GLYNN GROUP
ENGINEERING & ARCHITECTURE, PLLC

Civil • Geotechnical
Structural • Architecture
Material Testing • Consulting

# Climate Controlled Storage
# 2495 Wehrle Drive
## Amherst, New York

# Geotechnical Engineering Report

## GGEA 23-1214

*Prepared for:*
*416 Homez, Inc.*
*4493 South Buffalo Street H3*
*Orchard Park, New York 14213*

*Prepared by:*
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October 26, 2023

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## 1.0 INTRODUCTION

### 1.1 SCOPE

This report provides subsurface exploration data and geotechnical recommendations for the proposed construction of a new climate controlled storage facility at 2495 Wehrle Drive in the Town of Amherst, New York. Glynn Group Engineering & Architecture, PLLC (GGEA) has provided the following scope of services:

- Performed a site visit to examine site topography and establish five (5) soil borings within the footprint of proposed structure.
- Cleared utilities with UDig NY through drilling subcontractor.
- Mobilized drilling subcontractor with ATV drill rig and support crew.
- Provided SPT soil sampling at each boring location in accordance with ASTM D1586 "Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils". All borings were advanced to auger refusal on bedrock.
- Provided soil boring logs (prepared by subcontractor), to include SPT data, N values, soil classification, refusal depth and encountered groundwater conditions.
- Prepared a geotechnical report in accordance with the 2020 NYS Building Code to include subsurface design parameters, seismic site class and design category, groundwater conditions, expansive soil analysis, liquefaction analysis, foundation recommendations, slab on grade recommendations, pavement recommendations and construction recommendations.

### 1.2 CONTRACT

GGEA performed this study in accordance with a written proposal to 416 Homez, Inc. dated August 22, 2023. GGEA received the notice to proceed via signed contract from Vicky Singh Ghotra on September 1, 2023. All services provided by GGEA are subject to the Standard Terms and Conditions included in the geotechnical proposal.

### 1.3 EXCLUSIONS

The project efforts exercised by GGEA include geotechnical analysis, design recommendations and the preparation of this report. The scope of this report specifically excludes any review of former site use, in particular, environmental or pollution related concerns.

## 2.0 PROJECT BACKGROUND

### 2.1 SITE DESCRIPTION AND PROPOSED IMPROVEMENTS

The project site is located on the south side of Wehrle Drive approximately 1,100 feet west of Transit Road in the Town of Amherst, New York. The property encompasses approximately 8.4 acres and is identified as SBL 81.02-3-20.1. The property is relatively flat and characterized by a northern portion that is covered primarily by field grass and a southern portion that is covered by dense trees and shrubs. Historical aerials identify the site once served as an agricultural field. An existing unnamed paved roadway is located along the western limits of the property directly across from Berkley Road. The proposed construction is to consist of a 73,989 square foot one story climate controlled storage facility with an associated perimeter roadway and parking. A Project Location Plan has been included in Appendix B and a Subsurface Exploration Plan has been included in Appendix C.

### 2.2 GEOLOGIC SETTING

Geologic Maps of Western New York identify subsurface conditions to be composed of glacial till soils overlying shallow limestone bedrock of the Middle Devonian Onondaga Formation. The overburden soils at the site were deposited during the last glacial advance of the Pleistocene Epoch, referred to as the Wisconsinan Glacial Stage, which ended approximately 12,000 years ago. As the glacier advanced over the Western New York terrain, the ice mass carved, crushed and transported the underlying soil and rock to form glacial till, which typically consists of an unstratified dense matrix of silt, sand, rock and clay deposited beneath the ice. The underlying limestone bedrock was deposited in a warm shallow sea during the Middle Devonian approximately 390 million years ago.

## 3.0 FIELD EXPLORATION AND ANALYSIS

### 3.1 METHODOLOGY

The subsurface exploration consisted of five (5) SPT soil borings located throughout the property as identified on the Subsurface Exploration Plan included in Appendix C. GGEA performed a site visit on September 13, 2023 to examine the site topography and establish soil boring locations. GGEA's drilling subcontractor, Earth Dimensions Inc. (EDI), mobilized to the site on October 9, 2023 and completed drilling operations on the same day. Boreholes were backfilled with soil cuttings upon drilling completion.

Soil boring and sampling operations were performed using hollow stem augers to advance through overburden materials in accordance with ASTM D1586 "Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils". Resistance values, or blow counts, were recorded for each six-inch advancement of a twenty-four inch long, two inch diameter split spoon sampler. "N" values were calculated by totaling the resistance values for the 6/12 and 12/18 inch intervals. All data recorded during drilling operations can be found on the soil boring logs included in Appendix A.

Retrieved soil samples were logged and visually classified by EDI in accordance with the ASEE System of Definition for Visual Identification of Soils (Burmister Classification System) and ASTM D2488 "Standard Practice for Description and Identification of Soils (Visual – Manual Procedure)". Discrepancies observed between classifications noted on the soil boring logs and those identified in this report are due to the assignment of USCS classifications by GGEA.

### 3.2 SUBSURFACE CONDITIONS

All borings were advanced to auger refusal, which was encountered on limestone bedrock at depths ranging from 2.2 to 3.5 feet below existing grade. The site soils were found to typically consist of a thin layer of topsoil ranging from 0.4 to 1.5 feet overlying glacial till consisting of sandy silt with gravel (ML), sandy silty clay with gravel (CL-ML) and clayey gravel with sand (GC). Specific subsurface conditions can be found on the soil boring logs included in Appendix A, however representative soil profiles have been summarized follows:

| | | |
|---|---|---|
| B-1 | 0.0 – 1.0 ft | Topsoil. |
| | 1.0 – 2.2 ft | Brown, damp, compact to very dense, sandy silt with gravel (ML). N value of 13. |
| | > 2.2 ft | Limestone bedrock. |
| B-2 | 0.0 – 0.5 ft | Topsoil. |
| | 0.5 – 1.0 ft | Dark brown, damp, firm, sandy silty clay with gravel (CL-ML). |
| | 1.0 – 2.2 ft | Light brown, damp, compact to very dense, sandy silt with gravel (ML). N value of 16. |
| | > 2.2 ft | Limestone bedrock. |
| B-3 | 0.0 – 1.0 ft | Topsoil. |
| | 1.0 – 2.5 ft | Light brown, moist, compact to very dense, sandy silt with gravel (ML). N value of 16. |
| | > 2.5 ft | Limestone bedrock. |
| B-4 | 0.0 – 0.4 ft | Topsoil. |
| | 0.4 – 3.0 ft | Brown, damp, dense, clayey gravel with sand (GC). N value of 40. |
| | > 3.0 ft | Limestone bedrock. |

It is GGEA's opinion the extent of this exploration was sufficient to accurately characterize the subsurface conditions and provide information necessary for the preparation of this report. The soil borings portray the subsurface conditions encountered at the soil boring locations at the time of exploration. The stratification lines shown on the soil boring logs are approximate, whereas in-situ the changes between strata may be more gradual.

### 3.3 GROUNDWATER

Groundwater was not encountered in the augers upon the completion of drilling operations. Recovered soil samples were found to have a relatively low moisture content, with samples typically described as dry to moist. Based on these conditions, it is GGEA's opinion groundwater is not located within the overburden soils. The stabilized groundwater elevation is estimated at some depth within the limestone bedrock.

