Colliers Engineering & Design

GEOTECHNICAL EXPLORATION REPORT

November 2, 2023

VA Hudson Valley Medical Center Data Center
9 Administration Circle
Town of Fishkill
Dutchess County, New York

Prepared for:

Spees Design Build
625 1st Avenue
Seattle, WA 98104

Prepared by:

Ahmed Elmekati
New York Professional Engineer
License No. 094599

Colliers Engineering & Design CT, PC
18 Corporate Woods Blvd, Ste 400
Albany, NY 12211
Main: 845-352-2699
Colliersengineering.com

Project No. 23010570A

Colliers Engineering & Design

Table of Contents

Introduction 1
Available Information 1
Site and Project Description 1
Subsurface Explorations 1
Subsurface Conditions 2
Geologic Setting 2
Subsurface Description 2
Groundwater Conditions 2
Soil Laboratory Testing 3
Seismicity 3
Foundation Design Recommendations 3
Foundations 3
Floor Slab 4
Settlement 4
Groundwater 4
Seismic Design 5
Lateral Earth Pressures 5
Lateral Resistance 5
Site Preparation 6
Stripping of Topsoil 6
Existing Utilities 6
Surface Water Control 6
Construction Considerations 6
Excavation 6
Excavation Support 7
Structural Fill/Backfill 7
Subgrade Preparation 8
Construction Dewatering 9
Special Inspections 9
Closing 9

Limitations.....10

Figures

Figure 1: Site Location.

Figure 2: Bedrock Geology.

Figure 3: Surficial Geology.

Drawings

Exploration Location Plan B-01-ELP

Appendices

Appendix A ..... Test Boring Logs

Appendix B..... Soil Laboratory Testing

Appendix C..... Seismic Design Report

Introduction

In accordance with our proposal dated August 4, 2023 and revised September 6, 2023, Colliers Engineering & Design, Architecture, Land Architecture, Surveying CT, PC (CED) performed a geotechnical exploration program for the proposed Data Center at VA Hudson Valley Medical Center in the Town of Fishkill, Dutchess County, New York. The program was undertaken to explore the subsurface conditions below the area of the expansion and develop related geotechnical design recommendations and construction considerations.

This report summarizes our geotechnical design recommendations and construction considerations for this project.

Available Information

1. Drawing titled, "Data Center Site Plan", by Spees Design Build, dated June 14, 2023.
2. Drawing titled, "Facility Site Plan", by Spees Design Build, dated June 14, 2023.

Site and Project Description

The project site is situated near the northeast corner of the existing VA Hudson Valley Medical Center located at 9 Administration Circle, Town of Fishkill, Dutchess County, New York, as shown in Figure 1. The specific location is bound by parking locations towards north and east, Building 111 towards south, and Building 18 towards west.

The project comprises the construction of a new data center building occupying an approximate footprint of 5,200 square feet. Information pertaining to the details of this new building or corresponding column loads was not available at the time of this report.

Subsurface Explorations

CED performed a subsurface exploration program consisting of two test borings, TB-01 and TB-02, to explore the subsurface conditions below the proposed data center. The test borings were performed within accessible areas and extended up to 42.5 ft below existing surface grades. Drawing No. B-01-ELP presents the locations of the conducted test borings.

The geotechnical exploration program was performed by SoilTesting, Inc of Oxford, Connecticut, under the continuous observation of CED representative, Mr. Daniel Palaj, EIT. The exploration program was completed on October 11, 2023. CED representative located the exploration locations based on existing site features and handheld GPS equipment. The explorations were backfilled upon completion.

The test borings were advanced using hollow-stem auger drilling techniques using track-mounted equipment. Split spoon sampling was performed in accordance with ASTM D-1586 (Standard Method for Penetration Test and Split-Barrel Sampling of Soils) by means of a 2-inch OD split barrel sampler. The number of blows required to drive the split spoon every 6 inches into the soil were recorded and are shown on the logs. The sum of blows for the 6 to 18-inch interval is the SPT N-value expressed in terms of blows per foot (bpf). The SPT N-value indicates the soil resistance encountered at that respective layer. Blow counts exceeding 50 blows per 6 inches of penetration were considered split

spoon refusal. Sampling was performed continuously from the ground surface to a depth of 12 ft, then at 5-ft intervals to the termination depths of the test borings.

Soils encountered were classified in the field in accordance with the Burmeister Soil Classification System, a summary of which is included in Appendix A. Details pertaining to the subsurface conditions encountered are presented on the Test Boring Logs, included in Appendix A. Recovered soil samples were transported to our in-house Testing Laboratory in Totowa, New Jersey, where the samples were re-evaluated and select soil samples were identified for laboratory soil testing.

Subsurface Conditions

Geologic Setting

A review of the geologic information (Figure 2) indicates that bedrock underlying the site mainly consists of undifferentiated metamorphic and sedimentary rock. Bedrock is overlain by glacial till sediments (Figure 3), consisting of mostly silt, which is described as thin.

Subsurface Description

The test borings were first advanced through surface materials consisting of up to 3 inches of topsoil. General descriptions of the subsurface soil strata encountered below the surface materials are summarized below in order of their general occurrence with depth:

Stratum S – Sand

A stratum of granular soils was encountered below the surface materials at the exploration locations. Stratum S extends to 8 ft and 20 ft in thickness. This stratum consists of loose to dense brown, coarse to fine sand, varying amounts of silt/clay/gravel. The SPT-N values for this stratum ranged from 4 to 33 bpf.

Stratum M – Silt Deposits

A stratum of fine grained soils was encountered below Stratum S within the test borings. The test borings were terminated within this stratum. Stratum M consists of very stiff to hard gray silt, varying amounts of sand/gravel. The SPT-N values for this stratum ranged from 21 to 53 bpf.

Groundwater Conditions

Groundwater was encountered at depths ranging between 4 ft and 15 ft within the test borings during the time of our exploration program.

It should be noted that groundwater levels can fluctuate with locations, seasonal changes, precipitation, nearby construction activities, leakage into and out of utilities, and other factors.

Soil Laboratory Testing

Soil laboratory testing was performed on select soil samples at our in-house Testing Laboratory in Totowa, NJ. The corresponding test results are presented in Appendix B.

- **Grainsize Analysis**: One grainsize analysis test was conducted in accordance with ASTM D-6913.
- **Atterberg Limits**: Two Atterberg Limits tests were conducted in general accordance with ASTM D-4318.
- **Visual Classification**: Three samples were visually classified in general accordance with ASTM D-2488.

Seismicity

Based on the subsurface conditions encountered at the site, the seismic site class is Site Class D.

Foundation Design Recommendations

Specific information pertaining to the building loads was not available at the time of this report. As such, we assumed columns loads will be on the order of 100 kips. We can refine our recommendations once building loads are available and further engineering evaluations can be performed to evaluate potential differential settlement.

Foundations

Foundation Type and Depths

We recommend a system of shallow foundations consisting of isolated footings to support the building columns, and strip footings to support exterior and/or interior walls. Foundations shall bear at a minimum foundation depth of 48 inches below the surrounding finished grades to provide protection from frost action. The minimum horizontal foundation dimensions of the footings should be 36 inches for column footings and 24 inches for wall footings regardless of the actual applied bearing pressure to limit the risk of a punching-type shear failure.

