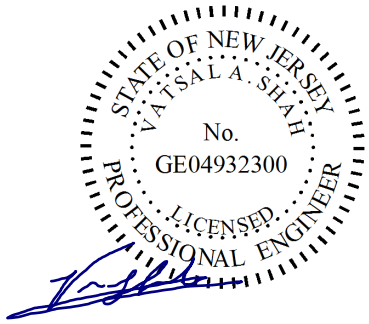
GEOTECHNICAL RECOMMENDATIONS REPORT

Clinton Commons

Town of Clinton, Hunterdon County,
New Jersey



September 6, 2023

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1 Executive Summary

ANS Geo, Inc. is pleased to present this Geotechnical Recommendations Report in accordance with the Soils and Foundations Chapter of the New Jersey Edition of the 2021 International Building Code (NJ-IBC 2021) to Concept Engineering Consultants (Client) for use in the design and construction of the Clinton Commons townhomes and commercial development project in the Town of Clinton, Hunterdon County, New Jersey. The contents of this report summarize the data gathered from our most recent subsurface investigation program which took place from August 21 to August 23, 2023, at the project site, previous subsurface and geophysical investigation data, and our foundation recommendations for the proposed new structures.

The 28.06-acre project site is located at Lot 32 of Block 14, in the Town of Clinton. The site is bounded by Route 31 to the North, seven private residences along George's Place to the East, seven private residences, Clinton Presbyterian Church and Riverside Cemetery along Center Street to the South, and South Branch River to the West. An approximately 0.38-acre lot, occupied by a single-family residential home, lies at the end of Central Avenue, which reaches approximately 300 feet towards the center of the project site from Center Street to the South.

Previously, ANS Geo was retained by Concept Engineering Consultants to conduct a geophysical investigation to evaluate potential karst conditions at the proposed Clinton Commons project site and complete a Phase II Carbonate Area District Report per the Municipal Zoning Regulations of the Town of Clinton. This investigation and report followed investigations of this same project site completed by Engineering and Land Planning Associates in June 2009 and April 2020. ANS Geo completed 12 test borings and a percussion probe program to corroborate the previously obtained data. The Phase II Geophysical Investigation Report and its appendices as previously submitted to the Client and the Town of Clinton are provided as **Appendix F** to this report.

Considering the previous investigation report and the Client's need for geotechnical recommendations per NJ-IBC 2021, ANS Geo developed an investigation plan, consolidated our findings, and made use of all past and recent data to generate the recommendations found in this report, which are summarized below:

a) Following an Electrical Resistivity Imaging survey of the project site performed by ANS Geo in February and March of 2022, a total of 12 borings and ten (10) percussion probes were advanced within the project site, also by ANS Geo, in May and September of 2022. Soils encountered generally consisted of silty gravels and sands with varying amounts of silts, clays, residual soil, and weathered bedrock. The bedrock surface varied from existing grade to 23 feet below ground surface (BGS). The geophysical testing identified three regions of the project site which were most likely to have had karstic formations; these regions were then investigated and considered as unlikely to have conditions problematic to construction based on borings and percussion probes, however, a Karst Mitigation Plan shall be prepared and used during construction for any unforeseen karst conditions encountered during construction. The Karst Mitigation Plan shall be prepared prior to construction.

b) Seven additional borings were advanced at the project site specifically within in the footprint of proposed structures and in proximity to the proposed utility near Center Street by ANS Geo between August 21 and 23, 2023. Soils encountered generally consisted of silty gravels and silt with varying amounts of sands and clays, underlain by residual soil, clays, and weathered bedrock. The results of this investigation and the depth to bedrock are consistent with past investigations, with the deepest bedrock surface encountered at 25 feet BGS.

c) Groundwater was not observed in any of the test borings, though geologic mapping indicates groundwater may be encountered within six feet of the ground surface in a Northwestern portion of the site that does not underly any proposed construction.

d) The Seismic Site Classification based on completed borings and ASCE 7-10 mapping is **Seismic Site Class C.**

e) A retaining wall has been proposed to manage the changes in elevation throughout the development. The allowable bearing capacity for the proposed retaining wall is 1,000 psf.

f) The allowable bearing capacities and bearing resistance for structures varies throughout the project site due to the range of depths to bedrock and strength properties of surficial soils. Therefore, ANS Geo has identified the Regions 1, 2, and 3 of the project site as distinct in terms of the bearing material and calculated values for construction. Helical piles may be considered as an alternative foundation option for food market building. See Section 8 for foundation recommendations and Figure 3 depicting these portions of the project site, and **Appendix A** for the same figure. See the table below for a summary of bearing values across the project site.