## 4.0 GEOTECHNICAL EVALUATION AND RECOMMENDATIONS

### 4.1 BEARING CAPACITY AND FOUNDATIONS

The subsurface conditions at this site are of good structural quality and will provide for the construction of a shallow foundation system consisting of perimeter frost walls supported by continuous strip footings and interior/exterior columns supported by square spread footings. GGEA provides design and construction recommendations for foundations as follows:

1. Although native soils were found to typically exhibit a high relative density, due to the relatively shallow and variable depth of bedrock (2.2 to 3.0 feet), GGEA recommends advancing all exterior perimeter foundations to bedrock. Excavations shall be advanced through overburden soils and weathered rock until refusal is encountered using a toothed bucket.
2. Per Section 1809.5 of the 2020 NYS Building Code, foundations bearing directly on bedrock are not subject to the locally prescribed frost protection depth of > 3.5 feet below final grade.
3. Foundations bearing directly on bedrock should be designed for a net allowable bearing capacity not to exceed 10,000 psf.
4. Pinning of foundations to bedrock is not necessary unless pinning is required to resist uplift, to resist lateral forces or if specified by Town Code Enforcement.
5. Interior spread footings shall be advanced to a minimum depth of 2.0 feet below existing grade and should be constructed to bear on competent glacial till soil or bedrock. In the event interior foundation subgrade is to be composed of glacial till soil, the soil shall be vibratory compacted and the net allowable bearing capacity shall be limited to 4,000 psf. The net allowable bearing capacity may be increased to 10,000 psf in the event foundations are advanced to bedrock.
6. If the storage facility is to consist of a pre-engineered metal building (PEMB), foundation lateral forces should be restrained by one of the following methods:

    (a) tie rods spanning the building width through the foundation frost walls,

    (b) hairpins extending from the perimeter column pedestals into the floor slab,

    or

    (c) oversizing the foundations to provide friction resistance between the concrete and soil. The coefficient of sliding for mass concrete on clean limestone bedrock is estimated at 0.70 per Chapter 3, Table 1 of NAVFAC 7.2.

### 4.2 SLAB ON GRADE

The building interior slab on grade should be designed and constructed in accordance with the following recommendations:

1. All slabs should be designed using a recognized standard procedure, such as identified in the text "Designing Floor Slabs on Grade" by Ringo and Anderson (ISBN 0-924659-34-3). The thickness of the concrete slab should be determined based on the intended usage and proposed loading (fork truck dynamic loading and static rack loading).

2. Topsoil and poor quality native soils should be removed beneath the footprint of the slab. Based on subsurface conditions encountered at the soil boring locations, excavation to a depth of approximately 1.5 feet is estimated to engage competent subgrade soil.
3. Once a competent subgrade elevation is achieved, the exposed subgrade should be compacted thoroughly with a smooth drum vibratory roller to produce a uniform density throughout. In place density testing of the subgrade is not required. The top surface of the subgrade should be pitched to drain to prevent ponding of stormwater.
4. After the subgrade is thoroughly compacted, proof roll the exposed subgrade with a fully loaded 10 wheel dump truck weighing at least 30 tons or a smooth drum roller having an effective force of at least 600 pounds per linear inch of roller width. Any area exhibiting weaving, yielding, rutting (>3/4 inch) or boiling should be reworked and compacted to produce an acceptable response *or* over excavated and replaced with Structural Fill. The depth of the undercut and type of Structural Fill will depend on the bearing condition at the base of the undercut, the weather at the time of construction and the soil material encountered. Proof rolling operations should be observed and directed by a qualified geotechnical professional.
5. After proof rolling of the prepared subgrade is successfully performed (including overexcavation and replacement of failing areas), Structural Fill should be installed as necessary to achieve the design subgrade elevation. The Structural Fill should be placed in maximum 9 inch lifts and compacted to 95 % modified proctor (ASTM D1557).
6. Upon successful installation of Structural Fill to the design subgrade elevation, a granular base composed of Select Structural Fill should be installed and compacted to 95 % modified proctor. The thickness of the granular base layer should be dictated by the slab design (prepared by others), however GGEA recommends a minimum granular base thickness of 8 inches.
7. Install subsurface utilities.
8. Install the concrete slab as designed. GGEA recommends a modulus of subgrade reaction (k) not to exceed 150 pci for properly prepared subgrade. The installation of a vapor barrier and specification of the concrete finish technique is at the discretion of the architect. Proper joint spacing and reinforcing steel spacing/placement will be critical to the long term performance of slab. The Portland Cement Association (PCA) recommends joint spacing in feet should be two to three times the slab thickness in inches.

Although not required for design, if the granular base is to be used as working surface for an extended period of time prior to concrete placement, the installation of a separation and reinforcement geotextile should be considered between the soil subgrade and granular base. GGEA recommends a woven geotextile such as US Fabrics US 250 (or equivalent). Any granular base that becomes contaminated with soil as a result of repeated construction traffic should be removed and replaced prior to placing concrete.

### 4.3 EXCAVATION, BACKFILL AND RETAINING WALLS

The native soils encountered within the construction depth of this project are composed primarily of loose topsoil overlying firm cohesive glacial till and compact to dense granular glacial till. Excavation through native soils can be accomplished with easy to moderate effort from standard excavation equipment, increasing in effort with depth. The limestone bedrock is of moderately hard composition and will require significant effort from a large hydraulic breaker (> 4,000 foot pounds) to remove.

Native soils may be repurposed as Structural Fill, pending the soils are stockpiled and blended to create a homogenous material. The blended and stockpiled material must provide a USCS classification that meets the specification for Structural Fill (all soil material with the exception of USCS classifications of CH, MH, OH, OL, ML and CL-ML). Silt (ML) soil provide a potential for frost heave if subjected to water and freezing temperatures and therefore should not be used as Structural Fill where exposed to frost. Successful stockpiling and blending of excavated soils may result in a USCS classification acceptable for use as Structural Fill, however a large portion of the native soils are identified as ML and CL-ML on the boring logs, which is undesirable. Blending of the material with GC soils may yield a USCS classification that is acceptable for Structural Fill when laboratory tested.

The soils encountered at this site should be classified by an OSHA competent person in accordance with 29 CFR, Part 1926, OSHA Subpart P, "Excavations and Trenches" prior to and during excavation. From the testing and exploration program, GGEA estimates the site soils within the construction depth of this project can be classified as Type C under the OSHA classification guidelines. However, this classification may change depending on other site criteria and moisture conditions at the time of construction. An OSHA competent person should judge the potential need for excavation bracing and excavation geometry in the field.

Foundation backfill placed beneath structurally loaded areas (pavement, sidewalk, slab) should consist of properly placed and compacted Select Structural Fill. Foundation backfill placed in non-structural landscaped areas may consist of compacted Common Fill or Structural Fill. Excavated native soils may be repurposed as Common Fill pending they are free of topsoil. Excavated native soils may be repurposed as Structural Fill pending blending and testing as previously discussed.

In place density testing should be performed at a rate of one test per 50 feet of trench or 2,500 square feet of area per lift, at a minimum of one test per day of placement. Specifications regarding Common Fill, Structural Fill and Select Structural Fill are included in Appendix E. Foundation backfill shall be installed in a balanced condition with foundations completely backfilled prior to applying load.

