed in the explorations performed for this study and perched/trapped water seepage was not observed in the test pits performed in the SWM basin areas. In general, the residual gravel soils tested resulted in high infiltration rates at the depths tested.

Chapter 12 requires that infiltration tests be performed within the most restrictive layer within 8 feet of the proposed infiltration elevations. Therefore, per the Chapter 12 guidance, additional basin flood testing should be performed to establish the permeability rate of the bedrock at the test pit locations. A basin flood test involves excavating a “basin” with a minimum bottom area of 50 square feet. If groundwater is observed within the basin, the basin flooding test shall not be used. If no groundwater is observed, the basin shall be filled with 12 inches (about 375 gallons) of water and allowed to drain completely. The basins generally extend at least 2 to 3 feet into bedrock to ensure that, once filled, the 12 inches of water will be fully contained within the excavated rock.

Construction oversight by competent engineering personnel during installation of stormwater management facilities is critical to successful functioning of the system. Ideally, construction oversight should be provided by the geotechnical engineer, or qualified representative, retained by the project owner to document construction operations and assure that project specifications and special construction requirements are met. Periodic inspection and maintenance of the system will be required to maximize the efficiency and design life of the system.

CONCLUSIONS AND RECOMMENDATIONS

Based on the results of this study, it is GTA's opinion that construction of the proposed residential development is feasible, given that the geotechnical recommendations are followed, and that the standard level of care is maintained during construction. Following the recommended earthwork procedures as outlined in this report, it is our opinion that the proposed structures may be supported by conventional spread footings, and the ground or basement level floor slabs may be established on-grade. Geotechnical issues that may impact site development include the potential to encounter perched water seepage and sedimentary bedrock at relatively shallow depths. Further discussions of our geotechnical recommendations for site development are presented in the following sections of this report.

Site Preparation

Site preparation should begin by clearing and grubbing the trees and surface vegetation, and stripping the topsoil from within and at least five feet beyond proposed building and pavement areas. The stripped topsoil will not be suitable for reuse as controlled compacted fill or backfill within building or pavement areas, or as backfill against the building walls or atop utilities.

Following this work, the subgrade soils exposed below the proposed building and pavement areas to remain at grade or receive fill should be evaluated by a representative from GTA. Ideally, the evaluation should consist of proofrolling and compacting the soils to a dense and unyielding consistency by several passes of a large smooth drum vibratory compactor with a static drum weight of at least ten tons, although some other method may be deemed more appropriate by the geotechnical engineer depending on the prevailing weather conditions. Soils that are observed to be soft or unstable during the evaluation should be selectively excavated, and the resultant excavations should be backfilled with controlled compacted fill. Portions of the natural residual soils are highly susceptible to disturbance and softening from excessive moisture and construction vehicle traffic. It should be anticipated that potentially extensive undercutting may be required, particularly in the traditionally wet seasons.

Earthwork

We recommend that the earthwork phase of the project be performed during the warmer, drier months of the year. Bid documents should clearly state that the geotechnical engineer will evaluate the suitability of the soils for various purposes at the time of construction, and that high moisture content will not be considered as a basis for rejection of soils as unsuitable. The potential for moisture conditioning (drying) of the soils should be anticipated and included in the earthwork contract.

Highly-weathered rock was encountered in the test pits at depths ranging from about 2 to 3 feet below the ground surface, and refusal to further excavation with the Kobelco 135SR excavator was encountered at depths ranging from approximately 3½ to 5 feet below the existing surface grades on weathered shale bedrock. It should be anticipated that excavation of weathered shale will be necessary in areas where the proposed floor elevations are established below these depths. In general, the excavator used for this study was able to penetrate about 2 to 3 feet below the initial rock surface in the confined test pit excavations. We believe that large bulldozers fitted with hydraulic rippers and large excavators equipped with rock teeth should be able to excavate several feet below the refusal levels encountered in the test pits. Otherwise, pneumatic rock hammers could be required to advance excavations in localized areas. Planned basement floor elevations were not available at the time this report was prepared. However, it's possible that the proposed basement floor level may extend several feet below refusal depths. The potential contractor should be given the opportunity to perform test pits to confirm the proposed basement floor levels can be achieved using heavy duty excavators. The excavations should be witnessed by a representative from GTA.

All construction excavations should be sloped and shored in accordance with OSHA excavation regulations or stricter local governing safety codes. It is our opinion that the undisturbed natural soils or controlled compacted fill composed of similarly graded materials would generally be classified as "Type C" soils under the OSHA excavation regulations. The weathered rock would be classified as "Type B" soils, and potentially as "stable rock" depending on the orientation of the bedding planes. Significantly flatter excavation side-slopes will be required where groundwater seepage occurs. Permanent slopes should be designed no steeper than three horizontal to one vertical (3H:1V).

The excavated predominately coarse-grained natural site soils and excavated shale fragments (GM, GP-GM) are considered suitable for reuse as controlled fill, with some limitations. Moisture conditioning of the on-site soils may be required to attain the recommended degree of compaction, depending on the prevailing weather conditions at the time the earthwork is performed. Predominantly fine-grained soils (silt and clay) are susceptible to moisture-related compaction problems and as such are considered less desirable for use as controlled compacted fill than the coarse-grained soils. If encountered, we recommend that fine-grained soils be used as general fill in landscaped areas or within SWM basin embankments.

Off-site borrow should meet USCS designation SM, SP, SW, SC, GP, GM, GC, or GW and be approved by the geotechnical engineer prior to use.

All fill placed below proposed buildings and pavements should consist of controlled compacted fill and be installed under the observation of a representative from GTA. Mass fill should be spread in layers on the order of eight to ten inches in loose thickness and compacted to the following recommended specifications. Backfill placed in confined areas, such as foundation and utility excavations, should not be greater than 3 inches in diameter and be spread in thinner layers and compacted to the same degree using manually operated compaction equipment.

RECOMMENDED COMPACTION SPECIFICATIONS

Structure / Fill Location	Compaction / Moisture Specification
Below foundations, retaining walls, floor slabs, and within wall backfill or slopes steeper than 5H:1V	95% of ASTM D-1557 Moisture: ± 3% of optimum
Top 1 foot of pavement subgrade	95% of ASTM D-1557 Moisture: ± 2% of optimum
Fills below 1 foot of pavement subgrade	90% of ASTM D-1557 Moisture: ± 3% of optimum

All compactive effort should be verified by in-place density testing by a representative of GTA. The 2018 International Building Code (IBC) requires that fill subgrades and every lift of fill be observed and tested. New fills constructed on slopes steeper than 5H:1V should be keyed into existing slopes for stability considerations. All fill slopes steeper than 5H:1V should generally be placed as controlled fill and be compacted to minimum densities as specified above. Fill for slopes in non-structural areas, such as landscape berms, can be constructed as steep as 3H:1V up to a height of ten feet.