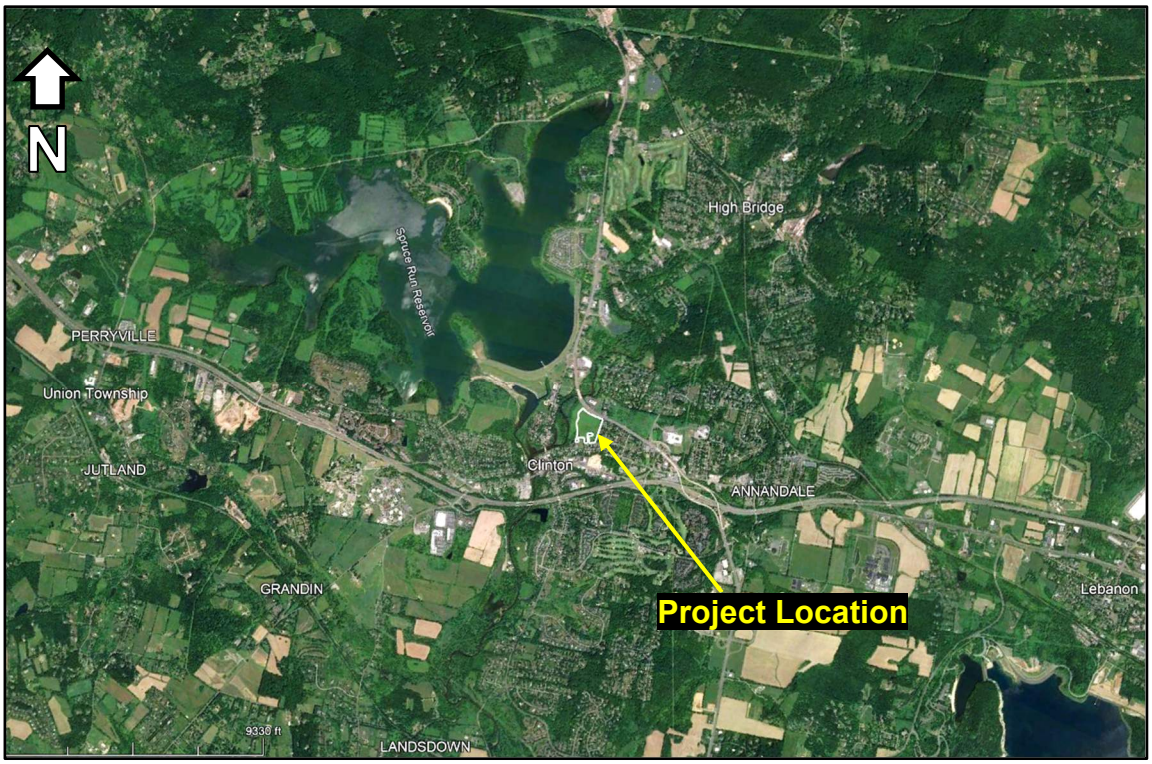
Footing Type	Bearing Stratum	Ultimate Bearing Capacity (psf)	Allowable Bearing Capacity (psf)
Region 1: Townhome Buildings 1, 3, 6, 7, 8, 9, 10			
Strip (Wall) (B = 3 ft, L = 30 ft)	Competent Bedrock	8,000	4,000
Spread (Column) (B = 5 ft, L = 5 ft)			
Region 2: Commercial Restaurant, Townhome Buildings 2, 4, 5			
Strip (Wall) (B = 3 ft, L = 30 ft)	Crushed Stone/ Structural Fill Over Dense Gravels	6,000	2,500
Spread (Column) (B = 5 ft, L = 5 ft)			
Region 3			
Townhome Building 11/Gas Station			
Strip (Wall) (B = 1.5 ft, L = 30 ft)	Crushed Stone/ Structural Fill Over Gravel and Clay	6,000	3,000
Spread (Column) (B = 3 ft, L = 3 ft)		6,000	3,000
Food Market			
Strip (Wall) (B = 1.5 ft, L = 30 ft)	Crushed Stone/ Structural Fill Over Gravel and Clay	6,000	3,000
Spread (Column) (B = 3 ft, L = 3 ft)		6,000	3,000
Mat Footing (150 ft by 150 ft)		1,000	750

2 Project Understanding

Concept Engineering Consultants was selected to provide engineering services for the development of the 28.06-acre open farm space located at Block 14, Lot 32, at the end of Central Avenue in the Town of Clinton in Hunterdon County, New Jersey. This development includes the construction of the following 14 structures of the following approximate square-footages: a food market of 22,000 square feet, a convenience store of 5,700 square feet with a gas station, a restaurant or retail building of 2,600 square feet, one residential building of 3,750 square feet, four residential buildings of 5,000 square feet each, five residential buildings of 7,500 square feet each, and one residential building of 8,750 square feet, which combine for 56 townhomes. ANS Geo has been retained by the Client to provide geotechnical engineering services in support of this development. In addition, infrastructural elements including but not limited to roadways and parking lots, utilities, a retaining wall system, and a stormwater infiltration basin are proposed as part of the proposed construction. While a bearing capacity and construction recommendations for the proposed retaining wall are provided in this report, detailed designs for each of these infrastructural elements will be performed by others or presented in a separate memorandum or report from this recommendations report. As preliminary borings and Phase II Carbonate Rock Area reporting have both been completed, this report shall serve to further our investigation of the subsurface conditions at key locations through the project site, and to provide foundation recommendations for the proposed new construction.

The location of the project site is shown in Figure 1 and Figure 2 in different scales for better understanding. One boring location plan which depicts the seven borings drilled in August 2023, and an Investigation Location Plan, which depicts the location of all as-drilled borings and all previous geophysical investigations at the project site, including the seven borings drilled in August of 2023, are provided as **Appendix A**.

Figure 1: Project Vicinity Map



(Source: Google Earth accessed on August 10, 2023)

Figure 2: Project Site Map

(Source: Google Earth accessed on August 10, 2023)

3 Methodology

3.1 Test Borings

ANS Geo retained Boring Brothers, Inc. of Egg Harbor Township, New Jersey to advance test borings. The first mobilization occurred between May 11th and May 13th, 2022, the second mobilization occurred between September 12th and September 20th, 2022, and the third mobilization occurred between August 21st and August 23rd, 2023. An as-drilled boring location plan, depicting all borings logged by ANS Geo at the project site to-date, is shown in the Investigation Location Plan, provided in **Appendix A**.

A CME-55LC track-mounted drill rig was used to collect soil samples using the Standard Penetration Test (SPT) Method in accordance with ASTM Standard D1586 – Standard Test Method for SPT and Split-Barrel Sampling of soils. Soil samples were collected continuously from existing ground surface to the weathered rock as indicated by refusal of the split-spoon or ten feet below ground surface and at five-foot intervals thereafter, whichever occurred first. Each split-spoon was driven using 140 pounds of hammer force with a free fall of 30 inches. Blow counts were recorded at 6-inch intervals over a total driven depth of 24 inches for each SPT sample. The N-Value is defined as the number of blows required to drive the split-spoon sampler through a 12-inch interval after the initial 6 inches of split-spoon penetration. SPT split-spoon refusal is when 50 blows per foot (bpf) are required to drive the split-spoon over a 6-inch interval.