If the project is to include the construction of retaining walls, the retaining walls should be backfilled with Structural Fill or Select Structural Fill compacted to 95% of modified proctor (ASTM D1557) density within 2 % of optimum moisture content. Clean poorly graded drainage stone should be installed directly behind the wall to allow for hydrostatic pressure relief through weeps or drain tile at the base. The drainage stone should be wrapped in a separation and filtration geotextile such as US 120NW or equivalent. The subgrade at the base of the retaining wall should be composed of bedrock and prepared in accordance with the recommendations of Section 4.1 of this report. GGEA provides the following estimated design parameters for native soils and compacted Select Structural Fill:

<u>Native sandy silt with gravel (ML)</u>

moist unit weight = 125 pcf

friction angle = $32^0$

cohesion = 0 psf

Rankine theory

at rest pressure coefficient (Ko) = 0.47
active pressure coefficient (Ka) = 0.31
passive pressure coefficient (Kp) = 3.25

2020 NYS Building Code Table 1610.1 Lateral Soil Load
at rest pressure = 100 psf/ft of depth
active pressure = 45 psf/ft of depth

coefficient of sliding for mass concrete = 0.35

Native clayey gravel with sand (GC)

moist unit weight = 130 pcf

friction angle = $32^0$

cohesion = 0 psf

Rankine theory
at rest pressure coefficient (Ko) = 0.47
active pressure coefficient (Ka) = 0.31
passive pressure coefficient (Kp) = 3.25

2020 NYS Building Code Table 1610.1 Lateral Soil Load
at rest pressure = 60 psf/ft of depth
active pressure = 45 psf/ft of depth

coefficient of sliding for mass concrete = 0.40

Select Structural Fill

moist unit weight = 145 pcf

friction angle = $40^0$

Rankine theory
at rest pressure coefficient (Ko) = 0.36
active pressure coefficient (Ka) = 0.22
passive pressure coefficient (Kp) = 4.60

2020 NYS Building Code Table 1610.1 Lateral Soil Load
at rest pressure = 60 psf/ft of depth
active pressure = 30 psf/ft of depth

coefficient of sliding for mass concrete = 0.55

Foundations for retaining walls shall be prepared in accordance with the parameters established in Section 4.1 of this report.

### 4.4 FLEIXBLE PAVEMENT

GGEA provides design and construction recommendations for flexible pavement as follows:

1. Remove existing topsoil and poor quality subsoil materials to the design subgrade elevation. Any poor quality soil (soft, saturated, organic) should be removed and replaced with Structural Fill. The subgrade should be graded to drain.

2. Based on conditions observed at the soil boring locations, excavation to a depth of approximately 1.5 feet below existing grade is anticipated to engage competent subgrade.
3. Thoroughly compact the exposed subgrade with a smooth drum vibratory roller. In place density testing of the subgrade is not required.
4. After thorough compaction of the subgrade is performed, proof roll the exposed subgrade with a fully loaded 10 wheel dump truck weighing at least 30 tons or a smooth drum roller having an effective force of at least 600 pounds per linear inch of roller width. Any area exhibiting weaving, yielding, rutting or boiling should be reworked and compacted to produce an acceptable response or over excavated and replaced with Structural Fill. The depth of the undercut and type of Structural Fill will depend on the soil material encountered, weather conditions at the time of construction and the bearing conditions at the base of the undercut. The top surface of the subgrade should be pitched to drain to prevent ponding of stormwater. Proof rolling operations should be observed and directed by a qualified geotechnical professional.
5. Install Structural Fill as necessary to achieve the design subgrade elevation. Install in maximum 9 inch lifts and compact to 95 % modified proctor.
6. Once the design subgrade elevation is achieved, install a separation geotextile to prevent contamination of the overlying granular base layer with fines from the underlying subgrade soil. GGEA recommends an AASHTO Class 2 separation geotextile such as US Fabrics US 250 or equivalent.
7. Install a granular base layer composed of properly placed and compacted Select Structural Fill. GGEA recommends a minimum granular base thickness of 10 inches for automobile traffic and 12 inches for truck traffic.
8. If the design dictates, install ditches, lateral drains, weeps and storm drainage piping.
9. If catch basins are installed, special attention should be directed to the compaction of stone around the catch basins and the pipes. Failure to properly compact the stone will result in pavement settlement around the catch basins and ponding of water.
10. Construct a flexible pavement system consisting of asphalt concrete binder followed by asphalt concrete top (wearing course). GGEA provides recommended pavement sections as follows:

    Light Duty (primarily car traffic)
    10 inches Select Structural Fill – Compacted to 95 % Modified Proctor
    2.5 inches of asphalt concrete binder
    1.0 inch of asphalt concrete top

    Heavy Duty (mixed truck and car traffic)
    12 inches Select Structural Fill – Compacted to 95 % Modified Proctor
    3.5 inches of asphalt concrete binder
    1.5 inch of asphalt concrete top

Site contractors should be notified that roadways and parking areas will not support repeated travel by construction loads. Pavement and subgrade failure can be anticipated in areas that receive a high volume of heavy construction traffic. To preclude the overstressing of the pavement system it is recommended that haul roads be located in non-critical areas. As an option, the base course of stone can be overbuilt to a total thickness of 20 inches to serve as a haul route. The additional thickness of stone should be removed prior to paving along with any areas of stone that have been contaminated with soil. Failure to remove fine-grained soils from the stone base may cause pavement distress in the form of heaving resulting from freeze thaw effects.

In the event the binder layer is used as a working surface during construction or there is a prolonged time period between binder and top placement such that daily activities occur over the binder surface, the surface must be power washed, not just swept, and a tack coat should be applied prior to installation of the top course. In addition, any yielding area of pavement binder should be removed and replaced prior to application of the top course.

### 4.5 STORMWATER PONDS

The relatively shallow depth to bedrock encountered at this site provides limitations to stormwater pond construction. Compaction of native soils with a smooth drum vibratory roller may produce a soil of low permeability that will hold water, however the use of a synthetic geomembrane pond liner should be considered to improve pond integrity where soil cover over bedrock cannot be maintained at 12 inches or more.

### 4.6 EXPANSIVE SOIL

Some cohesive soils undergo volumetric change (shrinkage and swelling) with changes in moisture content and degree of saturation, which are commonly referred to as expansive soils. This condition primarily occurs with fat clay (CH) soil, which is a cohesive soil that exhibits a liquid limit of 50 or greater. The liquid limit is the water content, in percent, of a soil that defines the boundary between the plastic and viscous fluid states. Expansive soils can be found in many areas throughout Western New York and have been associated with foundation problems.

Laboratory testing was not performed on recovered soil samples, however visual classification did not identify USCS soil classifications associated with expansion concerns.

### 4.7 LIQUEFACTION

Liquefaction is the process where saturated cohesionless (granular) soils, specifically, loose sands and silts, transform from a solid into a liquid as a result of an increase in the pore water pressure caused by repeated disturbance such as experienced during seismic events. Liquefaction results in an immediate loss of shear strength and bearing capacity, causing total and differential settling of the overlying structure.

The soils encountered at this site exhibit a high relative density and are not susceptible to liquefaction.

### 4.8 SETTLEMENT

Shallow foundations designed, constructed and maintained in accordance with the recommendations of this report will provide for negligible settlement, with estimated total and differential settlement of significantly less than 1.0 inch and 0.5 inches, respectfully.