Groundwater seepage was not observed in the explorations performed for this study; however, perched water seepage was observed in Test Pit TP-6 at a depth of about 2 feet below the ground surface, corresponding to the soil/rock interface. It should be anticipated that seepage of perched or trapped water may also occur in construction excavations at varying depths throughout the site, particularly at the soil/rock interface. We anticipate that water seepage into construction excavations will be able to be controlled by pumping from sumps located within the excavations. Positive drainage should be maintained during construction to prevent inundation of subgrade soils by surface water runoff. Excavations to remove wet, soft soils should be backfilled with controlled compacted fill or AASHTO No. 57 stone aggregate.

Subsurface Utilities

It is our opinion that the natural soils and controlled compacted fill are considered suitable for support of subsurface utilities. GTA recommends a 6-inch-thick granular bedding layer consisting of AASHTO No. 57 stone aggregate be placed if water seepage occurs or where fill materials are present at or above the planned invert elevations.

Contractors should provide adequate earth support and dewatering systems in utility trench excavations. Dewatering through the use of "sump and pump" techniques may be required in some areas to remove water seepage, especially if utility installation is performed during the wet season or after prolonged periods of inclement weather.

Utilities installed below pavements and other structural areas should be backfilled using controlled fill, compacted in accordance with the recommendations presented in the *Earthwork* section of this report.

Foundations

Assuming maximum column loads of up to approximately 50 to 75 kips and bearing wall loads of approximately 4 to 6 kips per linear foot, the proposed structures may be supported on conventional shallow spread foundations. Foundations established on the undisturbed natural soils, highly-weathered rock, or controlled compacted fill properly installed directly atop the natural materials may be designed to impose an allowable net bearing pressure of up to 4,000 pounds per square foot. Minimum widths for wall footings of 24 inches and column footings of 30 inches are recommended to prevent a punching-type shear failure if the design, based on the above bearing pressure, results in a narrower footing.

Based on the assumed loads, settlements on the order of 1-inch total and ½-inch differential can be anticipated. Exterior footings should be founded a minimum of 36 inches below the final exterior grades to provide protection from frost action, or deeper if required by local building code. Interior foundations in permanently heated portions of the structures may be established at convenient depths below the floor slab.

Where soft/loose natural soils are encountered at the footing subgrade or within the zone of foundation stress influence, the foundation excavations should extend to stable materials. Footing subgrades requiring overexcavation may be backfilled to the design bearing grade with controlled compacted fill, open-graded crushed stone meeting the gradational requirements of AASHTO Size No. 57 aggregate, or concrete. Open-graded stone may be placed in approximately 12-inch-thick loose lifts and be compacted by tamping with the equipment bucket or a vibrating-plate compactor. Controlled compacted fill should be placed and compacted in accordance with the recommendations presented in the *Earthwork* section of this report. The decision to undercut footings or perform other foundation remedial measures should be made in the field by the geotechnical engineer during footing construction.

If seepage of groundwater, perched, or trapped water is encountered during foundation construction, the excavation should be dewatered using sumps and removing the water by pumping away from the building site. Excavations to remove wet, soft soils should be backfilled with AASHTO No. 57 stone aggregate.

Detailed foundation subgrade evaluations should be performed by a representative of GTA in each footing excavation, prior to the placement of reinforcing steel or concrete, to confirm that the recommended allowable soil bearing capacity is available. The foundation bearing surface evaluations should be performed using a combination of visual observation, hand-rod probing, Dynamic Cone Penetrometer (DCP) testing, and comparisons with the explorations. Concrete placement should generally be performed the same day the excavations for the footings are performed to prevent exposure and potential weakening of the foundation subgrade.

Floor Design

Following the earthwork procedures recommended in this report, it is our opinion that the floor slabs can be designed as concrete slabs-on-grade using a design modulus of subgrade reaction (k) of 150 pounds per cubic inch (pci). GTA recommends that the concrete floor slabs be founded on a minimum 4-inch-thick coarse granular layer. Washed gravel or crushed stone meeting the gradation of AASHTO Size No. 57 aggregate can be used for the granular layer unless otherwise required by local code. Where moisture sensitive floor finishes are planned, it is generally recommended that a polyethylene vapor retarder be installed in accordance with ACI guidelines to interrupt the rise of capillary moisture through the slabs. Undisturbed natural soil and controlled fill subgrade materials should be observed to evaluate compaction and stability prior to the placement of the granular layer. The slabs may bear on wall projections; however, they should be jointed so that the foundation walls can settle slightly without affecting the slabs.

Construction activities and exposure to the environment often cause deterioration of slab subgrades. Therefore, we recommend that the slab subgrade soils be evaluated by a representative of the geotechnical engineer immediately prior to stone and concrete placement. This evaluation may include a combination of visual observations, proofrolling, hand-probing, and field density tests to verify that the subgrade soils have been prepared properly. Contractors should anticipate that remedial work could be required to achieve a stable subgrade prior to stone placement, even if the subgrade soils had previously been compacted to the required densities. All interior utility trenches should be backfilled and compacted in accordance with our *Earthwork* recommendations.

Below-Grade Wall Drainage, Backfill, and Design

The soils at this site are generally described as silty gravel (GM) or poorly-graded gravels with silt and sand (GP-GM), which grades into highly-weathered rock. The granular soils (GM, GP-

GM) are considered suitable for below-grade wall backfill, with some limitations as discussed herein. Fine-grained soils, if encountered, should be precluded from use basement wall backfill as these types of soils can exert swell pressures on the walls. Below-grade walls should be designed to resist the lateral soil pressure from the retained backfill. This will be a function of the height of the walls, the differential height of backfill, the type of material, the drainage conditions, and the method of placement and compaction.

Existing surface drainage throughout much of the site appears generally adequate due to the existing topography. The final grades should be designed to maintain positive drainage, and to divert surface water away from the proposed houses. Final grades in the vicinity of the foundations should be graded to at least 4 to 5 percent if feasible, and conform to local code.

It should be anticipated that seepage of perched or trapped water may occur in construction excavations at the soil/rock interface across the site. Basement excavations will likely penetrate this potential seepage zone, which can create a sump or “bathtub” where water can accumulate but cannot drain naturally into the underlying bedrock. Accordingly, raising basement grades or installing gravity underdrains are recommended for these locations.

The tables in the 2018 International Residential Code can be used for sizing of basement/below-grade walls based on the material classifications, height of wall, and differential height of backfill. We recommend that a minimum thickness of 8 inches be used, although a thicker wall or the use of reinforcing steel may be required to satisfy the code requirements for a particular configuration. An engineered design is required for walls subject to hydrostatic pressure or supporting over 48 inches of unbalanced backfill that do not have permanent lateral support at the top and bottom.