Upon encountering split spoon refusal, mud rotary drilling techniques were used to advance the boring to bedrock where rock coring began. Either minimum five or ten feet of rock coring were completed using an NQ-size diamond bit in each boring. Recovered rock cores were visually classified, and calculation of recovery and Rock Quality Designation (RQD) were completed in the field.

The locations of test borings, which were part of this most recent August 2023 exploration program, proposed by ANS Geo and confirmed by Concept Engineering Consultants and a representative of the Town of Clinton, were located within the footprints of the proposed food market (two borings), townhome buildings 1, 2, 5, 11, and in close proximity to the sewer along Central Avenue. Test borings were overseen and logged by an ANS Geo representative under the direction of a Professional Engineer licensed in the State of New Jersey. Upon completion the boreholes were backfilled to existing grade with soil cuttings and bentonite chips. Typed test boring logs, including soil sampling and rock coring, are provided in **Appendix B**. Below is a table summarizing the August 2023 test boring results.

Table 1: August 2023 Subsurface Exploration Summary

Borehole ID	Approx. Existing Elevation (feet)	Approx. Proposed Elevation (feet)	Approx. Elevation Difference (feet)	Proposed Boring Depth (feet)	Encountered Top of Rock (feet)	Total Depth of Rock Coring (feet)	Borehole Termination Depth (feet)
B-02	240	237	3	50	20	5	25
B-14	245	242	3	50	14	5	19
B-16	232	235	-3	50	25	5	30
B-17	275	270	5	50	7	10	17
B-18	276	273	3	50	9	5	14
B-19	255	255	0	50	8	5	12
B-20	246	250	-4	50	11	10	21

4 Geology and Subsurface Conditions

A desktop review of surficial geology and bedrock geology maps and reports made available by the United States Geological Survey (USGS) was completed prior to conducting our field investigation. The mapping indicates that the predominant bedrock formation within the project boundary is the Allentown Formation consisting primarily of Dolomite. The Lower Beekmantown Group is mapped within the southwestern portion of the site and also consists of Dolomite. Due to the degree of folding and fracturing of the bedrock according to mapping, bedrock may generally present a high degree of dipping. Additionally, a thrust-fault runs northwest to southeast along the southwest boundary of the project site. In addition, Concealed Faults, Anticlines, and Synclines of bedrock masses are mapped within the project site.

ANS Geo additionally reviewed the surficial geology in the project area using the National Resource Conservation Service (NRCS) Web Soil Survey. The NRCS mapping indicates that the upper five feet of soil within the project area consists primarily of the Duffield silt loam unit, which is comprised of silts and clays and shallow unweathered bedrock. The full NRCS soil report is provided as **Appendix C.**

4.1 Previous Geophysical Investigations

In the previous investigations, six Electrical Resistivity Imaging (ERI) tests were performed to develop profiles of the density of subsurface materials across the project site. The data was used to characterize

the type, depth, and extent of potential karst features at select representative locations. In ANS Geo's previously submitted report dated December 23, 2022, the soil profile was evaluated to be dense with a generally high bedrock surface. However, a number of possible pockets of "Epi-Karst" were identified; these are zones of weathered bedrock or loose gravels, appearing as pockets of low-resistivity material as deep as 30 feet BGS and other higher-resistivity material. Additionally, one range of soil imaged by ERI-04 yielded a resistivity of over 10,000 Ohmmeters, indicating a possible soil-filled, karstic anomaly. ANS Geo completed a Geotechnical Investigation Program between May 2022 and September 2022 consisting of 12 test borings and ten percussion probes located to target these possible karstic conditions.

This geophysical program approached all significant portions of the site which were likely to have karst formations and—using information from borings and percussion probes—encountered generally competent soil and rock. It should be noted that within areas of mapped carbonate bedrock formations, there remains a possibility that karst conditions may be encountered during construction. ANS Geo has provided a general understanding of the subsurface conditions to gauge the impact which karst geohazards may or may not have on the design, siting, and construction of the proposed project. Despite our thorough investigations, there may be karstic conditions at locations within the site that were not explicitly sampled, and may only be encountered during construction.

4.2 Previous Standard Penetration Tests by ANS Geo

ANS Geo performed 12 borings at the project site between May and September 2022. Table 3 below lists each boring with the approximate elevation as-drilled based on client provided contour mapping, against proposed elevation at the same location, and bedrock depth information.

Table 2: Phase II Test Borings: May and September 2022

Borehole ID	Approx. Existing Elevation (feet)	Approx. Proposed Elevation (feet)	Approx. Elevation Difference (feet)	Proposed Boring Depth (feet)	Encountered Top of Rock (feet)	Total Depth of Rock Coring (feet)	Borehole Termination Depth (feet)
B-01	235	241	-6	40	17	10	27
B-03	253	256	-3	40	20	10	30
B-04	222	224	-2	40	23	10	33
B-05	246	246	0	40	4	10	14
B-06	269	264	5	40	10	30	40
B-07	245	244	1	40	5	10	15
B-08	264	263	1	40	10	10	20
B-09	249	242	7	40	3	10	13
B-10	258	256	2	40	10	10	20
B-12	260	261	-1	40	10	10	20
B-13	235	225	10	40	10	10	20
B-15	253	252	1	40	4	10	14

4.3 Generalized Subsurface Profile

ANS Geo has provided the generalized subsurface conditions below based upon the observations made during ANS Geo's recent and past geotechnical investigations. The general subsurface conditions on site consisted of overburden soil over bedrock.

4.3.1 Region 1

The subsurface conditions encountered throughout borings B-05, B-07, B-09, B-15, and B-17 were used to provide a generalized profile below. The test boring logs provided in **Appendix B** and **Appendix F**, should be reviewed for location-specific subsurface conditions.