Foundations should be supported on granular soils of Stratum S or on structural fill. Foundations should not bear on cohesive soils. As such, cohesive soils of Stratum M should be over-excavated a minimum of 1 ft and replaced with structural fill if encountered below the bottom of foundations. The Structural Fill shall be placed in accordance with Structural Fill/Backfill section of this report.

Allowable Bearing Pressure

The allowable net bearing pressure is 1.5 TSF (3 KSF), provided that the foundations bear on granular soils of Stratum S or on structural fill after over-excavating the underlying soils of Stratum M as described above.

Protection of Subsurface Utilities

We recommend that shallow foundations be established below a zone bounded by a plane that extends outward and upward at a 1 horizontal to 1 vertical slope from the bottom of any proposed or existing adjacent utilities.

Floor Slab

The design of the floor slab should be developed as conventional slab-on-grade. The modulus of subgrade reaction for a 1-square foot plate (k_{v1}) should be 140 tons per cubic foot (TCF). For slabs up to 20 ft wide, this modulus should be adjusted for the width of the slab in accordance with the following expression:

$$k_{slab} = k_{v1} \frac{(B+1)^2}{(2B)^2}$$

where B is width of the slab, k_{slab} is modulus of subgrade reaction of a slab of width B, and k_{v1} is modulus of subgrade reaction for a 1-foot square plate.

Proposed mesh-reinforced concrete floor slabs can be uniformly supported on-grade and simply supported at the wall to allow unrestricted rotation or vertical movement of slab edges. Saw joints or construction joints should isolate each bay to control shrinkage cracks. A minimum of 6 inches of ¾-inch clean crushed stone or a 12-inch-thick layer (minimum) of well-graded sand and gravel with no more than 12% non-plastic fines, is recommended below the slab to provide uniform curing conditions. A minimum 10-mil vapor retarder may be placed between the slab and base course, as directed by the Architect, to minimize moisture migration to the surface. All structural fill supporting the floor slab should be compacted to 95% of its maximum dry density (ASTM D-1557).

Settlement

We estimate settlement for the proposed foundations to be on the order of 1-inch total, with differential settlements between adjacent columns on the order of 0.5 inches. We recommend information pertaining to column loads be provided to us to further refine our settlement estimates.

Groundwater

Groundwater was encountered at depths ranging between 4 ft and 15 ft within the Test Borings during the time of our exploration program.

Groundwater levels can fluctuate with locations, seasonal changes, precipitation, nearby construction activities, leakage into and out of utilities, and other factors. As such, groundwater encountered during construction may vary from that observed during the subsurface explorations. Foundation design should consider groundwater at a depth of 5 ft or shallower to account for seasonal variations. It should be noted that perched groundwater conditions may develop in various locations due to the presence of high fines content in some areas.

Seismic Design

Based on the subsurface conditions encountered at the site and considering the foundation level will be bearing on Structural Fill, the seismic design shall consider Site Class D. The following represents the seismic design parameters (see also Appendix C):

Seismic Site Class: D
Mapped Spectral Acceleration S_s (period =0.2 S): 0.226
Mapped Spectral Acceleration S_1 (period =1.0 S): 0.057
Site Coefficient F_a: 1.6
Site Coefficient F_v: 2.4
Spectral Response Accelerations:
S_{MS} (g): 0.361
S_{M1} (g): 0.136
Design Spectral Accelerations:
S_{DS} (g): 0.241
S_{D1} (g): 0.091

Based on the SPT N-values encountered during sampling and the nature of the underlying soils, the site soils are not susceptible to liquefaction.

Lateral Earth Pressures

Lateral earth pressures acting on exterior walls should be designed considering the following:

- Compute lateral earth pressures using a total unit weight for soils of 120 pounds per cubic foot and a drained internal friction angle of 30 degrees. Foundation elements restrained from movement should be designed considering at-rest earth pressures. Consider the buoyant unit weight for zones below the groundwater table.

- Surcharge loads from streets, construction equipment, and nearby structures should be added to the lateral earth pressures. We recommend using a coefficient of 0.5 times the vertical surcharge loads to determine the horizontal surcharge load.

Lateral Resistance

Lateral loads on shallow foundations will be resisted by passive pressures on the vertical sides of the foundations, and by frictional sliding resistance on the bases of foundations:

- *Passive Resistance to Lateral Loads:*
    - Compute ultimate passive resistance using a total unit weight for soils of 120 pounds per cubic foot and an internal friction angle of 30 degrees. Consider the buoyant unit weight for zones below the groundwater table.
    - Use a factor of safety of 1.5 on the ultimate passive resistance when working loads are used.

  - Spacing between adjacent footings needs to be considered to verify that a full passive "wedge" can be developed.

- *Frictional Resistance to Lateral Loads:*
  - Compute ultimate frictional resistance using a coefficient of friction of 0.50 on the horizontal base of foundations.
  - Use a factor of safety of 1.5 on the ultimate frictional resistance when working loads are used.

Site Preparation

Stripping of Topsoil

Existing topsoil within the footprints of the proposed building, plus a 5-foot perimeter zone, should be stripped and stockpiled for re-use. Topsoil is not suitable for re-use as controlled compacted fill or backfill. The topsoil can be stockpiled on-site for future re-use as general fill within landscaped areas or can be legally disposed of off-site. If the topsoil is to be re-used, it should be screened to eliminate oversize particles and deleterious material. An agronomist should examine the material for its ability to support new vegetation.

Existing Utilities

We recommend that a subsurface utility exploration be performed to locate subsurface utilities prior to commencement of construction. The contractor should be prepared to relocate utilities prior to construction if needed.

Underground utilities that are to be reused should be evaluated by the Civil Engineer, and utility trench backfill should be evaluated by the geotechnical engineer, to determine their suitability for support of the planned construction. If any existing utilities are to be preserved, grading operations must be carefully performed so as not to disturb or damage the existing utility.

Surface Water Control

The contractor should be prepared to address ponding of water that may accumulate due to seasonal variations. Surface water should be controlled using gravity drainage and local sump pumping to prevent ponding of water following periods of precipitation or snowmelt. Surface grading should be maintained on a continual basis during construction to direct surface water runoff away from open excavations and prevent water from pooling on subgrade soils. The sump pits should be filled with minimum ¾-inch clean stone and lined with geotextile filter fabric to prevent soil migration. Pumped water should be discharged away from the building pad and open excavations.

Construction Considerations

Excavation

Considering the over-excavation to replace cohesive soils of Stratum M with structural fill, we anticipate excavations for the proposed development to extend up to 4 ft to 15 ft (if a basement is constructed) below existing grades for the construction of the shallow foundations.

The subsurface conditions encountered within the test borings suggest conventional dozers and excavators appear practical to remove these materials. However, the contractor should be prepared to handle zones of hard excavation if they are encountered.

A minimum of 6 inches of Structural Fill should be placed beneath all foundations and utilities founded over potential masses of boulders and cobbles to limit hard points and provide a uniform support to the bottom of the foundations and pipes.

Excavation Support

Construction excavations should be sloped and/or shored in accordance with OSHA excavation regulations or stricter local governing safety codes. Our opinion is that the existing site soils and new structural fill will generally be classified as "Type C" soils under OSHA excavation regulations.

All excavation support systems and earth slopes must be designed by a qualified engineer, licensed in the State of New York. Lateral pressures presented in the Lateral Earth Pressures section of this report shall be employed in the design of such systems. Appropriate live loads, building loads, and surcharges for sidewalk, vehicular and construction loads, impacts of groundwater seepage, if encountered, shall also be considered in the design.