All below-grade walls should be damp-proofed or water-proofed and include wall drainage connected to the foundation drain. An exterior perimeter drain consisting of a minimum 4-inch diameter perforated PVC pipe should be placed at the base of the walls and should be surrounded by at least 6 inches of open-graded crushed stone or washed gravel wrapped in a non-woven geotextile filter fabric. The perimeter drain should tie into a sump pit or, where possible, should drain by gravity to the storm sewer system or daylight.

Wall backfill should be free of organic matter, rocks greater than 3 inches in diameter, and construction debris. Backfill should be placed and compacted in lifts in a manner that does not damage the foundation, damp- or water-proofing, and drainage system. Foundation wall backfill should not be placed until the concrete has achieved adequate strength, the basement and first floors have been constructed, or the walls have been adequately braced from the interior of the structure.

Pavements

GTA recommends that the upper 18-inches of pavement subgrade be constructed of on-site materials with the following minimum soil properties:

Liquid Limit (AASHTO T-89)	30 or less
Plasticity Index (AASHTO T-89, T-90)	14 or less
Maximum Dry Density (AASHTO T-180)	105 pcf or greater
California Bearing Ratio (AASHTO T-193)	5 percent

The laboratory testing suggests that the on-site granular soils (GM, GP-GM) will generally meet the above criteria but the fine-grained soils, if encountered, may not. Predominately fine-grained soils (silt and clay) are highly susceptible to disturbance and softening from excess moisture content and construction equipment traffic. Contractors should anticipate that remedial work may be required to achieve a stable subgrade prior to paving, even if the subgrade soils had previously been compacted to the required densities. For preliminary planning purposes, GTA suggests the pavements be designed based on a CBR value of 7 percent, which assumes that granular soils or weathered shale (either as controlled fill or natural) are predominant within the upper 18 inches of roadway subgrade. CBR testing should be performed to confirm this estimated value. The permanent and/or temporary pavement design must consider that construction traffic may traverse paved roads that have not yet received the surface course.

Prior to construction of pavement sections, the pavement subgrade should be tested to verify design parameters and proofrolled with a loaded tandem axle dump truck under the observation of a geotechnical engineer to evaluate stability. Unsuitable soil should be overexcavated to stable subgrade soils or a maximum depth of 1 to 2 feet below the proposed subgrade level. The resultant excavations should be backfilled with granular controlled compacted fill or subbase stone aggregate. Undercutting, reworking and drying, or the use of geosynthetics may be necessary in some areas for subgrade stabilization depending on the weather conditions at the time pavement construction proceeds. Prudent planning and earthwork procedures will reduce the potential necessity for remedial work due to disturbance caused by construction equipment.

The pavement section should be designed using applicable State or Local standards for the anticipated traffic loading, and should consider that construction traffic will traverse the paved surface prior to placing the surface course. GTA should be provided the opportunity to perform or review the pavement section design.

ADDITIONAL SERVICES

We recommended that GTA be retained during construction of the subject project to provide geotechnical consultation and construction observation and testing services as outlined below:

- Additional basin flood testing for SWM design.
- Additional test pits once basement floor elevations are finalized to confirm the depths can be achieved.
- Review final site and structural plans to evaluate if they conform to the intent of this report.
- Provide on-site observation of site stripping, subgrade evaluation, and testing of controlled fills.
- Observe excavated footings for compliance with the project drawings and the intent of this geotechnical report.
- Observe the proofrolling of floor slab and pavement subgrades to evaluate stability.
- Perform observation and materials testing during concrete and masonry construction.

LIMITATIONS

This report, including all supporting exploration logs, field data, field notes, laboratory test data, calculations, estimates and other documents prepared by GTA in connection with this Project have been prepared for the exclusive use of Menlo Engineering Associates, Inc. (Client) pursuant to the Agreement between GTA and Client dated August 13, 2021 and executed on October 15, 2021, and in accordance with generally accepted engineering practice. All terms and conditions set forth in the Agreement and the General Provisions attached thereto are incorporated herein by reference. No warranty, express or implied, is made herein. Use and reproduction of this report by any other person without the expressed written permission of GTA and Client is unauthorized and such use is at the sole risk of the user.

The analysis and recommendations contained in this report are based on the data obtained from limited observation and testing of the encountered materials. Test pits indicate subsurface conditions only at specific locations and times, and only at the depths penetrated. They do not necessarily reflect strata or variations that may exist between the exploration locations. Consequently, the analysis and recommendations must be considered preliminary until the subsurface conditions can be verified by direct observation at the time of construction. If variations of subsurface conditions from those described in this report are noted during construction, recommendations in this report may need to be re-evaluated.

In the event that any changes in the nature, design, or location of the facilities are planned, the conclusions and recommendations contained in this report should not be considered valid unless the changes are reviewed and conclusions of this report are verified in writing. GTA is not responsible for any claims, damages, or liability associated with interpretation of subsurface data or reuse of the subsurface data or engineering analysis without the expressed written authorization of GTA.

The scope of our services for this geotechnical exploration did not include any environmental assessment or investigation for the presence or absence of wetlands, or hazardous or toxic materials in the soil, surface water, groundwater or air, on or below or around this site. Any statements in this report or on the logs regarding odors or unusual or suspicious items or conditions observed are strictly for the information of our Client.

This report and the attached logs are instruments of service. The subject matter of this report is limited to the facts and matters stated herein. Absence of a reference to any other conditions or subject matter shall not be construed by the reader to imply approval by the writer.

31211977 **GEO-TECHNOLOGY ASSOCIATES, INC.**

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, you can benefit from a lowered exposure to problems associated with subsurface conditions at project sites and development of them that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed herein, contact your GBA-member geotechnical engineer. Active engagement in GBA exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Understand the Geotechnical-Engineering Services Provided for this Report

Geotechnical-engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical-engineering services is typically a geotechnical-engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical-engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

Geotechnical-Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client.