- **SANDS AND GRAVELS WITH FINES (SM, SP):**
  Medium dense to very dense coarse to fine sands with various amounts of silt and gravel was encountered in all borings from existing ground surface to seven feet BGS in all borings. The N-Values of soils in this stratum ranged from seven to over 50 bpf. Bedrock was encountered beneath this stratum.

4.3.2 Region 2

The subsurface conditions encountered throughout borings B-07, B-08, B-18, and B-19 were used to provide a generalized profile below. The test boring logs provided in **Appendix B** and **Appendix F**, should be reviewed for location-specific subsurface conditions.

- **OVERBURDEN SANDS AND FINE-GRAINED SOILS (SM, SP, ML, SM, SC):**
  Medium dense to dense coarse to fine sands and soft to very stiff silts with various amounts of gravel and clay were encountered from existing ground surface to depths ranging from one to five feet BGS. The N-Values of soils in this stratum ranged from four to over 50 bpf.

- **SANDS AND GRAVELS WITH FINES (GM, SM, GP, SP):**
  Medium dense to very dense coarse to fine gravels and sands with various amounts of silt was encountered from below the overburden sands stratum to ten feet BGS. Standard penetration tests in this layer encountered N-values over 50 bpf or refusal. Bedrock was encountered beneath this stratum.

4.3.3 Region 3

The subsurface conditions encountered throughout borings B-01, B-02, B-03, B-04, B-14, and B-16 were used to provide a generalized profile below. The test boring logs provided in **Appendix B** and **Appendix F**, should be reviewed for location-specific subsurface conditions.

- **OVERBURDEN SILTS (ML, SM):**
  Stiff to hard silts of various sand and gravel contents were encountered from existing ground surface to depths ranging from one to five feet BGS. The N-Values of soils in this layer ranged from eight to over 48 bpf.

- **SANDS AND GRAVELS WITH FINES (GM, SM, GP, SP):**
  Medium dense to very dense coarse to fine gravels and sands with various amounts of silt was encountered in all borings from existing ground surface or below the overburden sands stratum to as deep as 20 feet BGS. The N-Values of soils in this layer ranged from seven to over 50 bpf.

- **CLAYS AND SILTS (CL, ML):**
  A layer of medium stiff to stiff clays and silts with varying amounts of sand and gravel was encountered in borings B-1, B-2, B-4, B-6, and B-16 between the sands and gravels and bedrock. This stratum ranged from three to ten feet in thickness. The N-Values of soils in this layer ranged from five to over 11 bpf.

- **WEATHERED ROCK:**
  Weathered bedrock material was encountered underneath the clays and silts or sands and gravels in all borings. This stratum ranged from one to seven feet in thickness and was about four feet thick on average. As split spoon sampling typically resulted in refusal in this layer, this soil can be described as very dense recoveries of coarse to fine gravel, with varying amounts of sand, silt, and clay. Bedrock was encountered beneath this stratum.

4.3.4 Bedrock

In all 19 borings, a minimum of five feet rock core was completed. Dolomitic Limestone was encountered beneath the sand and gravel layer or the weathered rock between three and 25 feet BGS in all borings. Bedrock was cored and classified as fine to medium-grained, slightly to highly weathered, and weak to very strong with very closely to widely spaced discontinuities. All borings were terminated in this layer after one to four rock cores, between 13 feet and 40 feet BGS. The rock core recovery ranged from 0% to 100% and RQD was calculated to range from 0% to 97%.

4.3.5 Proposed Sewer Location by Central Ave

The subsurface conditions encountered in borings B-15 and B-20 were used to provide information about the depth to bedrock. Refusal was encountered after about three feet of overburden silts and sands in both borings. In B-15, two rock core runs were advanced from four feet to 14 feet BGS. In boring B-20, ten feet of rock coring were performed from 11 to 21 feet BGS. Please see Table 1 and Table 2 for information on the approximate existing and proposed elevations in the vicinity of B-20 and B-15 respectively. The test boring logs provided in **Appendix B** and **Appendix F**, should be reviewed for location-specific subsurface conditions.

4.4 Groundwater Conditions

Groundwater was not observed in borings that were performed in August 2023. This may be due to fractured dolomitic limestone, and existing natural channels through where groundwater can flow through. Although groundwater was not encountered in our subsurface investigation, the NRCS Soil Report, presented as **Appendix C**, indicated a region West of the where the proposed foodmarket may be built as having groundwater at depth of half a foot to six feet below ground surface. Measures should be taken during construction to address potential groundwater-related challenges. Groundwater levels are also expected to fluctuate based on temperature and seasons.

4.5 Frost Depth

The frost line is the depth where the ground is expected to freeze during colder temperatures. Any footings or utilities constructed above frost line can experience frost heaving when the ground freezes and thaws. The frost depth for Hunterdon County is 36 inches BGS; therefore, ANS Geo recommends all footings be installed below the frost depth of 36 inches BGS.

5 Laboratory Results

Representative soil samples and rock core sections collected during our May 2022 investigation and our August 2023 investigation were submitted to ANS Consultants' accredited materials testing laboratory. A summary of the sieve laboratory testing results is provided in Table 3, index laboratory test results in Table 4, and rock compressive strength tests in Table 5. Laboratory results are included as two separate sets of lab tests within **Appendix D**.