Based on the limited information provided to us, we anticipate that the required excavations for the proposed building will likely require the use of an earth retention system. The design of such a system is beyond the scope of this report. The system should be designed by a licensed engineer in the State of New York.

Structural Fill/Backfill

All fill/backfill proposed to support building and site features that will be adversely affected by settlement is considered structural fill. Materials used as structural fill should consist of visually stable, inorganic, readily compactable materials that are free of trash, debris, organic inclusions, frozen material, or excess moisture. On-site materials with an organic content of less than 5 percent may be included in structural fill, provided they are well blended with other inorganic fill materials.

The existing on-site fine grained soils of Stratum M may be difficult for re-use as structural fill due to the high fines content. However, it can be used at proper moisture contents while utilizing appropriate compaction equipment. On site fine grained soils can be dried utilizing lime and/or by mixing with dry granular materials. The mixing with lime and/or granular materials shall be designed by the special inspection geotechnical engineer.

Structural fill should be placed in essentially horizontal lifts with a maximum loose thickness of 8 inches. The optimum loose lift thickness of the structural fill material shall be established by the contractor in the field via an earthwork test pad. In addition to meeting the compaction criteria, the compacted material shall maintain visual stability beneath the compaction equipment and be observed and documented by the Geotechnical Engineer.

Each lift should be compacted to at least 95 percent of the maximum dry density for building or floor slab support, and 95 percent of the maximum dry density for pavement construction and utility trench

backfill, as determined by the modified Proctor test (ASTM D-1557). Compaction of granular materials can be achieved using as large a vibratory compactor as practical. Moisture contents shall be maintained within 2 to 3 percent of the optimum moisture content during compaction procedures.

Subgrade Preparation

Building Foundations

Building foundations should be constructed on granular soils of Stratum S or structural fill. This will require careful excavation during construction such that subgrade is not disturbed. Any over-excavation below the foundations shall be backfilled to the bearing elevation with Structural Fill.

Subgrade soils exposed in foundation excavations should be evaluated by a Geotechnical Engineer prior to placement of structural fill, reinforcing steel, or concrete, to confirm stability of the subgrade soils. The evaluation should consist of proof-rolling and compacting the subgrade soils with the largest practical equipment and observation or testing as deemed necessary by the Geotechnical Engineer.

Floor Slabs

The floor slab subgrade soils should be compacted and proof-rolled under the direction of the Geotechnical Engineer to evaluate stability. We recommend a minimum 6-inch-thick bedding of clean stone to be placed below the floor slab to interrupt the rise of capillary moisture through the slab and allow for proper curing of the concrete. The floor slab may bear on footing projections; however, control joints should be provided at the slab and wall/column interfaces to reduce the potential for slab cracking, should the building settle differentially from the floor slab.

Subsurface Utilities

The structural fill materials will be suitable for support of subsurface utilities. However, should cobbles, boulders, loose and/or unstable soils be encountered at the utility invert levels, the subgrade should be over-excavated a minimum depth of 6 inches and backfilled with granular material, such as AASHTO No. 57 aggregate, to provide uniform support. Utility excavations should be backfilled using structural fill in accordance with the Structural Fill section of this report.

General Subgrade Considerations

Any natural subgrade soils that are determined to be soft, loose, wet, or otherwise unstable should be selectively excavated and replaced with structural fill, placed, and compacted in accordance with the recommendations mentioned above.

Unless foundation construction proceeds within 24 hours of foundation subgrade preparation, including approval by the Geotechnical Engineer, subgrades should be protected from the elements to reduce exposure and potential weakening of the subgrade materials, particularly if precipitation or freezing temperatures are expected prior to foundation construction. Preventative measures such as placing a minimum 2-inch-thick lean concrete “mud mat” on the subgrade, or providing suitable cover for the excavations, may be considered appropriate, depending on the prevailing weather conditions.

Foundation excavations should be protected from frost and water infiltration until the foundations have been constructed and backfilled.

Construction Dewatering

Groundwater levels encountered during construction may vary somewhat from those levels shown on the test boring logs due to seasonal variations or climatic conditions. In the worst scenario, for bidding purposes only, the contractor should assume a groundwater elevation at the ground surface. A dewatering plan should be submitted for approval prior to construction. It is further recommended that two piezometers be installed within the excavations with the screen sealed at the bottom of the excavation for a depth of 600mm.

The dewatering specifications should be of the performance type requiring that the successful contractor provide an adequate dewatering system capable of maintaining the water table a minimum of 2 ft below the prevailing excavation bottom during the construction of the bridge abutment and wingwalls, as well as during backfilling operations.

Dewatering should continue until adequate structural dead weight is available to resist uplift pressures. The required dewatering operation could be continuous for a few months on an around-the-clock basis. Therefore, we recommend that a standby system be provided to assure the continuity of the dewatering operation.

Special Inspections

Special Inspections shall be required for the following construction:

- Subgrade Inspection – Inspection is required periodically and immediately prior to placement of footings and foundations.
- Backfill – Continuous inspection is required.
- Evaluation of in-place density – In accordance with technical specifications for earthwork.

Closing

The conclusions and recommendations presented in this report are based, in part, on the explorations accomplished for this evaluation. The number, location, and depth of the explorations were completed within the constraints of budget and site access to yield the information to formulate the recommendations. We recommend that CED be provided the opportunity for general review of the project plans and specifications when they become available, to confirm that the recommendations and design considerations presented in this report have been properly interpreted and implemented into the project design package.

The design recommendations and construction considerations presented in this report were developed based on the subsurface information interpreted from the referenced explorations. Should the information not be adequate for the Contractor's purposes, the Contractor may make, prior to bidding, their own explorations, tests, and analyses.

Limitations

This data report and all supporting documentation have been prepared exclusively for the use of **Spees Design Build,** pursuant to the Agreement between Colliers Engineering & Design CT, PC and **Spees Design Build**. All provisions set forth in the Agreement and the General Terms and Conditions attached thereto are incorporated herein by reference. No warranty, express or implied, is made herein.

The findings, conclusions, and recommendations contained in this report are based on limited exploration and testing of the subsurface at the referenced project site. The explorations indicate subsurface conditions at the specific locations, depths, and times explored. Should deviations from the described subsurface conditions be encountered at any time prior to or during construction, CED should be notified to determine whether the findings necessitate modification of our recommendations.

This report is applicable only to the contemplated site design described herein; any changes in the design should be brought to our attention so that we may evaluate whether our recommendations will be affected. CED 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 Colliers. As such, the conclusions and recommendations contained in this report are pending our review of final plans and specifications, and verification of subsurface conditions by direct observation at the time of construction.

This report and supporting documentation are instruments of service. The subject matter of this report is limited to the facts and matters stated herein.

The scope of this geotechnical exploration program did not include investigation or evaluation of any environmental issues, such as wetlands, or hazardous or toxic materials on, below, or in the vicinity of the subject site. Any statements in this report or supporting documentation regarding odors or unusual or suspicious items or conditions observed are strictly for the information of our Client.