Likewise, geotechnical-engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical-engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

Do not rely on this report if your geotechnical engineer prepared it:
- for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do not rely on an executive summary. Do not read selective elements only. *Read and refer to the report in full.*

You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:
- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept* *responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.*

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface using various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are not final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals' plans and specifications; and
- be available whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for information purposes only.* To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures.* If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

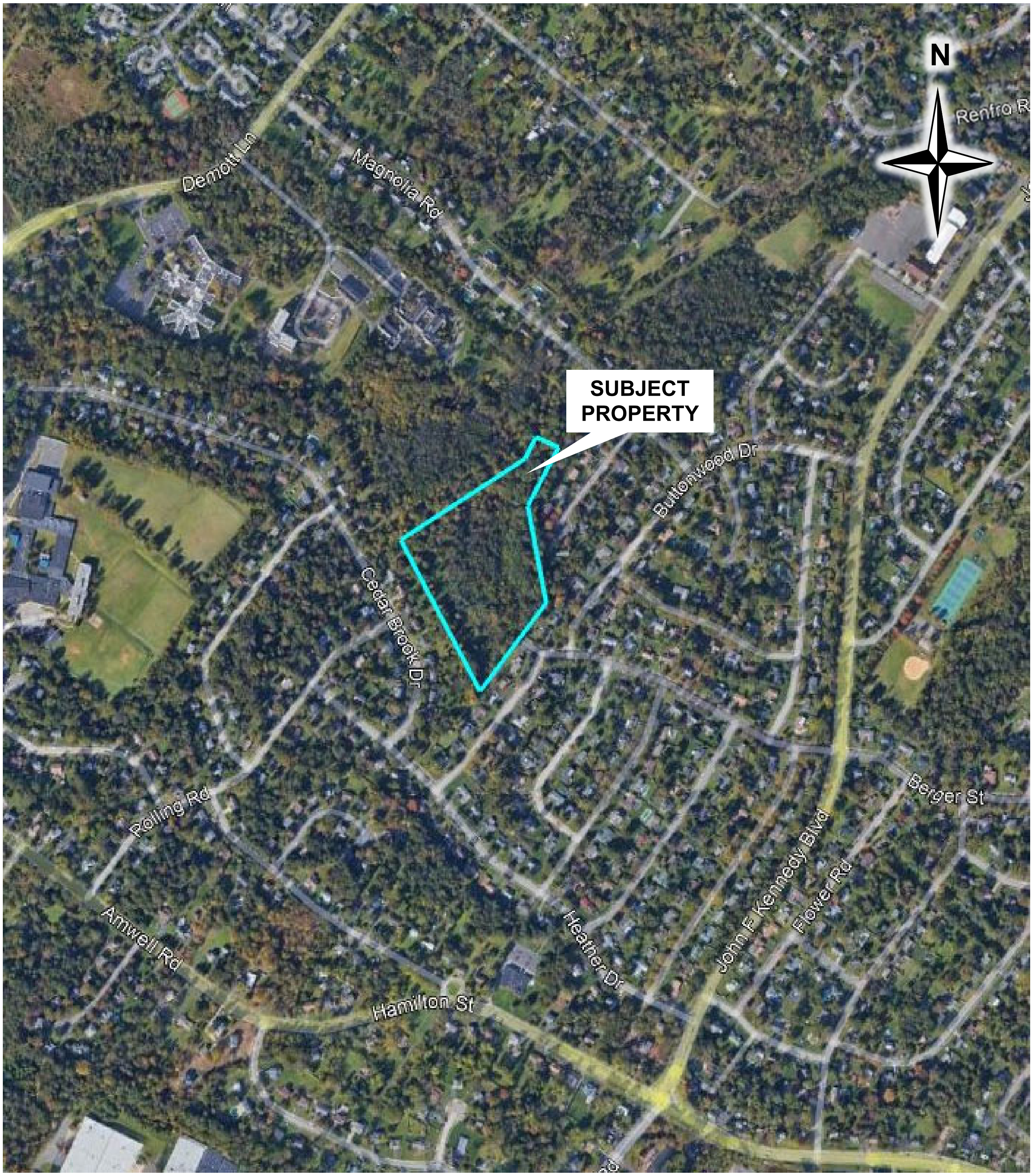
While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer's services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration. Confront the risk of moisture infiltration*** by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are not building-envelope or mold specialists.***

GBA GEOPROFESSIONAL BUSINESS ASSOCIATION

Telephone: 301/565-2733
e-mail: info@geoprofessional.org www.geoprofessional.org

APPENDIX A

Figures



Note: Site boundary is approximate.

SITE LOCATION MAP

14 Worlds Fair Drive, Suite A
Somerset, New Jersey 08873
(732) 271-9301
fax (732) 271-9306

GEO-TECHNOLOGY ASSOCIATES, INC.

WILF CAMPUS FOR SENIOR LIVING - PROPOSED RESIDENTIAL DEVELOPMENT

Franklin Township
Somerset County, New Jersey

Prepared For: Menlo Engineering Associates, Inc.

SOURCE: Google Maps

SCALE: NTS	DATE: JAN. 2022	PROJECT #: 31212201

Figure 1

*Baseplan prepared by Menlo Engineering Associates, Inc. titled "Concept Plan" dated August 3, 2021.

LEGEND:

TP-X
⊞ Indicates the numbers and approximate locations of test pits performed by GTA for this study.

TEST PIT LOCATION PLAN

14 Worlds Fair Drive, Suite A
Somerset, New Jersey 08873
(732) 271-9301
fax (732) 271-9306

GEO-TECHNOLOGY ASSOCIATES, INC.

WILF CAMPUS FOR SENIOR LIVING - PROPOSED RESIDENTIAL DEVELOPMENT

Franklin Township
Somerset County, New Jersey

Prepared For: Menlo Engineering Associates, Inc.

DESIGN BY: *	DRAWN BY: AFS	REVIEWED BY: AMT
SCALE: NTS	DATE: JAN. 2022	PROJECT #: 31211977

Figure 2

APPENDIX B

Exploration Logs

NOTES FOR EXPLORATION LOGS

KEY TO USCS TERMINOLOGY AND GRAPHIC SYMBOLS

MAJOR DIVISIONS (BASED UPON ASTM D 2488)				SYMBOLS	
				GRAPHIC	LETTER
COARSE-GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LESS THAN 15% PASSING THE NO. 200 SIEVE)		▨	GW
				▨	GP
		GRAVELS WITH FINES (MORE THAN 15% PASSING THE NO. 200 SIEVE)		▨	GM
				▨	GC
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LESS THAN 15% PASSING THE NO. 200 SIEVE)		▨	SW
				▨	SP
		SANDS WITH FINES (MORE THAN 15% PASSING THE NO. 200 SIEVE)		▨	SM
				▨	SC
FINE-GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILT OR CLAY (<15% RETAINED ON THE NO. 200 SIEVE) SILT OR CLAY WITH SAND OR GRAVEL (15% TO 30% RETAINED ON THE NO. 200 SIEVE) SANDY OR GRAVELLY SILT OR CLAY (>30% RETAINED ON THE NO. 200 SIEVE)		SILTS AND LEAN CLAYS LIQUID LIMIT LESS THAN 50	▨	ML
				▨	CL
				▨	OL
			ELASTIC SILTS AND FAT CLAYS LIQUID LIMIT GREATER THAN 50	▨	MH
				▨	CH
				▨	OH
HIGHLY ORGANIC SOILS				▨	PT