Table 3: Sieve Analysis Results

Sieve Analysis (ASTM D6913)						
Boring ID	**Sample ID**	**Depth (feet)**	**% Gravel**	**% Sand**	**% Fines**	**% Moisture**
B-08	S-2	2-4	0	9.3	90.7	24.1
B-08	S-4	2-4	24.4	48.6	27.0	9.3
B-10	S-3	4-6	3.6	35.8	60.6	21.5
B-12	S-2	2-4	38.4	30.3	31.3	5.9
B-12	S-3	4-6	10.8	42.7	46.5	7.0
B-16	S-3	4-6	39.4	34.7	25.9	9.3
B-17	S-2	2-4	38.2	39.7	22.1	7.7
B-18	S-3	4-6	31.3	48.7	20.0	12.2
B-19	S-2	2-4	28.0	37.9	34.1	9.1

Table 4: Atterberg Limits Testing

Boring ID	Sample ID	Depth (feet)	Liquid Limit	Plastic Limit	Plastic Index	Moisture Content	USCS Classification
B-02	S-7	15-17	37	19	18	20.6	CL
B-06	S-2	2-4	46	25	21	16.4	CL
B-10	S-2	2-4	41	24	17	26.7	CL
B-16	S-8	20-22	33	18	15	19.8	CL

Table 5: Rock Strength Testing

Boring ID	Core Run	Depth (feet)	Unconfined Compressive Strength (psi)	Unit Weight (pcf)
B-02	R-1	20'8"-21'3"	6,012	171.8
B-05	R-1	7'7"-8'3"	2,620	174.7
B-12	R-1	12'2'-12'7"	2,689	170.7
B-15	R-1	6'5"-7'1"	4,112	170.1
B-18	R-1	9'2"-9'7"	13,965	172.7

5.1 Modified Proctor Compaction Testing

To assist with the design of pavement for the multiple proposed permanent roadways and parking lots, ANS collected one bulk sample of approximately four gallons of soil between the existing ground surface to three feet BGS between borings B-18 and B-19 for Modified Proctor Testing for the optimum moisture contents in accordance with ASTM D1557. The test, completed by ANS, yielded an optimum moisture content of 14.6%. See Table 6 for a summary below. Detailed Modified Proctor Testing results are included in **Appendix D**.

Table 6: Modified Proctor Test Results

Location ID	Sample Depth (ft)	Optimum Moisture (%)	Maximum Dry Density (pcf)
Bulk S-1 (B-18 to B-19)	0-3	14.6	110.8

6 Seismic Site Classification

Based on the observations recorded during our subsurface investigation program and utilizing the N-Value method in accordance with the AASHTO, NJDOT, and as prescribed in Chapter 20 of ASCE 7-16, **Site Class C** (very dense soil and soft rock) can be assumed as the average condition across this project site.

The seismic ground motion values for this classification were obtained from the USGS Seismic Hazard Maps, referenced in ASCE 7-16 Standard, and provided as **Appendix E**, and are as follows:

- 0.2 second spectral response acceleration, S_S= 0.22 g
- 1 second spectral response acceleration, S_1= 0.047 g
- Maximum spectral acceleration for short periods, S_{MS}= 0.22 g
- Maximum spectral acceleration for a 1-second period, S_{M1}= 0.06
- 5% damped design spectral acceleration at short periods, S_{DS}= 0.15
- 5% damped design spectral acceleration at 1-second period, S_{D1}= 0.04

Liquefaction is caused by a fast increase of pore water pressures in loose and soft soils. The site predominantly consists of 2 to 20 feet of medium dense to dense gravels over bedrock. Therefore, there is a low risk of soil liquefaction induced by significant seismic activity, and it is not a concern at this project site. Seismic support data is provided in **Appendix E**.

7 Stormwater Basin Recommendations

In the West side of the project site, a stormwater infiltration basin has been proposed. Infiltration of stormwater into the existing ground shall be permitted as long as the estimated quantity of water infiltrating into the existing ground is not higher than the current quantity in terms of volume and flow of water. Due to the possible “Epi-Karst” and soil in-filled layers among the weathered bedrock found throughout the site, the stormwater basin shall only infiltrate as per the pre-development conditions. If there is an increase in flowrate, velocity, or volume of water infiltrating into the ground surface, karst conditions may be developed within this formation.

The stormwater basin should be designed by a licensed Civil Engineer in the state of New Jersey and should adhere to local laws and regulations regarding stormwater including New Jersey Department of Environmental Conservation standards.