### 4.9 SEISMIC SITE CLASS AND DESIGN CATEGORY

In accordance with Section 1613 (Earthquake Loads) of the 2020 NYS Building Code, GGEA has classified the site as **Seismic Site Class C.** The site classification is based on the summation of N values for the upper 100 feet of boring B-5 in accordance with ASCE 7-16 Equation 20.4-2. The design spectral response accelerations have been calculated as 0.149 g for the short period design spectral response acceleration ($S_{DS}$) and 0.046 g for the one second design spectral response acceleration ($S_{D1}$). In accordance with tables 1613.2.5(1) and 1613.2.5(2), using Risk Category II, the site is classified as **Seismic Design Category A.** Calculations have been provided in Appendix D.

### 4.10 GENERAL CONSTRUCTION RECOMMENDATIONS

GGEA provides general construction recommendations as follows:

1. Exposed soil bearing grades beneath foundations should be compacted to densify any soil that may have been disturbed by the excavation process. Compaction should be performed in accordance with the recommendations of item 5 in Section 4.1 of this report. Densification of the subgrade will assure the development of the anticipated bearing strength and reduce settlement potential.
2. Fine grained soils, such as those encountered within the proposed construction depth for this project, may lose considerable strength and bearing capacity if subjected to prolonged saturation. The accumulation of stormwater and/or perched groundwater within foundation excavations and subsequent deterioration of the foundation subgrade during construction should not be permitted. The foundation excavations should include temporary sumps located outside of the building footprint to permit water removal by means of suction pumps during construction. Likewise, water should not be permitted to accumulate in the foundation excavation after footings have been constructed and prior to backfilling. Care should be exercised to not allow pumped water to recycle back to into the excavations. Mud mats should be considered if the subgrade integrity cannot be maintained. Note this is applicable to soil foundation subgrade only and not bedrock.
3. If additional undercut is necessary during foundation excavation, the bottom should be graded to a uniform elevation and gradually sloped or stepped back to the design elevation. Undercut “pockets” should be avoided.
4. Conformance to OSHA standards is mandatory during excavation and trench work.
5. Topsoil and organic soils should be removed from all load bearing areas.
6. No fill material or concrete should be placed in water, over saturated subgrade or over frozen subgrade.
7. The foundation bearing grade should not be allowed to freeze either prior to or after placement of concrete. Insulating blankets should be used to cover bearing grades plus a one foot perimeter outside forms and constructed footings until backfill is placed.
8. Grading and contouring efforts should take care to address existing site drainage conditions and mitigate any conflicts with the proposed site development.
9. Continuous footings and associated wall loads should be proportioned to create nearly equal contact pressures throughout, which will serve to minimize differential settlement. Likewise, square spread footings and associated column loads should be proportioned to create nearly equal contact pressures at all locations.

10. Upon excavation, if encountered soils or moisture contents are found to be different than those identified on the soil boring log and represented within this report, the bearing capacity of the soil and/or rock will need to be reevaluated by a qualified geotechnical engineer. Likewise, the footing design may then require adjustment to accommodate for a change in bearing capacity or for conditions of varying bearing capacity.

### 4.11 CONCLUSION

This completes the geotechnical report for the proposed climate controlled storage facility at 2495 Wehrle Drive in the Town of Amherst, New York. This report has been prepared based on the encountered subsurface conditions at the soil boring locations and pertinent data supplied by 416 Homez, Inc. The information presented within this report is intended to serve as the basis for foundation design and should be communicated to the project architect/design professional, excavation contractor and foundation contractor. Please contact GGEA if major project changes are made or if encountered subsurface conditions vary from those noted in this report.

Sincerely,

G. Edward Lover, P.G.
Senior Geologist

Mark W. Glynn, P.E.
Consulting Engineer, Principal

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# Appendix A

## Subsurface Exploration Logs

Climate Controlled Storage
2495 Wehrle Drive
Amherst, New York

**Geotechnical Engineering Report**

GGEA 23-1214

October 26, 2023

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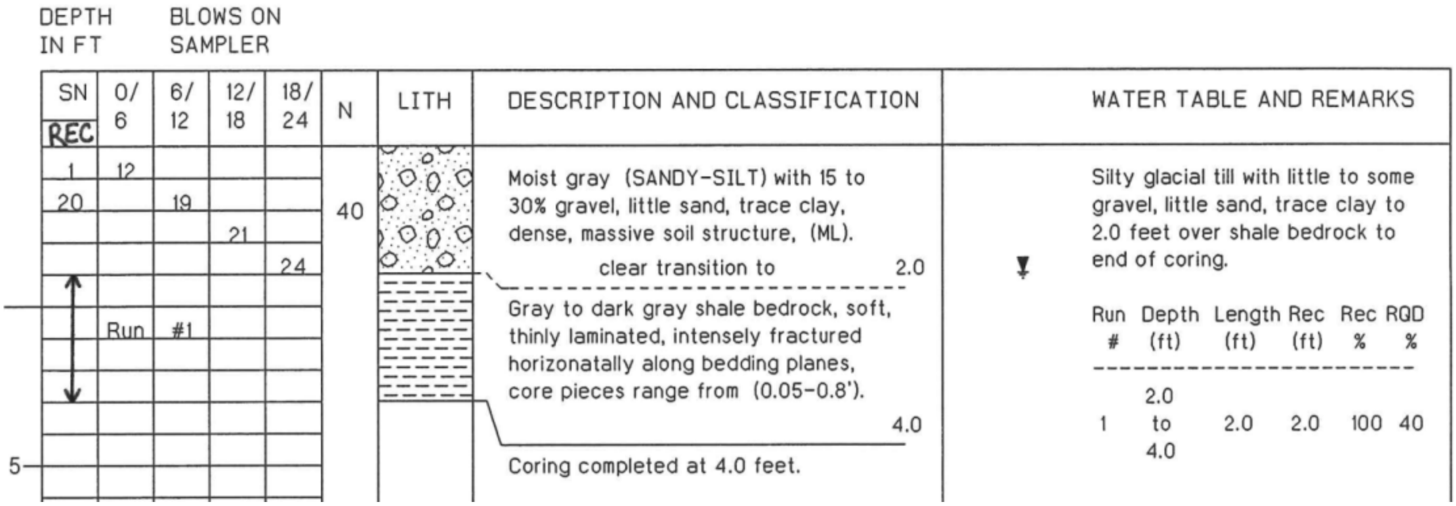
# GEOTECHNICAL REFERENCE STANDARDS AND KEY TO SOIL BORING LOGS




**Depth:** The far left column provides the vertical scale of the boring log in feet below ground surface.

**Sample Number (SN):** The sample number is used for identification on sample containers and/or laboratory tests. Abbreviations are used for different samples and tests (Table 4.)

**Sample Recovery (REC)**: Shown in the sample number column below the sample number in inches out of 24.

**Blows:** The number of blows obtained from each of the 6-inch intervals of a 24-inch Standard Penetration Test (ASTM D1586).

**N-Value:** The Standard Penetration Test N-Value, as specified by ASTM D1586 is defined as the number of blows required by a 140-pound hammer falling 30 inches per blow to drive a 2-inch outside diameter split spoon sampler 24 inches. The N-Value is the sum of the 6/12 and 12/18 value.