Figures

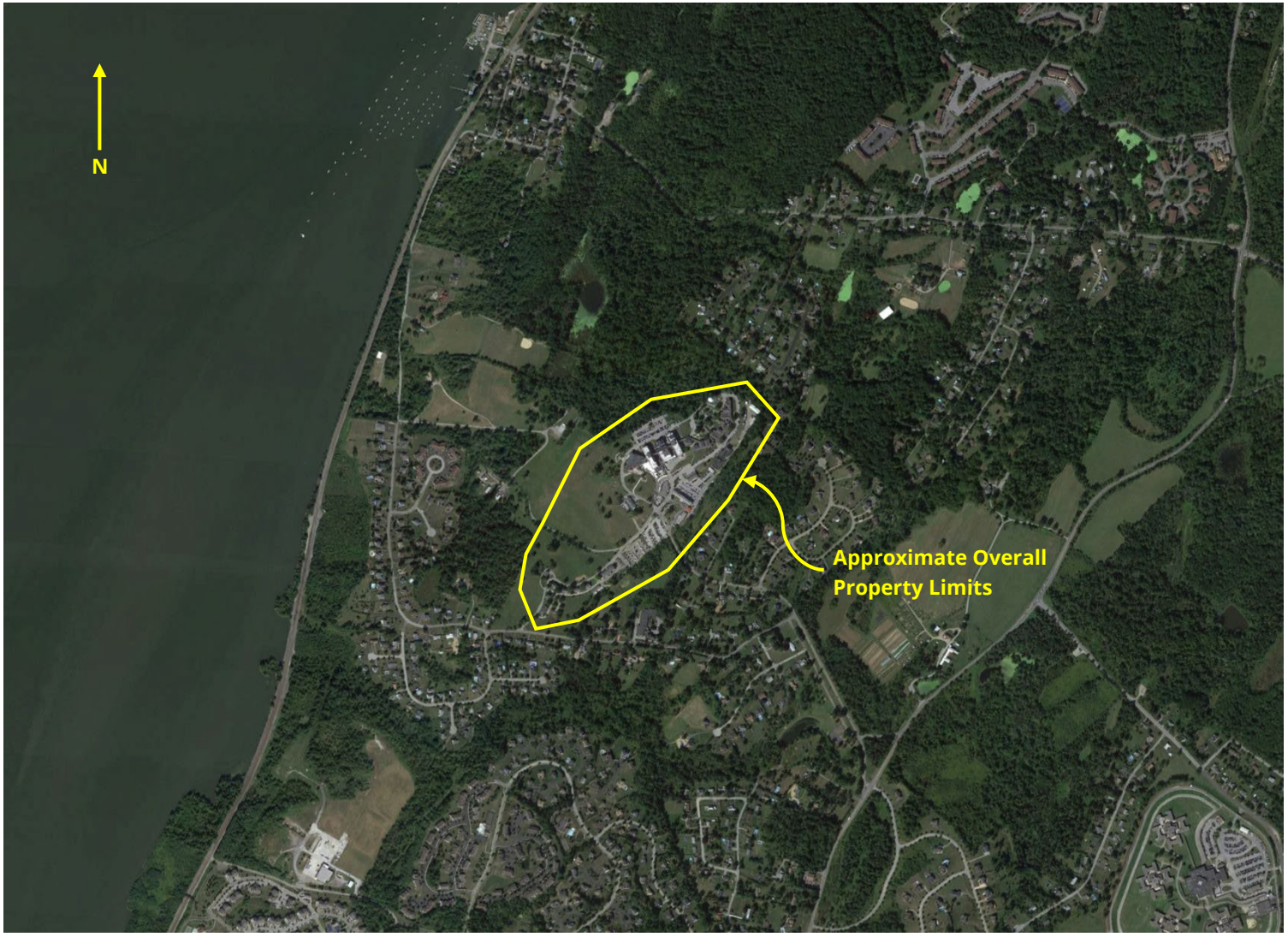


Figure 1: Site Location.

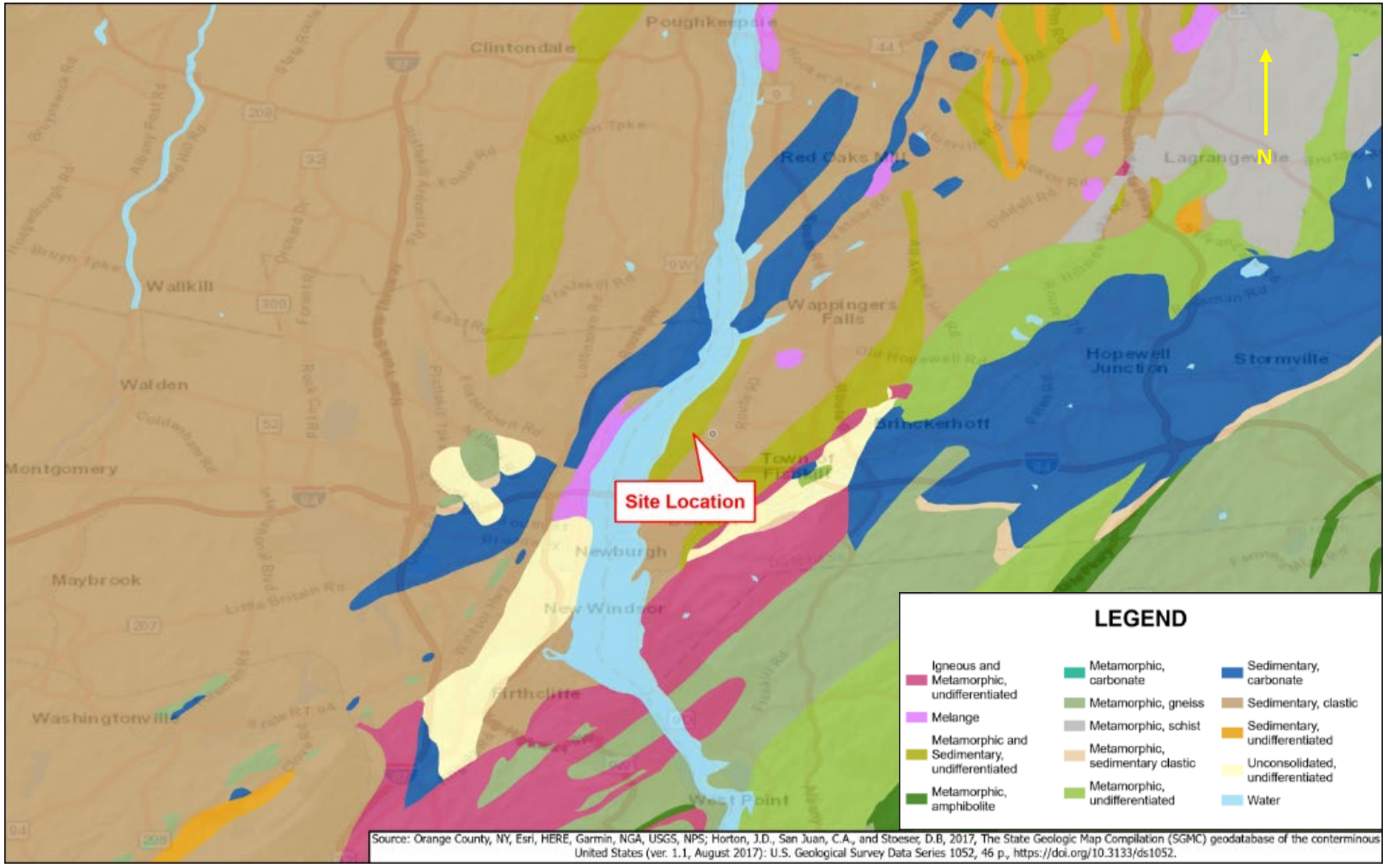


Figure 2: Bedrock Geology.