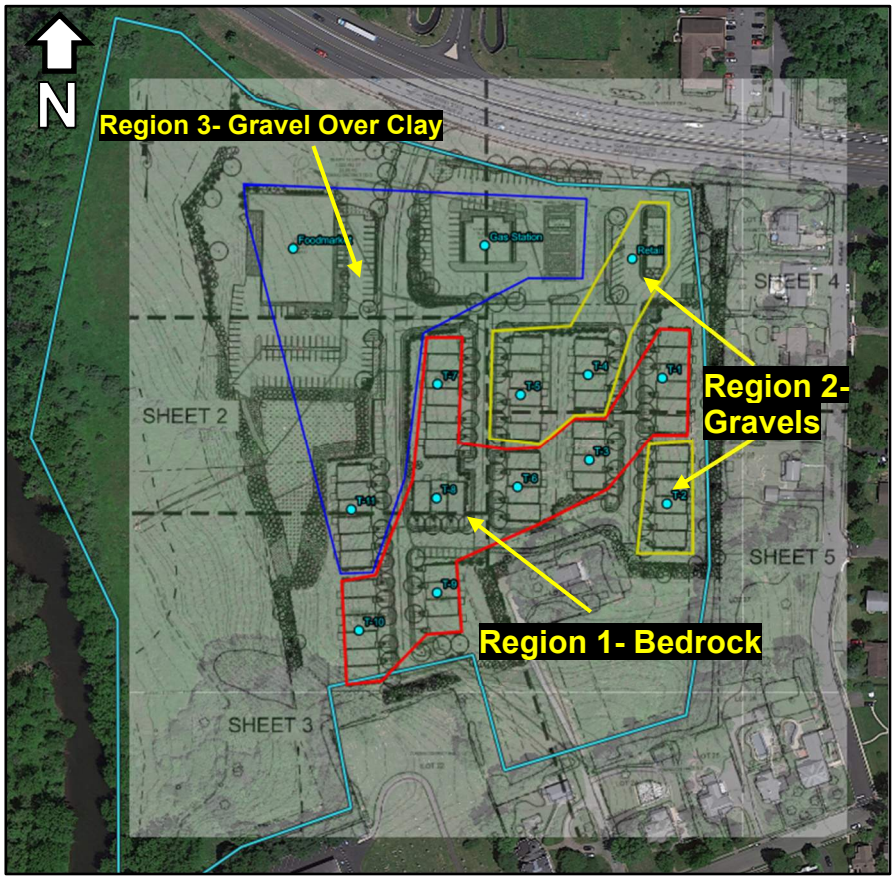
8 Foundation Recommendations

Based on the encountered subsurface conditions, ANS Geo recommends shallow foundations for all fourteen of the proposed new buildings. Assuming a maximum spread (column) foundation with five (5) by five (5) feet in dimensions, and a typical wall (strip) footing of a maximum of three (3) feet wide, ANS Geo calculated bearing capacities and settlement for footings earing on three different materials based on the different soil qualities and bedrock depth encountered within the proposed footprint of each given structure. ANS Geo also considered the elevation at which each structure is likely to be founded. Note that the elevations provided for the borings as-drilled are approximate, and will not lead to precise comparisons with the proposed new construction, but provide an approximation. It should be noted that soil strata varied widely throughout the project site.

Based on the subsurface investigation, native material throughout the project site has silt content greater than ten percent. ANS Geo recommends over-excavating a minimum of twelve (12) inches of existing native material and backfilling with twelve (12) inches of compacted 3-inch sized crushed stone or recommended structural fill as per Table 9 in Section 9.3. In the case of either type of footing bearing on bedrock, the subgrade shall be prepared as specified in Section 9.3.

ANS Geo has calculated spread (column) footings with assumed maximum dimensions bearing on all three bearing surfaces, but strip (wall) footings of a maximum width of three feet may only be used in Region 1, on bedrock, and a maximum width of 1.5 feet in Region 2, over gravel. Strip footings bearing on gravel over clay in Region 3 were calculated by ANS Geo to cause primary consolidation in excess of one inch. Therefore, maximum dimensions of spread and strip footings are smaller than Region 1 and Region 2. See Figure 3 below for a depiction of each region within the project site defined by estimated bearing material. Note that the regions identified in the figure below are approximate and may vary upon excavation. It is possible that a different material than indicated by the figure below may be encountered at foundation subgrade depth during construction. Therefore, subgrade shall be inspected and confirmed ANS Geo's licensed professional engineer prior to constructing footing.

Figure 3: Bearing Surface Regions



(Source: Google Earth accessed on August 29, 2023, E&LP Clinton Commons Minor Subdivision Plan December 3, 2020)

Assuming each of the proposed new buildings' footings will be bearing at a depth of at least four (4) feet BGS on the soil or bedrock as listed below, the following allowable bearing capacities shall be considered in accordance with the 2021 New Jersey Edition of the International Building Code. The recommended Allowable Bearing Capacities are based on a tolerable limit of one inch of total settlement for column footings, one inch of total settlement for wall footings, one-half inch of differential settlement, and our experience with the encountered subsurface conditions on the project site. Due to the coarse nature of the soils observed onsite in Region 1 and Region 2 in Figure 3 below, it is anticipated that the majority of settlement under Townhome Buildings 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, and the retail building will be immediate. Given that the drained and cohesive nature of soils located in Region 3, the majority of the settlement under Townhome building 11, the Food Market and the Gas Station is expected to result from primary consolidation.

Table 7: Bearing Capacities for Proposed Structures By Bearing Material

Footing Type	Bearing Stratum	Ultimate Bearing Capacity (psf)	Allowable Bearing Capacity (psf)
Region 1: Townhome Buildings 1, 3, 6, 7, 8, 9, 10			
Strip (Wall) (B = 3 ft, L = 30 ft)	Competent Bedrock	8,000	4,000
Spread (Column) (B = 5 ft, L = 5 ft)			
Region 2: Commercial Restaurant, Townhome Buildings 2, 4, 5			
Strip (Wall) (B = 3 ft, L = 30 ft)	Crushed Stone/ Structural Fill Over Dense Gravels	6,000	2,500
Spread (Column) (B = 5 ft, L = 5 ft)			
Region 3			
Townhome Building 11/Gas Station			
Strip (Wall) (B = 1.5 ft, L = 30 ft)	Crushed Stone/ Structural Fill Over Gravel and Clay	6,000	3,000
Spread (Column) (B = 3 ft, L = 3 ft)		6,000	3,000
Food Market			
Strip (Wall) (B = 1.5 ft, L = 30 ft)	Crushed Stone/ Structural Fill Over Gravel and Clay	6,000	3,000
Spread (Column) (B = 3 ft, L = 3 ft)		6,000	3,000
Mat Footing (150 ft by 150 ft)		1,000	750

ANS Geo recommends using an Allowable Bearing Capacity as recommended in the Table 7 for all shallow foundations bearing corresponded surfaces or crushed stone or structural fill to avoid any excessive differential settlement.

Based on our interpretation of the subsurface conditions observed during each of our investigation programs, ANS Geo recommends that the geotechnical design parameters, as depicted in Table 8, be considered for this project site including the design of proposed retaining walls.

Table 8: Geotechnical Design Parameters

Depth* (feet)	Material	Total Unit Weight (lb/ft^3)	Effective Unit Weight (lb/ft^3)	Internal Friction Angle	Cohesion (lb/ft^2)	Modulus of Vertical Subgrade (k) (lb/in^3)	K_0 (At-rest earth pressure coefficient)	K_a (Active earth pressure coefficient)	K_p ** (Passive earth pressure coefficient)
TBD	Structural Fill	130	130	33°	0	115	0.455	0.294	1.70
0' – 4'	Sandy Silt	105	105	27°	0	60	0.546	0.376	1.33
4' – 11'	Silty Gravel	115	115	29°	0	80	0.515	0.347	1.44

11’ – 16’	Silty Clay	110	110	0°	900	25	1	1	1
16’ – 20’	Weathered Bedrock	125	125	33°	0	80	0.455	0.294	1.70
18’+	Bedrock	170	155	35°	0	160	0.426	0.271	1.85

*As existing and proposed grades vary throughout the site, these layers are approximate. Silty Clay was not encountered in Region 1-Bedrock or in Region 2-Gravel.