**Lithology (LITH):** A graphic representation of the soil and rock description and classification.

**Description and classification:**
All recovered soil and rock samples are described and classified in the field during the drilling process. Soil classifications are based on the Unified Soil Classification System ASTM D2487 and ASTM D2488. The relative proportion of soil mixtures with two or more soils is described in accordance with "Suggested Methods of Test for Identification of Soils" by D.M. Burmister, ASTM Special Technical Publication479, June 1970. Rock descriptions and classifications are frequently referenced from "Rock Core Evaluation Manual Geotechnical Engineering Manual GEM-23" by NYSDOT, 2015. Description and classification are based on visual observation, except where they have been modified to reflect results of laboratory tests as deemed appropriate.

- Soils Field Observations: Moisture (Table 2.), Color, Relative proportion of soil mixtures with two or more soils (Table 5.), Penetration Resistance (Table 3.), Soil Structure, and USCS Classification (Table 1.).

- Rock Field Observations: Color, Rock Type, Hardness (Table 6.), Grain size or Texture, Bedding (Table 7.), Fracturing (Table 8.), Size and Range, and additional observations. The field identification descriptors Rock Hardness, Bedding, and Fracturing are based off the NYSDOT GEM-23.

- The depths of stratum lines shown on the boring logs are based on interpretation and may not represent precise subsurface conditions.

**Remarks:** This section denotes depth of recovery, stratigraphy of soil and rock, depositional environment, and general documentation of drilling efforts and techniques.

**Water Level:** Water level readings are made in bore holes at times and under conditions stated on the boring logs. Fluctuations in the water level may occur due to factors other than those present at the time measurements are taken. The symbol " ▼ " denotes the water level below ground surface at a specified time.

**RQD:** Denotes the percentage of intact and sound rock retrieved from a borehole of any orientation. All pieces of intact and sound rock core equal to or greater than 100mm (4 in.) long are summed and divided by the total length of the core run. (ASTM D6032)

# GEOTECHNICAL REFERENCE STANDARDS AND KEY TO SOIL BORING LOGS

**Table 1. Unified Soil Classification System**

| Major Divisions | | | Symbol | Typical Descriptions |
|---|---|---|---|---|
| Coarse Grained Soils<br>More than 50% of material is larger than No. 200 Sieve size. | Gravel and Gravelly soils<br>More than 50% of coarse fraction retained on No. 4 Sieve. | Clean gravels (Little or no fines) | GW | Well-graded gravels, gravel-sand mixtures, little or no fines |
| | | | GP | Poorly-graded gravels, gravel-sand mixtures, little or no fines |
| | | Gravels with fines (appreciable amount of fines) | GM | Silty gravels, gravel-sand-silt mixtures |
| | | | GC | Clayey gravels, gravel-sand-clay mixtures |
| | Sand and Sandy Soils<br>More than 50% of coarse fraction passing No. 4 Sieve. | Clean sand (little or no fines) | SW | Well-graded sands, gravelly sands, little or no fines (Wide Equal Range) |
| | | | SP | Poorly-graded sands, gravelly sands, little or no fines, predominately one size or intermediate size |
| | | Sands with fines (appreciable amount of fines) | SM | Silty sands, sand-silt mixtures |
| | | | SC | Clayey-sands, sand-clay mixtures |
| Fine Grained Soils<br>Less than 50% of material is smaller than No. 200 Sieve size. | Silts and Clays | Liquid limit LESS than 50 | ML | Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity |
| | | | CL | Inorganic clays or low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays |
| | | | OL | Organic silts and organic silty clays or low plasticity |
| | Silts and Clays | Liquid limit GREATER than 50 | MH | Inorganic silts, micaccous or diatomaccous fine sand or silty soils |
| | | | CH | Inorganic clays or high plasticity, fat clays |
| | | | OH | Organic clays or medium to high plasticity, organic silts |
| Highly Organic Soils | | | PT | Peat, humus, swamp soils with high organic contents |

**NOTE: MULTIPLE SYMBOLS ARE USED TO DISTINGUISH DUAL AND BORDERLINE SOILS**

**Table 2. Relative Soil Moisture**

| Moisture Content | |
|---|---|
| Dry | Absence of moisture, dusty, dry to the touch |
| Moist | Damp but no visible water |
| Wet | Visible free water |

**Table 3. Relative Soil Penetrative Resistance**

| Penetrative Resistance of Non-Cohesive Soils | |
|---|---|
| **Term** | **Blows** |
| Very Loose | 0 - 4 |
| Loose | 5 - 10 |
| Compact | 11 - 30 |
| Dense | 30 - 50 |
| Very Dense | >50 |

| Penetrative Resistance of Cohesive Soils | |
|---|---|
| **Term** | **Blows** |
| Very Soft | 0 - 2 |
| Soft | 3 - 4 |
| Firm | 5 - 8 |
| Stiff | 9 - 15 |
| Very Stiff | 15 - 30 |
| Hard | > 30 |

**Table 4. Sample Abbreviations**

| Symbol | Description |
|---|---|
| ST | Shelby Tube Sample |
| VS | Vane Shear Test |
| WR | Weight of rods: A zero blow count with the weight of rods only. |
| WH | Weight of hammer: A zero blow count with the weight of the rods plus the weight of the hammer. |
| 50/# | Denotes if the number of blows exceeds 50 before 0.5 ft. interval. (ex. 50/4 or 50 blows over 4 inches) |
| Run | An individual advancement of core equipment |

**Table 5. Modified Burmister**

| Proportion of Soil Mixtures | |
|---|---|
| Trace | 0 - 10% |
| Little | 10 - 20% |
| Some | 20 - 35% |
| And | 35 - 50% |

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# GEOTECHNICAL REFERENCE STANDARDS AND KEY TO SOIL BORING LOGS

**Table 6. Relative Rock Hardness**

| Relative Rock Hardness | Long Description |
|---|---|
| Very soft rock | Can be scratched with fingernail. Slight indentation produced by light blow of point of geologic pick. Requires power tools for excavation. |
| Soft rock | Hand-held specimen crumbles under firm blows with point of geologic pick. |
| Moderately soft rock | Shallow indentations (0.04 to 0.12 in. (1 to 3 mm)) can be made by firm blows with point of geologic pick. Can be peeled with pocket knife with difficulty. |
| Moderately hard rock | Cannot be peeled or scraped with knife. Can be distinctly scratched with a steel nail. |
| Hard rock | Intact hand-held specimen requires more than one hammer blow to break it. Can be faintly scratched by a steel nail. |
| Very hard rock | Cannot be scratched with a steel nail. Intact specimen breaks only by repeated, heavy blows with geologic hammer. |
| Extremely hard rock | Intact specimen can only be chipped, not broken, by repeated, heavy blows of a geologic hammer. |

**Table 7. Rock Bedding**

| Bedding | Description |
|---|---|
| Very Thick-Bedding | Greater than 4 ft. (>1.2 m) |
| Thick-Bedded | 1 ft. to 4 ft. (0.3 m to 1.2 m) |
| Medium-Bedded | 4 in. to 12 in. (100 mm to 300mm) |
| Thin-Bedded | 1.2 in. to 4 in. (30 mm to 100 mm) |
| Very Thin-Bedded | 0.5 in. to 1.2 in. (13mm to 30mm) |
| Thickly Laminated | 0.1 in. to 0.5 in. (3 mm to 13 mm) |
| Thinly Laminated | Les than 0.1 in. (< 3 mm) |
| None | |