NOTE: DUAL SYMBOLS ARE USED TO INDICATE COARSE-GRAINED SOILS WHICH CONTAIN AN ESTIMATED 5 TO 15% FINES BASED ON VISUAL CLASSIFICATION OR BETWEEN 5 AND 12% FINES BASED ON LABORATORY TESTING; AND FINE-GRAINED SOILS WHEN THE PLOT OF LIQUID LIMIT & PLASTICITY INDEX VALUES FALLS IN THE PLASTICITY CHART'S CROSS-HATCHED AREA. FINE-GRAINED SOILS ARE CLASSIFIED AS ORGANIC (OL OR OH) WHEN ENOUGH ORGANIC PARTICLES ARE PRESENT TO INFLUENCE ITS PROPERTIES. LABORATORY TEST RESULTS ARE USED TO SUPPLEMENT SOIL CLASSIFICATION BY THE VISUAL-MANUAL PROCEDURES OF ASTM D 2488.

ADDITIONAL TERMINOLOGY AND GRAPHIC SYMBOLS

	DESCRIPTION		GRAPHIC SYMBOLS
ADDITIONAL DESIGNATIONS	TOPSOIL		▨
	MAN MADE FILL		▨
	GLACIAL TILL		▨
	COBBLES AND BOULDERS		▨
RESIDUAL SOIL DESIGNATIONS	DESCRIPTION	"N" VALUE	
	HIGHLY WEATHERED ROCK	50 TO 50/1"	▨
	PARTIALLY WEATHERED ROCK	MORE THAN 50 BLOWS FOR 1" OF PENETRATION OR LESS, AUGER PENETRABLE	▨

COARSE-GRAINED SOILS
(GRAVEL AND SAND)

DESIGNATION	BLOWS PER FOOT (BPF) "N"
VERY LOOSE	0 - 4
LOOSE	5 - 10
MEDIUM DENSE	11 - 30
DENSE	31 - 50
VERY DENSE	>50

NOTE: "N" VALUE DETERMINED AS PER ASTM D 1586

FINE-GRAINED SOILS
(SILT AND CLAY)

CONSISTENCY	BPF "N"
VERY SOFT	<2
SOFT	2 - 4
MEDIUM STIFF	5 - 8
STIFF	9 - 15
VERY STIFF	16 - 30
HARD	>30

NOTE: ADDITIONAL DESIGNATIONS TO ADVANCE SAMPLER INDICATED IN BLOW COUNT COLUMN:
WOH = WEIGHT OF HAMMER
WOR = WEIGHT OF ROD(S)

SAMPLE TYPE

DESIGNATION	SYMBOL
SOIL SAMPLE	S-
SHELBY TUBE	U-
ROCK CORE	R-

WATER DESIGNATION

DESCRIPTION	SYMBOL
ENCOUNTERED DURING DRILLING	▽
UPON COMPLETION OF DRILLING	⧨
24 HOURS AFTER COMPLETION	▼

NOTE: WATER OBSERVATIONS WERE MADE AT THE TIME INDICATED. POROSITY OF SOIL STRATA, WEATHER CONDITIONS, SITE TOPOGRAPHY, ETC. MAY CAUSE WATER LEVEL CHANGES.

LOG OF TEST PIT NO. TP-1

PROJECT: **Wilf Campus for Senior Living - Proposed Residential Development**
CLIENT: **Menlo Engineering Associates, Inc.**
PROJECT LOCATION: **Franklin Township, Somerset County, NJ**

DATE STARTED: **11/10/2021**
DATE COMPLETED: **11/10/2021**
CONTRACTOR: **Heritage Contracting Company, Inc.**
EQUIPMENT: **Kobelco 135SR**

PROJECT NO.: **31211977**

GROUNDWATER ENCOUNTERED: **N/E**
GROUND SURFACE ELEVATION: **98 Ft.**
DATUM: **Topo**

LOGGED BY: **AFS**
CHECKED BY: **AMT**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			9 In. of Topsoil	
97.3		GM		Red-brown, moist, Silty GRAVEL with sand (Residual Shale)	
	2				
95.0		HW		Red-brown, moist, Highly-weathered ROCK (Shale)	
	4				
93.0				Test pit complete at 5 Ft. due to refusal on highly-weathered rock.	
	6				
	8				
	10				

NOTES: **Location and elevations are approximate.**
Backfilled on completion.

GEO-TECHNOLOGY
ASSOCIATES, INC.

14 Worlds Fair Drive, Suite A
Somerset, NJ 08873

LOG OF TEST PIT NO. TP-2

Sheet 1 of 1

PROJECT: **Wilf Campus for Senior Living - Proposed Residential Development**
CLIENT: **Menlo Engineering Associates, Inc.**
PROJECT LOCATION: **Franklin Township, Somerset County, NJ**

DATE STARTED: **11/10/2021**
DATE COMPLETED: **11/10/2021**
CONTRACTOR: **Heritage Contracting Company, Inc.**
EQUIPMENT: **Kobelco 135SR**

PROJECT NO.: **31211977**

GROUNDWATER ENCOUNTERED: **N/E**
GROUND SURFACE ELEVATION: **92.5 Ft.**
DATUM: **Topo**

LOGGED BY: **AFS**
CHECKED BY: **AMT**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			9 In. of Topsoil	
91.8		GP-GM		Red-brown, moist, Poorly-graded GRAVEL with silt (Residual Shale)	- NMC=14.6%
90.5	2	HW		Red-brown, moist, Highly-weathered ROCK (Shale)	
88.5	4			Test pit complete at 4 Ft. due to refusal on highly-weathered rock.	
	6				
	8				
	10				

NOTES: **Location and elevations are approximate.**
Backfilled on completion.

LOG OF TEST PIT NO. TP-3

Sheet 1 of 1

PROJECT: **Wilf Campus for Senior Living - Proposed Residential Development**
CLIENT: **Menlo Engineering Associates, Inc.**
PROJECT LOCATION: **Franklin Township, Somerset County, NJ**

DATE STARTED: **11/10/2021**
DATE COMPLETED: **11/10/2021**
CONTRACTOR: **Heritage Contracting Company, Inc.**
EQUIPMENT: **Kobelco 135SR**

PROJECT NO.: **31211977**

GROUNDWATER ENCOUNTERED: **N/E**
GROUND SURFACE ELEVATION: **90 Ft.**
DATUM: **Topo**

LOGGED BY: **AFS**
CHECKED BY: **AMT**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			10 In. of Topsoil	
89.2		GM		Red-brown, moist, Silty GRAVEL (Residual Shale)	
88.0	2	HW		Red-brown, moist, Highly-weathered ROCK (Shale)	- Infiltration test attempted at 2 Ft.
86.0	4			Test pit complete at 4 Ft. due to refusal on highly-weathered rock.	
	6				
	8				
	10				

NOTES: **Location and elevations are approximate.**
Backfilled on completion.