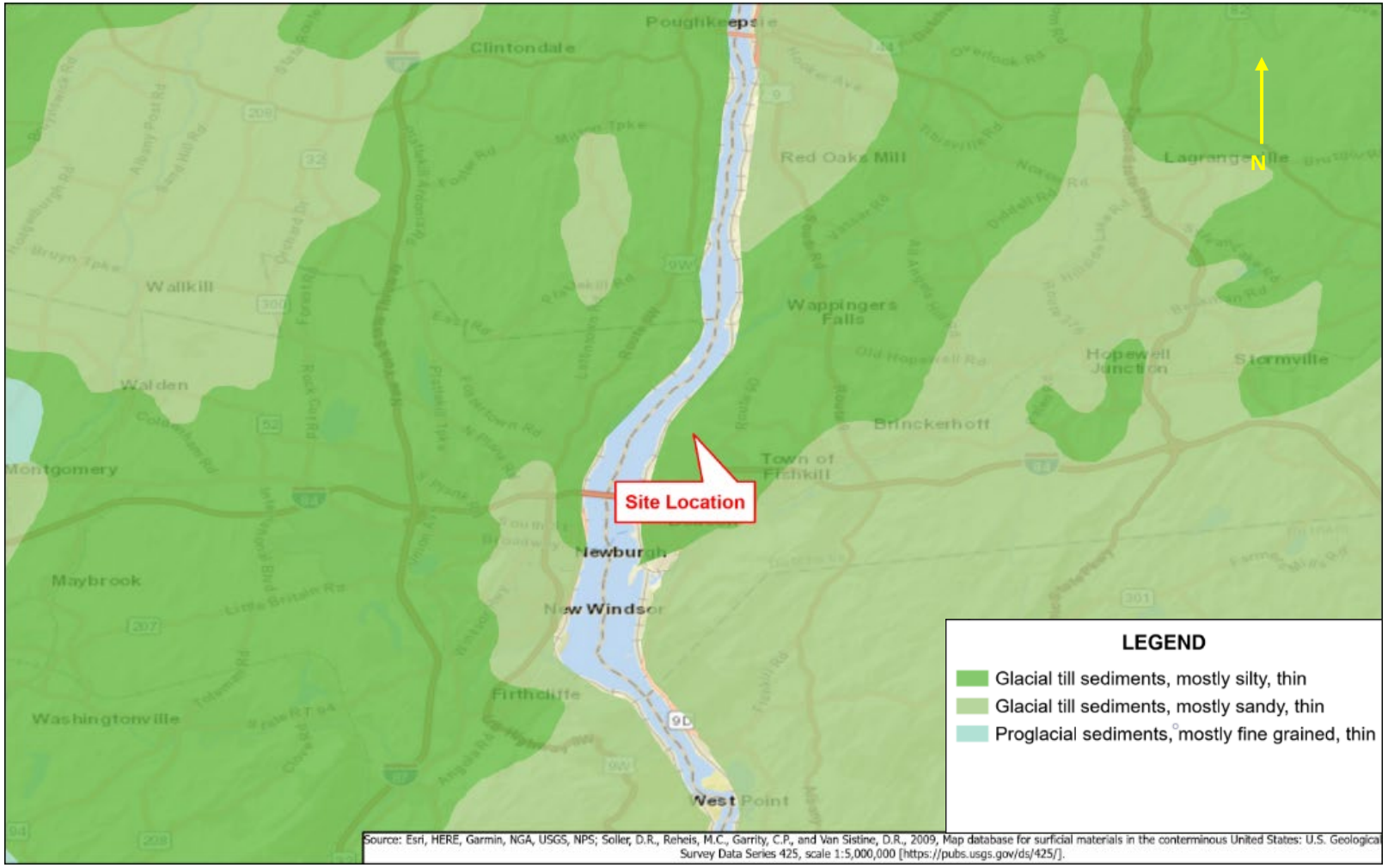
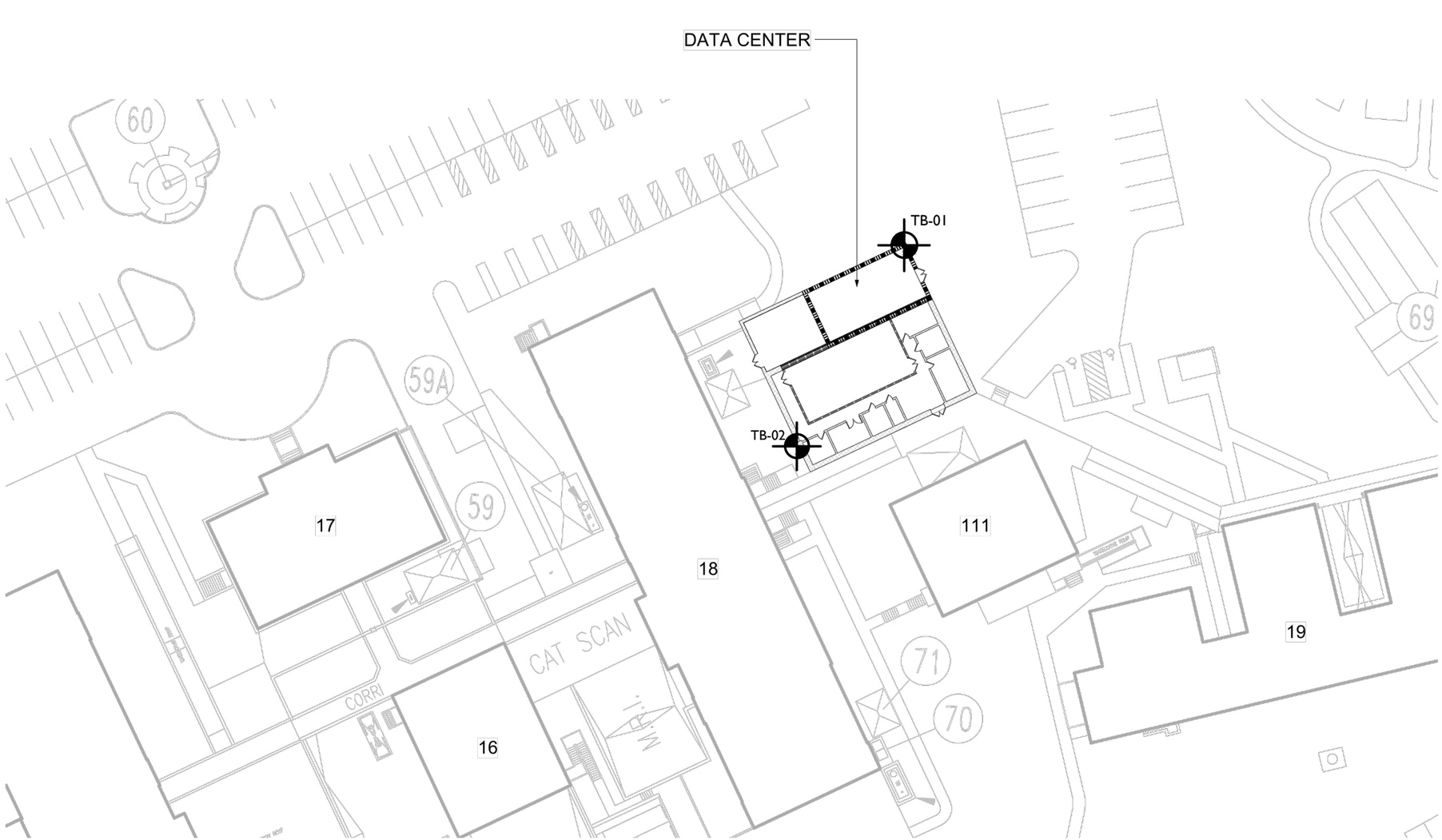


Figure 3: Surficial Geology.