**Table 8. Degree of Rock Core Fracturing**

| Degree of Fracturing | Description |
|---|---|
| Unfractured | No observed fractures. |
| Very slightly fractured | Core recovered in lengths greater than 3 ft. (1 m). |
| Slightly to very slightly fractured | Core recovered in lengths from 1 to 3 ft. (0.3 m to 1 m). |
| Slightly fractured | Core recovered mostly in lengths from 1 to 3 ft. (0.3 to 1 m) w ith few scattered lengths less than 1 ft. (0.3 m) or greater than 3 ft. (1 m). |
| Moderately to slightly fractured | Core recovered mostly in lengths averaging 1 ft. (0.3 m). |
| Moderately fractured | Core recovered mostly in lengths from 0.33 to 1 ft. (0.1 to 0.3 m) w ith most lengths about 0.67 ft. (0.2 m). |
| Intensely to moderately fractured | Core recovered in lengths of 0.33 to 0.67 ft. (0.1 to 0.2 m) w ith most lengths about 0.5 ft. (0.15 m). |
| Intensely fractured | Core recovered mostly in lengths from 0.1 to 0.33 ft. (0.03 to 0.1 m) w ith most lengths less than 0.33 ft. (0.1 m) and w ith fragmented intervals |
| Very intensely to intensely fractured | Core recovered as short core lengths averaging less than 0.1 ft. (0.03 m). |
| Very intensely fractured | Core recovered mostly as chips and fragments w ith a few scattered short core lengths. |

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**EDI Job Code:** 15E15b **Hole Number** B-1-23 **Surface Elevation:**

**Project Name:** 2495 Wehrle Drive **Northing:** **Easting:**

**Project Location:** Town of Amherst, Erie County, NY **Date Started:** 10/9/2023

**Client:** Glynn Group Engineering & Architecture, PLLC **Date Completed:** 10/9/2023

| Depth (ft) | SN | Rec (in) | Blows on Sampler 0/6 | 6/12 | 12/18 | 18/24 | N | LITH | Description and Classification | Water Table and Remarks |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 12 | 5 | 6 | 7 | 50/5 | 13 | | Dry to moist dark brown (SANDY-SILT) topsoil fill with 0 to 5% gravel, little to some sand, trace to little organic matter, trace clay and asphalt remnants, firm, massive soil structure, (ML). 1.0 | Coarse silty topsoil fill with little to some sand, trace to little organic matter, trace clay, gravel, and asphalt remnants to 1.0 feet over coarse silty glacial till with some sand, trace to little gravel to auger refusal. |
| | 2 | 0 | 50/1 | | | | | | Dry brown to light brown (SANDY-SILT) with 5 to 15% gravel, some sand, trace clay, compact to very dense, massive soil structure, (ML). 2.2 | |
| | | | | | | | | | Advanced augers to refusal at 2.2 feet. | No water at completion. |
| 5 | | | | | | | | | | Note: Advanced bore hole with 2 1/4" ID x 6" OD hollow stem auger casing with continuous split spoon sampling to auger refusal at 2.2 feet. Bore hole was backfilled with cuttings to ground surface upon completion. |
| 10 | | | | | | | | | | |
| 15 | | | | | | | | | | |
| 20 | | | | | | | | | | |

**N=NUMBER OF BLOWS TO DRIVE 2" SPOON 12" WITH 140lb. WEIGHT FALLING 30" PER BLOW**

**Logged By:** Kyle Shearing

**EARTH DIMENSIONS, INC.**

*Geotechnical and Environmental Drilling | Wetland Delineations and Consulting*

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**EDI Job Code:** 15E15b **Hole Number** B-2-23 **Surface Elevation:**

**Project Name:** 2495 Wehrle Drive **Northing:** **Easting:**

**Project Location:** Town of Amherst, Erie County, NY **Date Started:** 10/9/2023

**Client:** Glynn Group Engineering & Architecture, PLLC **Date Completed:** 10/9/2023

| Depth (ft) | SN | Rec (in) | Blows on Sampler 0/6 | 6/12 | 12/18 | 18/24 | N | LITH | Description and Classification | Water Table and Remarks |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 16 | 4 | 4 | 12 | 50/2 | 16 | | Dry dark brown (SAND-SILT-CLAY) topsoil with little to some sand, trace to little clay and organic matter, firm, weakly granular soil structure, (ML-CL). 0.5 | Silty topsoil with little to some gravel, trace to little clay and organic matter to 0.5 feet over silty glacial till with little sand and clay, trace to little gravel, trace organic matter to 1.0 feet over coarse silty glacial till with some sand, little to some limestone and chert stone fragments, trace clay to auger refusal. |
| | 2 | 0 | 50/1 | | | | | | Dry dark brown to grayish brown (SAND-SLIT-CLAY) with 5 to 15% mostly angular gravel, little sand and clay, trace organic matter, firm, massive soil structure, (ML-CL). 1.0 | No water at completion. |
| 5 | | | | | | | | | Dry light brown gravelly (SANDY-SILT) with 15 to 30% mostly limestone and chert stone fragments, some sand, trace clay, compact to very dense, massive soil structure, (ML) tending toward (GM),(SM). 2.2 | Note: Advanced bore hole with 2 1/4" ID x 6" OD hollow stem auger casing with continuous split spoon sampling to auger refusal at 2.2 feet. Bore hole was backfilled with cuttings to ground surface upon completion. |
| 10 | | | | | | | | | Advanced augers to refusal at 2.2 feet. | |
| 15 | | | | | | | | | | |
| 20 | | | | | | | | | | |

**N=NUMBER OF BLOWS TO DRIVE 2" SPOON 12" WITH 140lb. WEIGHT FALLING 30" PER BLOW**

**Logged By:** Kyle Shearing

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**EDI Job Code:** 15E15b **Hole Number** B-3-23 **Surface Elevation:**

**Project Name:** 2495 Wehrle Drive **Northing:** **Easting:**

**Project Location:** Town of Amherst, Erie County, NY **Date Started:** 10/9/2023

**Client:** Glynn Group Engineering & Architecture, PLLC **Date Completed:** 10/9/2023

| Depth (ft) | SN | Rec (in) | Blows on Sampler 0/6 | 6/12 | 12/18 | 18/24 | N | LITH | Description and Classification | Water Table and Remarks |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 24 | 2 | 2 | 4 | 12 | 6 | | Moist dark brown (SANDY-SILT) topsoil with some sand, trace to little organic matter, trace clay, very loose, granular soil structure, (ML). | Coarse silty topsoil with some sand, trace to little organic matter, trace clay to 1.0 feet over coarse silty glacial till with little to some sand, trace clay, gravel, and organic matter to auger refusal. |
| 1.0 | | | | | | | | | | |
| | 2 | 4 | 50/5 | | | | | | Moist to dry light brown (SANDY-SILT) with 5 to 10% gravel, little to some sand, trace clay and organic matter, compact to very dense, massive soil structure, (ML). | No water at completion. |
| 2.5 | | | | | | | | | Advanced augers to refusal at 2.5 feet. | Note: Advanced bore hole with 2 1/4" ID x 6" OD hollow stem auger casing with continuous split spoon sampling to auger refusal at 2.5 feet. Bore hole was backfilled with cuttings to ground surface upon completion. |
| 5 | | | | | | | | | | |
| 10 | | | | | | | | | | |
| 15 | | | | | | | | | | |
| 20 | | | | | | | | | | |

**N=NUMBER OF BLOWS TO DRIVE 2" SPOON 12" WITH 140lb. WEIGHT FALLING 30" PER BLOW**

**Logged By:** Kyle Shearing

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**EDI Job Code:** 15E15b **Hole Number** B-4-23 **Surface Elevation:**