LOG OF TEST PIT NO. TP-4

Sheet 1 of 1

PROJECT: **Wilf Campus for Senior Living - Proposed Residential Development**
CLIENT: **Menlo Engineering Associates, Inc.**
PROJECT LOCATION: **Franklin Township, Somerset County, NJ**

DATE STARTED: **11/10/2021**
DATE COMPLETED: **11/10/2021**
CONTRACTOR: **Heritage Contracting Company, Inc.**
EQUIPMENT: **Kobelco 135SR**

PROJECT NO.: **31211977**

GROUNDWATER ENCOUNTERED: **N/E**
GROUND SURFACE ELEVATION: **92 Ft.**
DATUM: **Topo**

LOGGED BY: **AFS**
CHECKED BY: **AMT**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			10 In. of Topsoil	
91.2		GM		Red-brown, moist, Silty GRAVEL (Residual Shale)	
90.0	2	HW		Red-brown, moist, Highly-weathered ROCK (Shale)	
89.0				Test pit complete at 3 Ft. due to refusal on highly-weathered rock.	
	4				
	6				
	8				
	10				

NOTES: **Location and elevations are approximate.**
Backfilled on completion.

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Somerset, NJ 08873

LOG OF TEST PIT NO. TP-4

Sheet 1 of 1

LOG OF TEST PIT NO. TP-5

Sheet 1 of 1

PROJECT: **Wilf Campus for Senior Living - Proposed Residential Development**
CLIENT: **Menlo Engineering Associates, Inc.**
PROJECT LOCATION: **Franklin Township, Somerset County, NJ**

DATE STARTED: **11/10/2021**
DATE COMPLETED: **11/10/2021**
CONTRACTOR: **Heritage Contracting Company, Inc.**
EQUIPMENT: **Kobelco 135SR**

PROJECT NO.: **31211977**

GROUNDWATER ENCOUNTERED: **N/E**
GROUND SURFACE ELEVATION: **87 Ft.**
DATUM: **Topo**

LOGGED BY: **AFS**
CHECKED BY: **AMT**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			10 In. of Topsoil	
86.2		GP-GM		Red-brown, moist, Poorly-graded GRAVEL with silt (Residual Shale)	- NMC=15.8% - Infiltration rate = 30 in/hr at 1 Ft.
85.5		HW		Red-brown, moist, Highly-weathered ROCK	
83.5				Test pit complete at 3-1/2 Ft. due to refusal on highly-weathered rock.	

Depth scale (ft.): 0, 2, 4, 6, 8, 10

NOTES: **Location and elevations are approximate.**
Backfilled on completion.

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ASSOCIATES, INC.

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Somerset, NJ 08873

LOG OF TEST PIT NO. TP-5

Sheet 1 of 1

LOG OF TEST PIT NO. TP-6

Sheet 1 of 1

PROJECT: **Wilf Campus for Senior Living - Proposed Residential Development**
CLIENT: **Menlo Engineering Associates, Inc.**
PROJECT LOCATION: **Franklin Township, Somerset County, NJ**

DATE STARTED: **11/10/2021**
DATE COMPLETED: **11/10/2021**
CONTRACTOR: **Heritage Contracting Company, Inc.**
EQUIPMENT: **Kobelco 135SR**

PROJECT NO.: **31211977**

GROUNDWATER ENCOUNTERED: **N/E**
GROUND SURFACE ELEVATION: **96 Ft.**
DATUM: **Topo**

LOGGED BY: **AFS**
CHECKED BY: **AMT**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			8 In. of Topsoil	
95.3		GM		Red-brown, moist, Silty GRAVEL (Residual Shale)	
94.0	2	HW		Red-brown, wet, Highly-weathered ROCK (Shale)	- Seepage water at 2 Ft.
92.0	4			Test pit complete at 4 Ft. due to refusal on highly-weathered rock.	
	6				
	8				
	10				

NOTES: **Location and elevations are approximate.**
Backfilled on completion.

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Somerset, NJ 08873

LOG OF TEST PIT NO. TP-6

Sheet 1 of 1

LOG OF TEST PIT NO. TP-7

PROJECT: **Wilf Campus for Senior Living - Proposed Residential Development**
CLIENT: **Menlo Engineering Associates, Inc.**
PROJECT LOCATION: **Franklin Township, Somerset County, NJ**

DATE STARTED: **11/10/2021**
DATE COMPLETED: **11/10/2021**
CONTRACTOR: **Heritage Contracting Company, Inc.**
EQUIPMENT: **Kobelco 135SR**

PROJECT NO.: **31211977**

GROUNDWATER ENCOUNTERED: **N/E**
GROUND SURFACE ELEVATION: **93 Ft.**
DATUM: **Topo**

LOGGED BY: **AFS**
CHECKED BY: **AMT**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			8 In. of Topsoil	
92.4		GM		Red-brown, moist, Silty GRAVEL with sand (Residual Shale)	- Infiltration rate = 60 in/hr at 1 Ft.
	2				
90.0		HW		Red-brown, moist, Highly-weathered ROCK (Shale)	
89.0	4			Test pit complete at 4 Ft. due to refusal on highly-weathered rock.	
	6				
	8				
	10				

NOTES: **Location and elevations are approximate.**
Backfilled on completion.

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ASSOCIATES, INC.

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Somerset, NJ 08873

LOG OF TEST PIT NO. TP-7

Sheet 1 of 1

LOG OF TEST PIT NO. TP-8

PROJECT: **Wilf Campus for Senior Living - Proposed Residential Development**
CLIENT: **Menlo Engineering Associates, Inc.**
PROJECT LOCATION: **Franklin Township, Somerset County, NJ**

DATE STARTED: **11/10/2021**
DATE COMPLETED: **11/10/2021**
CONTRACTOR: **Heritage Contracting Company, Inc.**
EQUIPMENT: **Kobelco 135SR**

PROJECT NO.: **31211977**

GROUNDWATER ENCOUNTERED: **N/E**
GROUND SURFACE ELEVATION: **90 Ft.**
DATUM: **Topo**

LOGGED BY: **AFS**
CHECKED BY: **AMT**

ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
	0			8 In. of Topsoil	
89.4		GM		Red-brown, moist, Silty GRAVEL with sand (Residual Shale)	- Infiltration rate = 60 in/hr at 1 Ft. - NMC=17.8%
87.0		HW		Red-brown, moist, Highly-weathered ROCK (Shale)	
86.5				Test pit complete at 3-1/2 due to refusal on highly-weathered rock.	