**All passive earth pressure coefficients have been reduced by a safety factor of 2.

8.1 Deep Foundation Option for Region 3 - Helical Pile Recommendations

Given that existing subsurface soil at the project site consists of medium stiff clays and silts, ANS Geo has analyzed helical piles as an alternative foundation option. This analysis was performed using DeepFND, a product of DeepEX LLC. Based on borings B-2 and B-16, which were located to be in the footprint of the proposed foodmarket, ANS Geo analyzed a 15-foot-long helical shaft with 2.88 inches in diameter, 0.3 inches in wall thickness, with three 20-inch diameter helical plates of 0.5 inches in thickness, each with 2-foot spacings. This pile has a torque-correlation factor of 5,000 lbs^{-1}.

The results of our analysis on helical pile include that the estimated maximum installation torque would be 6.42 kip-feet to support **an unfactored axial load of 15,000 lbs** and **an unfactored lateral load of 2,000 lbs**. The lateral capacity is for lateral deflection less than 1-inch at top of helical pile. If a lateral capacity greater than 2,000 lbs is required, an 8-inch diameter (O.D.) x 0.625-inch-thick steel casing is recommended to be installed from below the foundation to 10 feet BGS. The annulus between the steel casing and helical pile should be grouted with concrete of a minimum compressive strength of 4,000 psi. Using this configuration will allow the lateral capacity to be increased.

Helical piles should have spacing of a minimum of three times the diameter (3D) of the largest helix to minimize group action, which for the proposed helical pile configuration will be 60 inches (3 multiplied by 20 inches). The minimum number of piles required to support a given pile cap or column load should be evaluated and confirmed by the project’s Structural Engineer.

8.2 Retaining Wall Design

ANS Geo understands that a retaining wall has been proposed to be constructed as part of the development at the project site. At the time of this geotechnical recommendations report, ANS Geo has received plans depicting a proposed typical retaining wall to encompass the proposed stormwater basin. A global stability analysis has been excluded from this report; however based on available information, the provided the geotechnical design parameters in Table 8 above, including the earth pressure coefficients, may be used to calculate the stability of a retaining wall at the project site at the retaining wall design engineer’s own risk. A bearing capacity of 1,000 psf may be used for the foundation of the retaining wall. ANS Geo notes that a plan of the proposed retaining walls relative to project site layout and our geotechnical investigation so far is not available. Given that the wall may extend through the project site to regions of soil with different strength parameters, and other retaining walls may experience different loading conditions and bear on soil of different bearing capacities, it is noted that the given bearing capacity is preliminary and should be recalculated one the precise locations of all proposed retaining walls has been established.

Should additional information regarding the proposed retaining wall become available, ANS Geo should be given the opportunity to generate an additional memorandum including an analysis of global stability of the wall.

9 Construction Recommendations

9.1 Excavation

Depending on the proposed foundation configurations and the degree of earthwork, excavation will extend deeper than four feet below grade. Excavations deeper than four feet should be shored or sloped and benched unless the excavation is made entirely in stable rock, in accordance with OSHA regulations, for safe working conditions within the excavations. ANS Geo recommends any sloped excavations should be no steeper than 1H:1V (horizontal to vertical) given OSHA's Soil Classification Outline for granular Type B soils. All OSHA soil classifications should be field determined by the contractor's "competent person" prior to excavation. Any proposed shoring systems should be designed by the contractor's "competent person", be certified by a Professional Engineer licensed in the State of New Jersey and should be submitted for review.

It should be noted that weathered bedrock will likely be encountered before competent bedrock. Therefore, The Contractor should be prepared to excavate bedrock to the top of competent bedrock as per a licensed Geotechnical Engineer's approval.

9.1.1 Soil And Bedrock Disposal

ANS Geo notes that, per a previously submitted Earthwork Analysis Plan, 20,400 cubic yards of native soil and bedrock material are expected to be cut. This material shall either be removed from the site or reused as general backfill. This material is not suitable for structural fill and therefore shall not be placed under or adjacent load-bearing structures. All material to be removed from the project site should be tested at an accredited materials testing laboratory for environmental contamination prior to delivery to any landfill.

9.1.1 Excavation of Rock

Foundation depths across the site may range from one foot to seven feet BGS, and utilities may be installed as deep as 18 feet BGS including the proposed sewer line near Center Street in the South portion of the site. Previous investigations indicated that rock may be encountered as shallow as at existing grade to three feet BGS within this area; therefore, it is expected that removal of rock will be required to install the foundations as currently proposed. During excavation of rock, it is likely and probable that rock excavation methods will need to be used, which may consist of the use of a hydraulic ram/rock breaker, line drilling, pre-splitting, or similar methods. Under all circumstances, rock excavation techniques will likely deteriorate the intact, in-place quality of the rock mass and create additional fractures and joints during this work. At no time should controlled or uncontrolled blasting techniques be performed for rock removal.