Colliers Engineering & Design

Drawings



GENERAL NOTES:

1. LAYOUT BASED ON DRAWING TITLED, "DATA CENTER SITE PLAN", BY SPEES DESIGN BUILD, DATED JUNE 14, 2023.
2. THIS DRAWING IS PART OF COLLIERS ENGINEERING & DESIGN'S REPORT (PROJECT NO. 23010570A) AND SHOULD ONLY BE USED IN CONJUNCTION WITH THE REPORT.
3. TEST BORING SERIES TB-XX PERFORMED BY SOILTESTING INC, ON OCTOBER 11, 2023, UNDER CONTINUOUS OBSERVATION OF CED.
4. TEST BORINGS BACKFILLED UPON COMPLETION.

50 0 50

SCALE : 1" = 50'

Linear unit of measure: US Survey Foot (1 ft = 1200/3937 m)

LEGEND:

TB-XX

TEST BORING LOCATION (OCTOBER, 2023)

Colliers Engineering & Design

www.colliersengineering.com

Copyright © 2023. Colliers Engineering & Design All Rights Reserved. This drawing and all the information contained herein is authorized for use only by the party for whom the services were contracted or to whom it is certified. This drawing may not be copied, reused, disclosed, distributed or relied upon for any other purpose without the express written consent of Colliers Engineering & Design.

Doing Business as MASER CONSULTING

811 Know what's below. Call before you dig.

PROTECT YOURSELF

ALL STATES REQUIRE NOTIFICATION OF EXCAVATORS, DESIGNERS, OR ANY PERSON PREPARING TO DISTURB THE EARTH'S SURFACE ANYWHERE IN ANY STATE

STATE REQUIRED FILE NUMBER

FOR STATE SPECIFIC DIRECT PHONE NUMBERS VISIT: WWW.CALL811.COM

REV	DATE	DRAWN BY	DESCRIPTION
.	.	.	.
.	.	.	.
.	.	.	.
.	.	.	.
.	.	.	.
.	.	.	.

EXPLORATION LOCATION PLAN FOR

VA HUDSON VALLEY MEDICAL CENTER DATA CENTER

9 ADMINISTRATION CIRCLE
TOWN OF FISHKILL
DUTCHESS COUNTY
NEW YORK

Colliers Engineering & Design

ALBANY
18 Corporate Woods Blvd, Suite 400
Albany, NY 12211
Phone: 518.459.3252

COLLIERS ENGINEERING & DESIGN, INC. DOING BUSINESS AS MASER CONSULTING

SCALE:	DATE:	DRAWN BY:	CHECKED BY:
AS SHOWN	11/01/23	SCC	DP

PROJECT NUMBER: 23010570A

DRAWING NAME: B-EXPL

SHEET TITLE: EXPLORATION LOCATION PLAN

FIELD BOOK: XX PAGE: XX

SHEET NUMBER: B-01-ELP

2023\23010570A\Geotechnical\Explorations\B-EXPL.dwg\B-01-ELP By: SEAN.CROWELL

Colliers Engineering & Design

Appendix A

Test Boring Logs

Colliers Engineering & Design

Burmister Soil Classification System

I. Soil and Fraction Definitions

Material	Symbol	Fraction	Sieve Size	Definition
Boulders	Bldr	-----	9" +	Material retained on 9" sieve.
Cobbles	Cbl	-----	3" to 9"	Material passing 9" sieve and retained on the 3" sieve.
Gravel	G	Coarse (c) Medium (m) Fine (f)	1" to 3" 3/8" to 1" No. 10 to 3/8"	Material passing the 3" sieve and retained on the No. 10 sieve.
Sand	S	Coarse (c) Medium (m) Fine (f)	No. 30 to No. 10 No. 60 to No. 30 No. 200 to No. 60	Material passing No. 10 sieve and retained on the No. 200 sieve.

Material	Symbol	Plasticity	Plasticity Index	Definition
Silt	$	-----	Passing No. 200 (0.075 mm) PI<1	Material passing the No. 200 sieve that is non-plastic in character and exhibits little or no strength when air-dried.
Clayey Silt	c$	Slight (SL)	1 to 5	Clay – Soil. Material passing the No. 200 sieve which can be made to exhibit plasticity and clay qualities within a certain range of moisture content, and which exhibits considerable strength when air-dried.
Silt & Clay	$ & C	Low (L)	5 to 10	
Clay & Silt	C & $	Medium (M)	10 to 20	
Silty Clay	$C	High (H)	20 to 40	
Clay	C	Very High (VH)	40 Plus	
Organic Silt	(O$)	-----	-----	Material passing the No. 200 sieve which exhibits plastic properties within a certain range of moisture content and exhibits fine granular and organic characteristics.

II. Proportion Definition

Component	Written	Proportions	Symbol	Percentage by Weight*
Principal	CAPITALS	---	---	50 or more
Minor	Lower Case	And	a.	35 to 50
		Some	s.	20 to 35
		Little	l.	10 to 20
		Trace	t.	0 to 10

*Minus sign (-) lower limit, plus sign (+) upper limit, no sign middle range.

III. Terminology for Stratified Soils

Terminology	Definition
Parting	0 to 1/16" thickness
Seam	1/16" to ½" thickness
Layer	½" to 12" thickness
Occasional	One or less per foot of thickness
Frequent	More than one per foot of thickness
Alternating	Stratification descriptor (non-varved)

Colliers Engineering & Design

18 Corporate Woods Boulevard, Suite 400, Albany, NY 12211

PROJECT: VA Medical Campus Data Center

LOCATION: Wappingers Falls, NY

PROJECT NO. 23010570A

TEST BORING: TB-01

GROUND ELEVATION (ft): N/A
ELEV. FROM: Assumed

CONTRACTOR: Soil Testing Inc.
DRILLER: A. Kovel
DRILLING EQUIPMENT: CME 55 LC
METHOD: HSA X Mud Rotary ____ Other ____
HAMMER: CH ____ Safety ____ Automatic X
RODS: AW ____ NW X Other ____

GROUNDWATER:	DEPTH (ft)	DATE
FIRST ENCOUNTERED	N/E	10/11/23
END OF DRILLING (0 hrs.)		