NOTES: **Location and elevations are approximate.**
Backfilled on completion.

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ASSOCIATES, INC.

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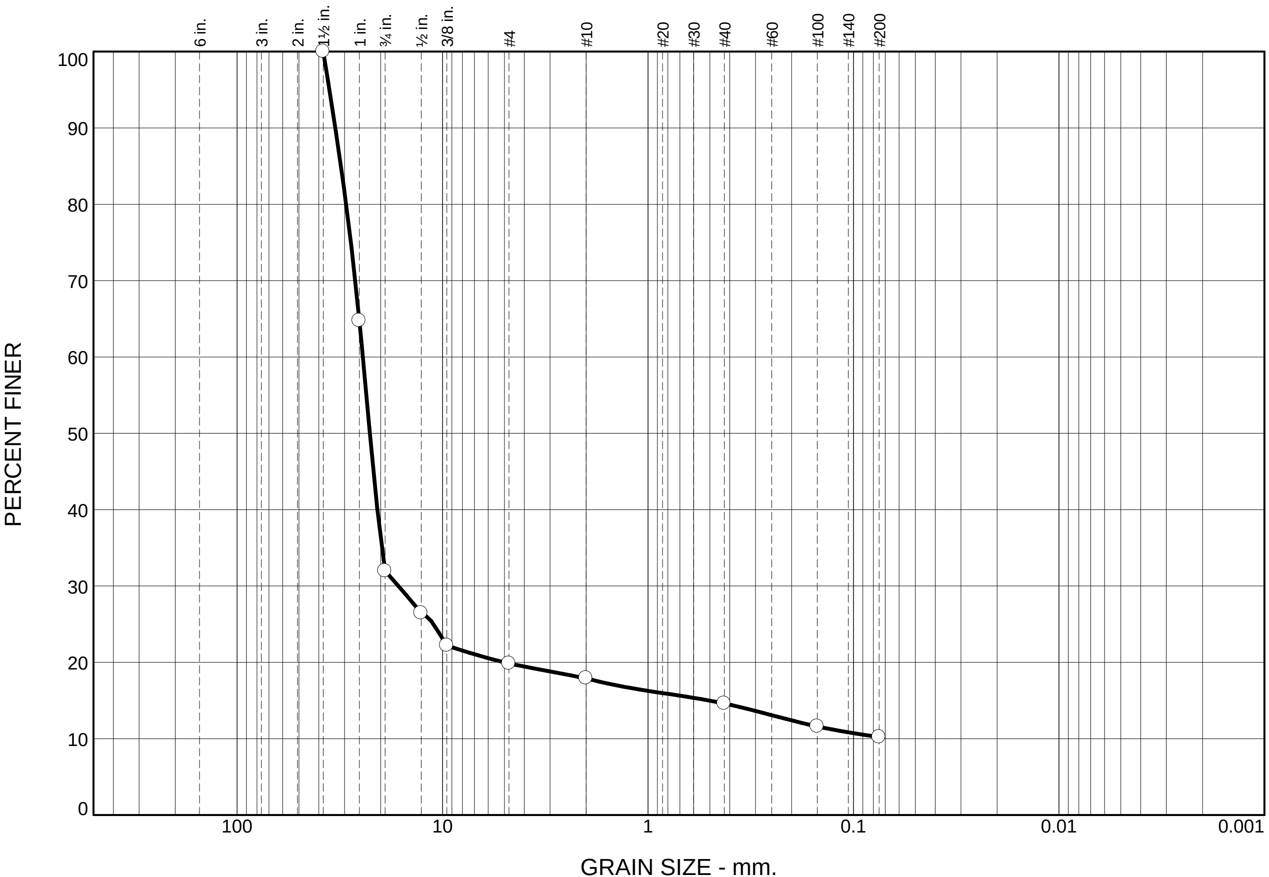
Somerset, NJ 08873

APPENDIX C

Laboratory Data

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	68.0	12.2	1.9	3.3	4.4	10.2	

⊠	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	NP	NP	31.2193	24.4266	22.5722	16.3969	0.5040			

Material Description	USCS	AASHTO
○ Poorly-graded GRAVEL with silt	GP-GM	A-1-a

Project No. 31211977 **Client:** Menlo Engineering Associates, Inc.

Project: Wilf Campus for Senior Living - Proposed Residential Development

○ **Source of Sample:** TP-2 **Depth:** 0.75

Remarks:

○NMC=14.6%

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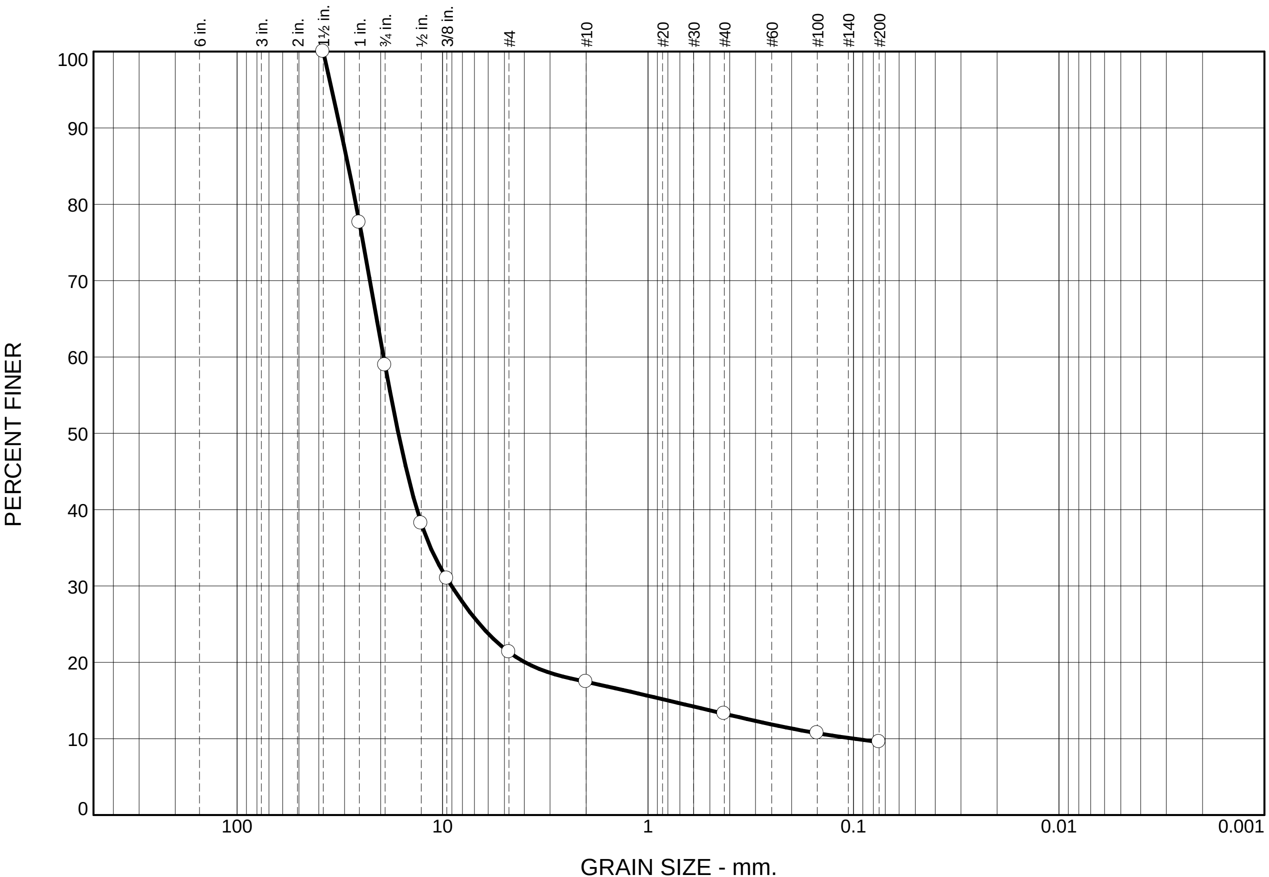
Somerset, NJ 08873