**Project Name:** 2495 Wehrle Drive **Northing:** **Easting:**

**Project Location:** Town of Amherst, Erie County, NY **Date Started:** 10/9/2023

**Client:** Glynn Group Engineering & Architecture, PLLC **Date Completed:** 10/9/2023

| Depth (ft) | SN | Rec (in) | Blows on Sampler 0/6 | 6/12 | 12/18 | 18/24 | N | LITH | Description and Classification | Water Table and Remarks |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 12 | 12 | 22 | 18 | 10 | 40 | | Dry brown (SAND-SILT-CLAY) topsoil with little sand and clay, trace to little organic matter, very stiff, weakly granular soil structure, (ML-CL). 0.4 | Silty topsoil with little sand and clay, trace to little organic matter to 0.4 feet over silty glacial till with some limestone and chert stone fragments, little to some sand, trace to little clay with an occasional cobble to auger refusal. |
| | 2 | 8 | 22 | 50/3 | | | | | Dry brown very gravelly (SAND-SILT-CLAY) with 40 to 60% mostly limestone and chert stone fragments, occasional cobble, little to some sand, trace to little clay, hard, massive soil structure, (GC). 3.0 | No water at completion. |
| 5 | | | | | | | | | Advanced augers to refusal at 3.0 feet. | Note: Advanced bore hole with 2 1/4" ID x 6"OD hollow stem auger casing with continuous split spoon sampling to auger refusal at 3.0 feet. Bore hole was backfilled with cuttings to ground surface upon completion. |
| 10 | | | | | | | | | | |
| 15 | | | | | | | | | | |
| 20 | | | | | | | | | | |

**N=NUMBER OF BLOWS TO DRIVE 2" SPOON 12" WITH 140lb. WEIGHT FALLING 30" PER BLOW**

**Logged By:** Kyle Shearing

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**EDI Job Code:** 15E15b **Hole Number** B-5-23 **Surface Elevation:**

**Project Name:** 2495 Wehrle Drive **Northing:** **Easting:**

**Project Location:** Town of Amherst, Erie County, NY **Date Started:** 10/9/2023

**Client:** Glynn Group Engineering & Architecture, PLLC **Date Completed:** 10/9/2023

| Depth (ft) | SN | Rec (in) | Blows on Sampler 0/6 | 6/12 | 12/18 | 18/24 | N | LITH | Description and Classification | Water Table and Remarks |
|---|---|---|---|---|---|---|---|---|---|---|
| 0–2 | 1 | 24 | 2 | 6 | 8 | 10 | 14 | | Moist dark brown (SAND-SILT-CLAY) topsoil with little to some sand, trace to little clay and organic matter, very loose, granular soil structure, (ML-CL). (0.5) | Silty topsoil with little to some sand, trace to little clay and organic matter to 0.5 feet over slity glacial till with little sand and gravel, trace to little clay to 2.5 feet over limestone stone fragments to auger refusal. |
| | | | | | | | | | Moist to dry light brown (SAND-SILT-CLAY) with 10 to 20% gravel, little sand, trace to little clay, very stiff, massive soil structure, (ML-CL). (2.5) | No water at completion. |
| 2–2.7 | 2 | 8 | 12 | 50/2 | | | | | Gray limstone stone fragments, moderately hard. (2.7) | Note: Advanced bore hole with 2 1/4" ID x 6" OD hollow stem auger casing with continuous split spoon sampling to auger refusal at 2.7 feet. Bore hole was backfilled with cuttings to ground surface upon completion. |
| | | | | | | | | | Advanced augers to refusal at 2.7 feet. | |

Depth scale: 5, 10, 15, 20

**N=NUMBER OF BLOWS TO DRIVE 2" SPOON 12" WITH 140lb. WEIGHT FALLING 30" PER BLOW**

**Logged By:** Kyle Shearing

# Appendix B

## Project Location Plan

Climate Controlled Storage
2495 Wehrle Drive
Amherst, New York

**Geotechnical Engineering Report**

GGEA 23-1214

October 26, 2023


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www.glynngroup.com


| | | | |
|---|---|---|---|
| PROJECT: 2495 WEHRLE DRIVE | | | |
| SUBJECT: PROJECT LOCATION PLAN | | | |
| CLIENT: 416 HOMEZ, INC. | | | |
| PROJ. NO.: 23-1214 | SCALE: 1" = 400' | DATE: 09.14.23 | BY: GEL |

SHEET NO.: S1

# Appendix C

## Subsurface Exploration Plan

Climate Controlled Storage
2495 Wehrle Drive
Amherst, New York

**Geotechnical Engineering Report**

GGEA 23-1214

October 26, 2023


GGE
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415 S. TRANSIT STREET
LOCKPORT, NEW YORK 14094
VOICE (716) 625 - 6933 / FAX (716) 625-6983
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PROJECT: 2495 WEHRLE DRIVE

SUBJECT: BORING LOCATION PLAN

CLIENT: 416 HOMEZ, INC.

| PROJ. NO.: | SCALE: | DATE: | BY: |
|---|---|---|---|
| 23-1214 | 1" = 100' | 09.14.23 | GEL |

SHEET NO.: S2

# Appendix D

## Seismic Site Class and Design Category

Climate Controlled Storage
2495 Wehrle Drive
Amherst, New York

**Geotechnical Engineering Report**

GGEA 23-1214

October 26, 2023

**Project :** 2495 Wehrle Drive
**Client:** 416 Homez, Inc.
**GGEA # :** 23-1214
**Date:** 11.26.23

B-5

| Depth (di) | N Value (Ni) |
|---|---|
| 2.7 | 14 |
| 97.3 | 100 |

ASCE 7-16
Equation 20.4-2

$$N = \frac{100}{\sum \frac{d_i}{N_i}}$$

$N$ = **85.8**

ASCE 7-16
Table 20.3-1

$N$ > 50 **SITE CLASS C**

2020 NYS Code Section 1613

| | | |
|---|---|---|
| $F_a$ = | 1.3 | Site coefficient Table 1613.2.3(1) |
| $F_v$ = | 1.5 | Site coefficient Table 1613.2.3(2) |
| $S_s$ = | 0.172 | Mapped accelerations short periods Figure 1613.2.1(1) |
| $S_1$ = | 0.045 | Mapped accelerations 1 sec period Figure 1613.2.1(2) |
| $S_{MS}$ = | 0.224 | Maximum spectral response short periods equation 16-36 |
| $S_{M1}$ = | 0.068 | Maximum spectral response 1 sec periods equation 16-37 |
| $S_{DS}$ = | 0.149 | Design spectral response short periods equation 16-38 |
| $S_{D1}$ = | 0.045 | Design spectral response 1 sec periods equation 16-39 |

Risk Category = II Table 1604.5

**Seismic Design Category =** **A** Table 1613.2.5(1)
Table 1613.2.5(2)

# Appendix E

## Fill Specifications

Climate Controlled Storage
2495 Wehrle Drive
Amherst, New York

**Geotechnical Engineering Report**

GGEA 23-1214

October 26, 2023

# Common Fill

All soil and/or crushed rock material with the exception
of those with USCS classifications of
CH, MH, OH, and OL.

Place material in 12 inch lifts (loose) and compact to 90 % of modified proctor (ASTM D-1557) maximum dry density within 2 % of optimum moisture content.