ASTM D-1586

DATE STARTED 10/11/23
DATE FINISHED 10/11/23
FIELD OBSERVER: Daniel Palaj, EIT
CHECKED BY: Daniel Palaj, EIT

DEPTH BELOW SURFACE (ft.)	SAMPLE NUMBER / DEPTH (ft.)	BLOWS PER 6 INCHES 0-6"	6-12"	12-18"	18-24"	RECOVERY (in)	POCKET PENETROM. (tsf)	MOISTURE (%)	WATER SYMBOL	PROFILE DEPTH / ELEV.	IDENTIFICATION OF SOILS / REMARKS
	S-1	1	2	3	4	12					S-1: (SM) Brown mc SAND, some Silt, trace f Gravel. (moist)
	0.0'-2.0'										
	S-2	7	6	6	7	14					S-2: Same as S-1. (dry)
	2.0'-4.0'										
5	S-3	2	6	4	3	12					S-3: (SM) Brown mf SAND, some Silt, trace f Gravel. (moist)
	4.0'-6.0'										
	S-4	2	2	4	4	12				Stratum S	S-4: (SM) Brown mf SAND, some Clay, trace f Gravel. (moist)
	6.0'-8.0'										
	S-5	10	3	4	4	8					S-5: (SM) Brown mf Sand, some Silt, little f Gravel. (moist)
10	8.0'-10.0'										
	S-6	2	6	5	27	12					S-6: Same as S-5. (moist)
	10.0'-12.0'										
15											
	S-7	7	12	12	10	13					S-7: Same as S-5. (wet)
	15.0'-17.0'										
20										20.0	
	S-8	5	10	13	15	14					S-8: (ML) Gray SILT, some f Sand, some mf Gravel. (wet)
	20.0'-22.0'										
25											
	S-9	7	9	12	17	24					S-9: Same as S-8. (moist)
	25.0'-27.0'										
30											
	S-10	17	18	17	24	24				Stratum M	S-10: Same as S-8. (moist)
	30.0'-32.0'										
35											
	S-11	20	24	24	31	24					S-11: Same as S-8. (moist)
	35.0'-37.0'										
40											
	S-12	21	22	30	39	24					S-12: Same as S-8. (moist)
	40.0'-42.0'									42.5	
										-42.5	END OF TEST BORING AT 42.5 FEET Auger Refusal on potenetial boulder at 42.5 ft

NOTES: Backfilled Upon Completion. Perched water conditions encountered at 15 ft.

Colliers Engineering & Design

18 Corporate Woods Boulevard, Suite 400, Albany, NY 12211

PROJECT: VA Medical Campus Data Center

LOCATION: Wappingers Falls, NY

PROJECT NO. 23010570A

TEST BORING: TB-02

GROUND ELEVATION (ft): N/A
ELEV. FROM: Assumed

CONTRACTOR: Soil Testing Inc.
DRILLER: A. Kovel
DRILLING EQUIPMENT: CME 55 LC
METHOD: HSA X Mud Rotary ____ Other ____
HAMMER: CH ____ Safety ____ Automatic X
RODS: AW ____ NW X Other ____

GROUNDWATER:	DEPTH (ft)	DATE
FIRST ENCOUNTERED	N/E	10/11/23
END OF DRILLING (0 hrs.)		

ASTM D-1586

DATE STARTED 10/11/23
DATE FINISHED 10/11/23
FIELD OBSERVER: Daniel Palaj, EIT
CHECKED BY: Daniel Palaj, EIT

DEPTH BELOW SURFACE (ft.)	SAMPLE NUMBER / DEPTH (ft.)	BLOWS PER 6 INCHES 0-6"	6-12"	12-18"	18-24"	RECOVERY (in)	POCKET PENETROM. (tsf)	MOISTURE (%)	WATER SYMBOL	PROFILE DEPTH / ELEV.	IDENTIFICATION OF SOILS / REMARKS
	S-1	3	2	5	6	12					S-1: (SM) Brown mf SAND, little Silt. (dry)
	0.0'-2.0'										
	S-2	3	2	2	1	0					S-2: No Recovery
	2.0'-4.0'										
5	S-3	1	1	4	7	16				Stratum S	S-3: (SM) Tan mf SAND, some Silt, trace mf Gravel. (wet)
	4.0'-6.0'										
	S-4	15	20	13	14	12					S-4: Same as S-3. (moist)
	6.0'-8.0'									8.0	
	S-5	7	14	14	20	20				Stratum SM	S-5: (SM/ML) Tan mf SAND and SILT, some cmf Gravel. (moist)
10	8.0'-10.0'									10.0	
	S-6	18	21	18	17	24				Stratum M	S-6: Same as S-5. (dry)
	10.0'-12.0'										
15											
	S-7	14	23	30	35	24					S-7: (ML) Gray SILT, some f Sand, little mf Gravel. (dry)
	15.0'-17.0'										
20										20.0	
	S-8	16	20	27	36	24				-20.0	S-8: Same as S-7. (moist)
	20.0'-22.0'										END OF TEST BORING AT 20.0 FEET
25											
30											
35											
40											

NOTES: Backfilled Upon Completion. Perched water conditions encountered at 6 ft.

TEST BORING: TB-02
PAGE 1 OF 1

Colliers Engineering & Design

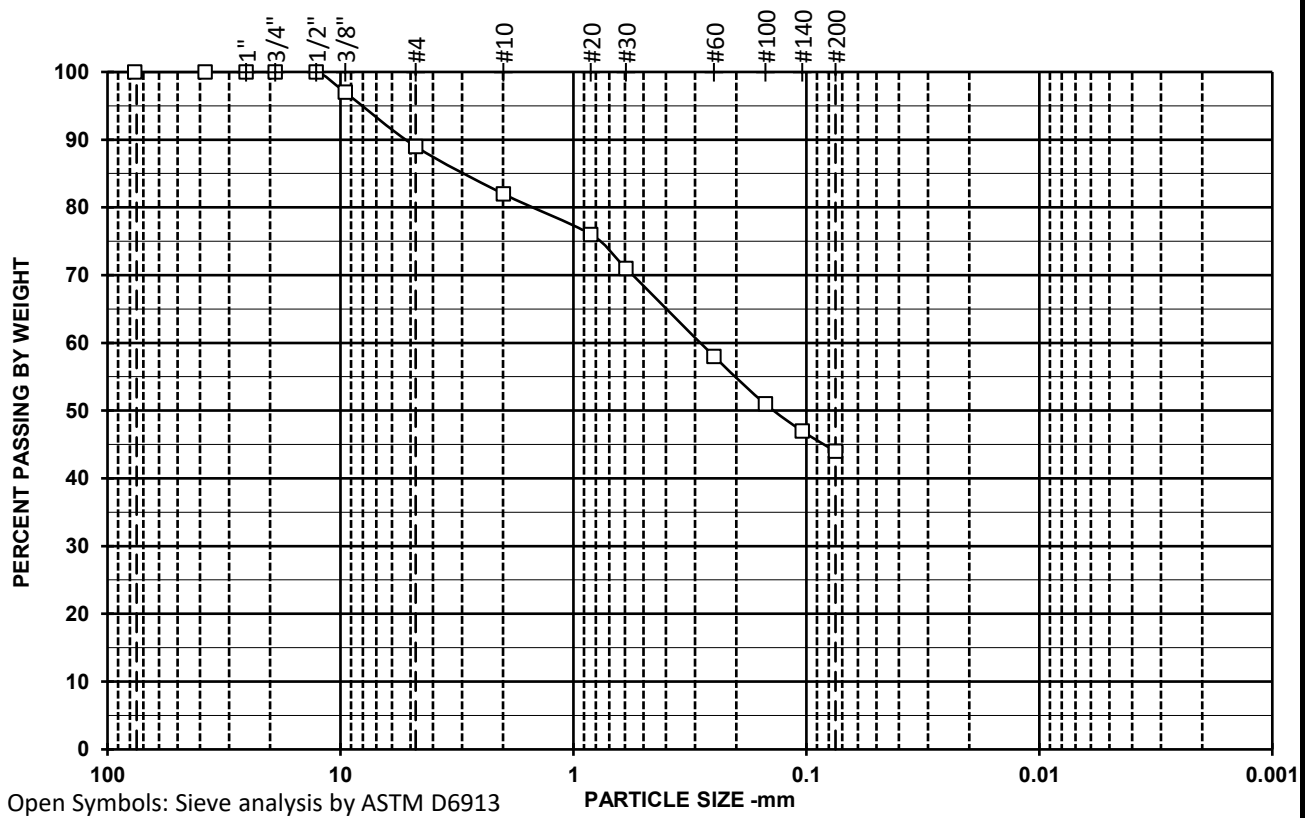
Appendix B

Soil Laboratory Testing

Colliers Engineering & Design #23010570A
VA Hudson Valley Medical Center Data Center
LABORATORY TESTING DATA SUMMARY