Figure

ASTM Specifications performed my include: D421, D422, D2216, D2217, and D4318.

Tested By: RK **Checked By:** AFS

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	41.1	37.5	3.9	4.2	3.7	9.6	

╳	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	NP	NP	28.7720	19.3734	16.4021	9.0318	0.7973	0.0995	42.30	194.65

Material Description	USCS	AASHTO
○ Poorly-graded GRAVEL with silt	GP-GM	A-1-a

Project No. 31211977 **Client:** Menlo Engineering Associates, Inc.

Project: Wilf Campus for Senior Living -
Proposed Residential Development

○ **Source of Sample:** TP-5 **Depth:** 0.8

Remarks:
○NMC=15.8%

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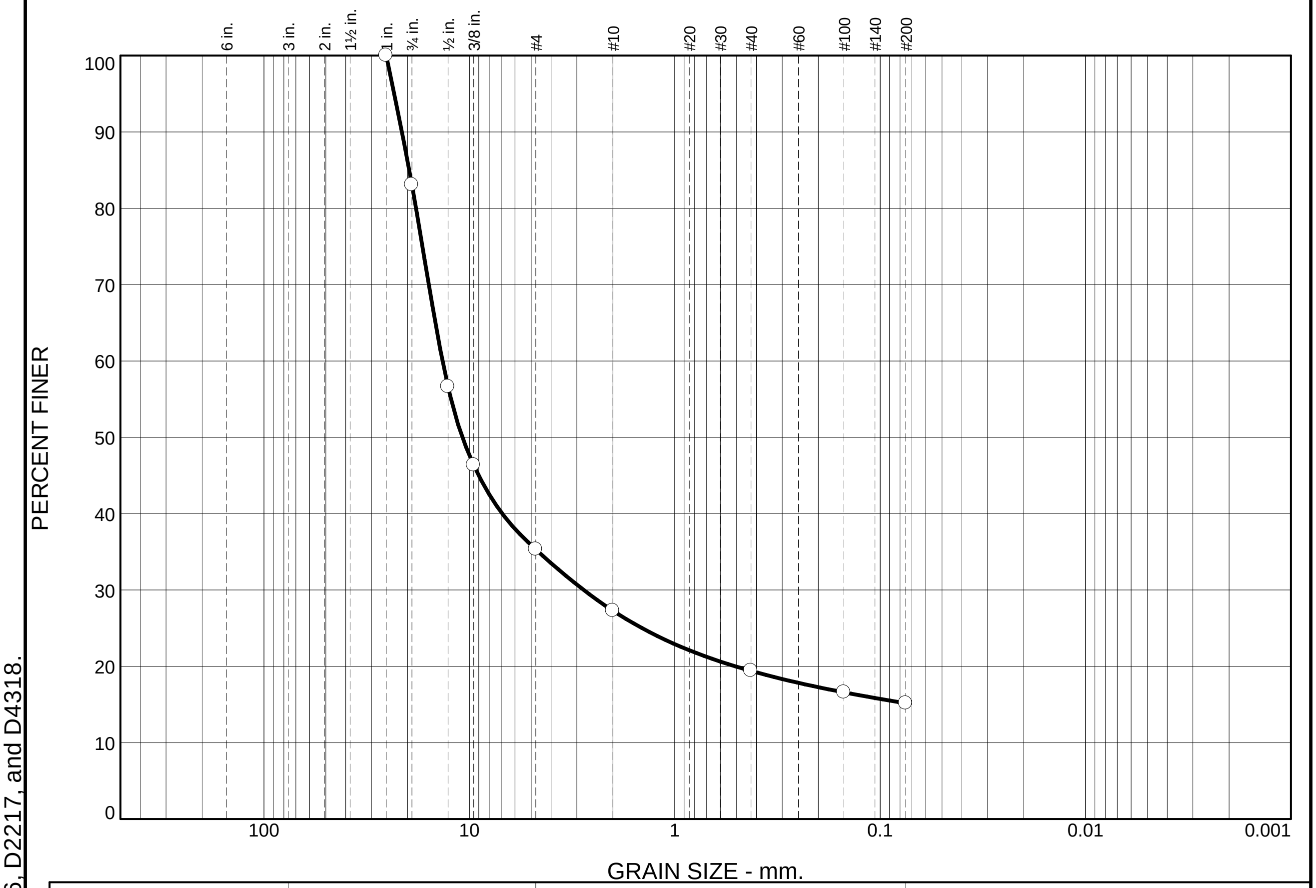
ASSOCIATES, INC.
14 Worlds Fair Drive, Suite A
Somerset, NJ 08873

Figure

ASTM Specifications performed my include: D421, D422, D2216, D2217, and D4318.

Tested By: RK **Checked By:** AFS

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	16.9	47.8	8.0	7.9	4.2	15.2	

☒	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	NP	NP	19.6261	13.5065	10.8153	2.7726				

Material Description	USCS	AASHTO
○ Silty GRAVEL with sand	GM	A-1-a

Project No. 31211977 **Client:** Menlo Engineering Associates, Inc.

Project: Wilf Campus for Senior Living - Proposed Residential Development

○ **Source of Sample:** TP-8 **Depth:** 1

Remarks:

○NMC=17.8%

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Figure

ASTM Specifications performed my include: D421, D422, D2216, D2217, and D4318.

Tested By: RK **Checked By:** AFS