The material should be compacted using a smooth drum vibratory roller (for large applications) or a reversible vibratory plate tamper (for smaller applications) such as a Bomag BPR 35/60 or similar (weight > 400 lbs).

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# Structural Fill

All soil and/or crushed rock material with the exception of those with USCS classifications of CH, MH, OH, OL, ML and CL-ML.

Place material in 9 inch lifts (loose) and compact to 95 % of modified proctor (ASTM D-1557) maximum dry density within 2 % of optimum moisture content.

The material should be compacted using a smooth drum vibratory roller (for large applications) or a reversible vibratory plate tamper (for smaller applications) such as a Bomag BPR 35/60 or similar (weight > 400 lbs).

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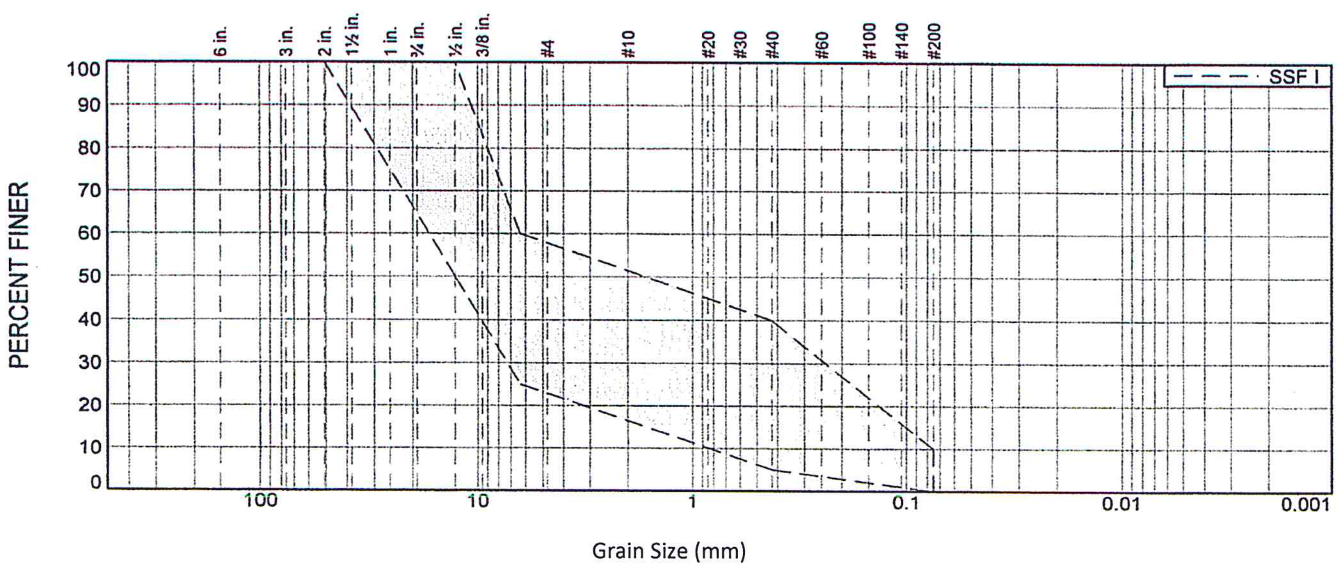
# Select Structural Fill

NYSDOT Item No. 304.12 Subbase Course, Type 2

| Sieve Size | Required % Passing |
|---|---|
| 2 inch | 100 |
| 1/4 inch | 25 - 60 |
| No. 40 | 5 - 40 |
| No. 200 | 0 - 10 |




In addition to the above specification, material shall also meet the well graded qualifications of ASTM D-2487, such that USCS classification = GW, GW-GM, SW or SW-SM.

Place material in 9 inch lifts (loose) and compact to 95 % of modified proctor (ASTM D-1557) maximum dry density within 2 % of optimum moisture content.

The material should be compacted using a smooth drum vibratory roller (for large applications) or a reversible vibratory plate tamper (for smaller applications) such as a Bomag BPR 35/60 or similar (weight > 400 lbs).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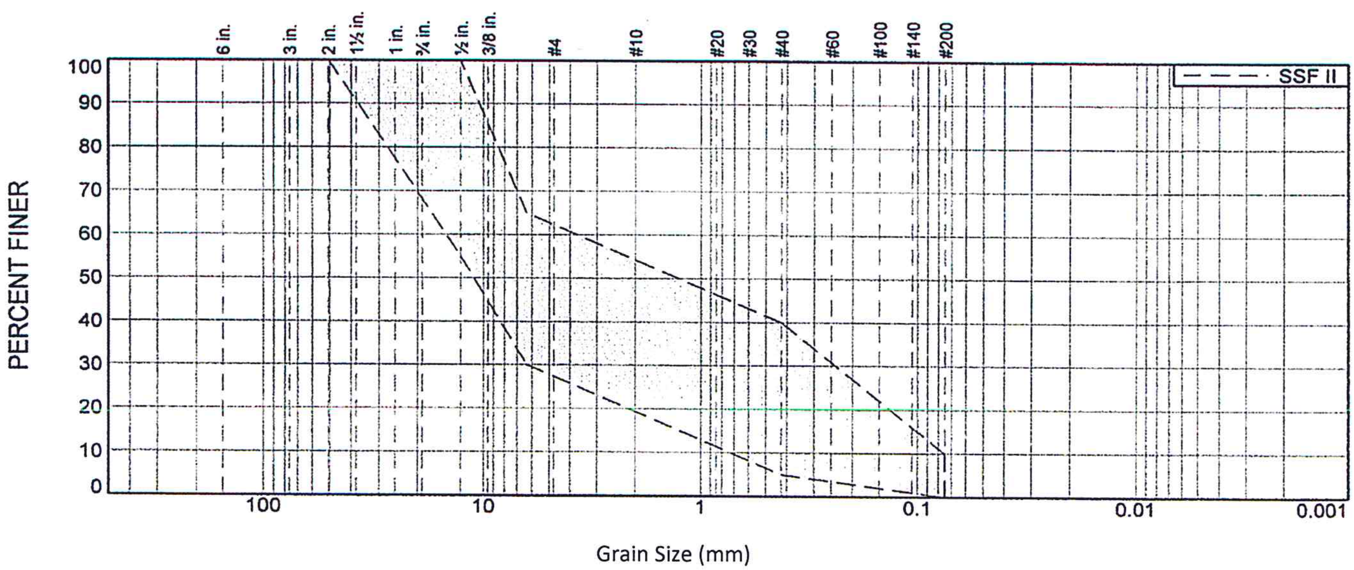
# Select Structural Fill

NYSDOT Item No. 304.14 Subbase Course, Type 4

| Sieve Size | Required % Passing |
|---|---|
| 2 inch | 100 |
| 1/4 inch | 30 - 65 |
| No. 40 | 5 - 40 |
| No. 200 | 0 - 10 |




In addition to the above specification, material shall also meet the well graded qualifications of ASTM D-2487, such that USCS classification = GW, GW-GM, SW or SW-SM.

Place material in 9 inch lifts (loose) and compact to 95 % of modified proctor (ASTM D-1557) maximum dry density within 2 % of optimum moisture content.

The material should be compacted using a smooth drum vibratory roller (for large applications) or a reversible vibratory plate tamper (for smaller applications) such as a Bomag BPR 35/60 or similar (weight > 400 lbs).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