BORING NO.	SAMPLE NO.	DEPTH (ft)	IDENTIFICATION TESTS						REMARKS
			WATER CONTENT (%)	LIQUID LIMIT (-)	PLASTIC LIMIT (-)	PLAS. INDEX (-)	USCS SYMB. (1)	SIEVE MINUS NO. 200 (%)	
TB-01	S-4	6-8	13.1				SC	44	
TB-01	S-9	25-27	8.3	23	13	10	SC		
TB-02	S-7	15-17	7.6	24	13	11	SC		

Note: (1) USCS symbol based on visual observation and Sieve and Atterberg limits reported.



Open Symbols: Sieve analysis by ASTM D6913

Filled symbols: Hydrometer analysis by ASTM D7928 corrected for complete sample

Symbol	□	◇	○
Boring	TB-01		
Sample	S-4		
Depth	6-8		
% +3"	0		
% Gravel	18		
% SAND	38		
%C SAND	11		
%M SAND	13		
%F SAND	14		
% FINES	44		
D_{100} (mm)	12.7		
D_{60} (mm)	0.285		
D_{30} (mm)			
D_{10} (mm)			
Cc			
Cu			

Size/ID #	Percent Finer Data		
6"	100		
4"	100		
3"	100		
1 1/2"	100		
1"	100		
3/4"	100		
1/2"	100		
3/8"	97		
#4	89		
#10	82		
#20	76		
#30	71		
#60	58		
#100	51		
#140	47		
#200	44		
5μ m			
2μ m			
1μ m			

SYMBOL	w (%)	LL	PL	PI	USCS	AASHTO	MODIFIED BURMISTER DESCRIPTION AND REMARKS	DATE
□	13.1				SC		Brown Clay & Silt, and coarse medium to fine Sand, little medium to fine Gravel.	11/02/23
◇								
○								

Colliers Engineering & Design #23010570A

TERRASENSE Geotechnical Laboratory #23010570A

VA Hudson Valley Medical Center
Data Center

PARTICLE SIZE DISTRIBUTION

TerraSense Analysis File: GrainSizeTSLV3

Siev1a.xlsx 11/14/2023

Colliers Engineering & Design

Appendix C

Seismic Design Report

This is a beta release of the new ATC Hazards by Location website. Please contact us with feedback.

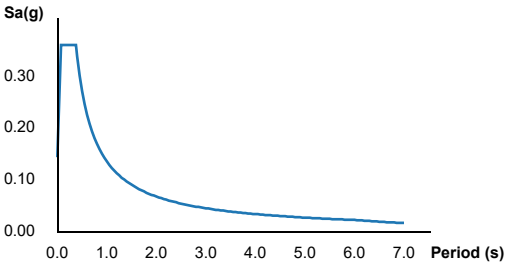
The ATC Hazards by Location website will not be updated to support ASCE 7-22. Find out why.

Hazards by Location

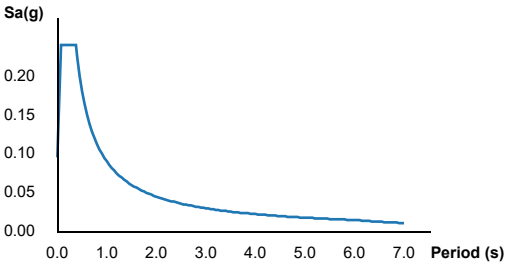
Search Information

Coordinates:	41.54410377441013, -73.96275381545259
Elevation:	176 ft
Timestamp:	2023-11-01T13:55:59.842Z
Hazard Type:	Seismic
Reference Document:	ASCE7-16
Risk Category:	II
Site Class:	D

MCER Horizontal Response Spectrum



Design Horizontal Response Spectrum



Basic Parameters

Name	Value	Description
S_S	0.226	MCE_R ground motion (period=0.2s)
S_1	0.057	MCE_R ground motion (period=1.0s)
S_{MS}	0.361	Site-modified spectral acceleration value
S_{M1}	0.136	Site-modified spectral acceleration value
S_{DS}	0.241	Numeric seismic design value at 0.2s SA
S_{D1}	0.091	Numeric seismic design value at 1.0s SA

Additional Information

Name	Value	Description
SDC	B	Seismic design category
F_a	1.6	Site amplification factor at 0.2s
F_v	2.4	Site amplification factor at 1.0s
CR_S	0.947	Coefficient of risk (0.2s)
CR_1	0.931	Coefficient of risk (1.0s)
PGA	0.13	MCE_G peak ground acceleration
F_{PGA}	1.54	Site amplification factor at PGA
PGA_M	0.2	Site modified peak ground acceleration
T_L	6	Long-period transition period (s)
SsRT	0.226	Probabilistic risk-targeted ground motion (0.2s)
SsUH	0.238	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
SsD	1.5	Factored deterministic acceleration value (0.2s)
S1RT	0.057	Probabilistic risk-targeted ground motion (1.0s)
S1UH	0.061	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
S1D	0.6	Factored deterministic acceleration value (1.0s)

PGAd	0.5	Factored deterministic acceleration value (PGA)

The results indicated here DO NOT reflect any state or local amendments to the values or any delineation lines made during the building code adoption process. Users should confirm any output obtained from this tool with the local Authority Having Jurisdiction before proceeding with design.

Please note that the ATC Hazards by Location website will not be updated to support ASCE 7-22. Find out why.

Disclaimer

Hazard loads are provided by the U.S. Geological Survey Seismic Design Web Services.

While the information presented on this website is believed to be correct, ATC and its sponsors and contributors assume no responsibility or liability for its accuracy. The material presented in the report should not be used or relied upon for any specific application without competent examination and verification of its accuracy, suitability and applicability by engineers or other licensed professionals. ATC does not intend that the use of this information replace the sound judgment of such competent professionals, having experience and knowledge in the field of practice, nor to substitute for the standard of care required of such professionals in interpreting and applying the results of the report provided by this website. Users of the information from this website assume all liability arising from such use. Use of the output of this website does not imply approval by the governing building code bodies responsible for building code approval and interpretation for the building site described by latitude/longitude location in the report.

Colliers Engineering & Design

Colliers Engineering & Design is a trusted provider of multi-discipline engineering, design and consulting services providing customized solutions for public and private clients through a network of offices nationwide.

For a full listing of our office locations, please visit colliersengineering.com

1 877 627 3772

Civil/Site • Traffic/Transportation • Governmental • Survey/Geospatial
Infrastructure • Geotechnical/Environmental • Telecommunications • Utilities/Energy