9.2 Dewatering

Though ground water was not encountered during any of ANS Geo's borings at the project site, the presence of groundwater and surface runoff should be expected during the construction phase of the project. Wet conditions should be prepared for and managed using localized sump-and-pump or similar techniques to allow for concrete foundation construction in-the-dry. The contractor should be sure to grade the surface as necessary to divert stormwater away from any open excavation to the extent possible. To prevent impacting water quality in the nearby Round Brook Stream, a temporary runoff diversion system may need to be designed to allow surface runoff to continue downstream while avoiding potential sediment pollution. Water discharge should be managed in compliance with applicable state and local regulations

9.2.1 Groundwater Runoff Maintenance

During construction, natural groundwater recharge and discharge rates should be maintained to prevent adverse behaviors of mapped “weathered bedrock Epi-Karst”, “preferential drainage conduits”, “highly weathered zones”, and “deep soil-infilled dissolution pockets”. Contractors should adhere to Best Management Practices for Stormwater Pollution Prevent Plans (SWPPP), which may involve installation of double-layered silt fencing and installation of hay bales or coir logs along the edges of construction zones to reduce runoff velocity.

9.3 Subgrade Preparation and Compaction

During the process of forming and pouring of shallow foundations on native soil above the bedrock surface, ANS Geo recommends over-excavating the subgrade by at least twelve (12) inches, lining the exposed material with a geotextile separation fabric, and bringing the subgrade back up to the design foundation elevation with ¾-inch crushed stone or compacted structural fill as specified within Table 9.

Table 9: Recommended Gradation of Structural Fill

Sieve Size	Percent Passing
3-inch	100
1 ½-inch	60 – 100
No. 4	30 – 60
No. 200	0 – 10

Native material beneath the separation fabric should be inspected for unsatisfactory conditions such as standing water, frozen soil, organics, protruding cobbles or boulders, or deleterious materials. Should any unsatisfactory conditions exist within the native subgrade, the excavation should be undercut an additional six (6) inches prior to placement of the geotextile fabric. Structural fill material should be placed in loose lifts not exceeding eight (8) inches in height and be compacted to at least 95 percent of its Modified Proctor Density in accordance with ASTM D1557.

For construction of shallow foundations bearing on bedrock, the bedrock subsurface shall be cleaned of all soil debris and free-standing water prior to concrete pouring. Weathered bedrock and any residual soil shall be removed off the bedrock subgrade prior to constructing the foundation formwork. The bedrock subgrade shall be inspected and approved by a Geotechnical Engineer licensed in New Jersey prior to formwork installation.

Since our evaluation is based on the results of our geotechnical investigation and rock unconfined compressive strength determined from laboratory testing of intact rock specimens, ANS Geo recommends that a full-time geotechnical representative from our firm be on-site to monitor rock excavation and preparation activities, and to perform inspection of the proposed foundation subbase and rock surface prior to the construction of formwork of foundations on rock. Should it be determined that field conditions reveal weaker, more jointed or weathered rock than that considered during our evaluation, it may be necessary to remediate the subgrade to accommodate the proposed foundations. This remediation may include, but is not limited to, the installation of rock anchors, removal of additional rock, the use of a mud-mat or compacted, crushed clean stone, or selective removal of jointed and weathered rock to provide a clean, non-yielding surface. In addition, it is possible that during excavation, areas of weathered rock, soil seams or infilling within joints, or residual soil from weathered rock may be encountered at the proposed foundation subgrade level. This material will need to be removed, and the area cleaned, prior to casting

of foundations. ANS Geo recommends that this top of rock surface be visually inspected prior to placement and casting of foundations.

Please note, ANS Geo's evaluation is limited to the structural foundations and does not include the retaining wall, adjacent roadways, or global or local slope stability evaluation. In addition, our evaluation was to determine the adequacy of the soil and rock to accommodate compression (bearing capacity) loads transmitted from the foundation structures. ANS Geo has not completed structural design to confirm the proposed size, configuration, location, or geometry of each structure, or to determine the adequacy of each footing. Should the design of the structure and foundations change, ANS Geo should be provided the opportunity to review and revise our technical evaluation, as necessary, to reflect current design conditions. In addition, as our technical evaluation has been based on our observations and several assumptions of subsurface conditions, ANS Geo has recommended periodic site visits to confirm and validate our technical evaluation. In the event ANS Geo is not retained to make periodic site visits, our recommendations will be considered invalid and must be re-evaluated without prejudice to the need for mitigation or post-construction remedial measures.

9.3.1 Helical Pile Installation Recommendations

The installation of the helical piles can be performed using a pile rig or excavator equipped with a torque meter. Helical pile installation does not require water. Due to the variation in soil quality within the pile installation depth across Region 3 as depicted in Figure 3 in Section 8 and in **Appendix A**, the minimum installation torque(s) may not be achieved at the given installation depth(s). If this occurs for any instance of either type of pile, the Contractor may continue installation by adding lengths of to the top of the given helical pile. The design of these additional pile lengths should be confirmed by the project's Structural Engineer. Once the target minimum installation torque is achieved, the excess pile length may be cut to locate the pile head at the desired elevation. Helical pile installation logs shall be maintained by a qualified Geotechnical Engineer on site recording the final torque reading and installation depth.

These helical pile recommendations are based on our understanding of the project subsurface conditions and assumed structural loads. Should existing conditions at the project site differ from what was encountered in ANS Geo completed borings B-01 through B-20, as provided in **Appendix B** and **Appendix F**, ANS Geo should be given the opportunity to review the applicability of the collected information and modify our recommendations, as needed.

9.3.2 Retaining Wall Foundation Preparation

Based on preliminary plans of the proposed retaining wall and ANS Geo's previous geotechnical explorations, the wall is expected to bear predominantly on gravel underlain by drained clay. However, given that our investigation did not encompass the entire extent of the proposed footprint of the wall, contractors should prepare to mitigate conditions which may reduce the bearing capacity of the soil. In the case of encountering saturated soil at the subgrade level, the bearing capacity of the wall may need to be recalculated due to reduced effective stresses in the soil. In the case of encountering the clay layer at the subgrade rather than medium dense gravels as in region 3 as depicted in Figure 3 of Section 7 above, the contractor should over-excavate

9.3.3 Bedrock Strength Reduction Mitigation

Special precautions must be taken by the contractor to ensure that the strength of the Dolomitic Limestone, the primary type of bedrock found within the project site, is not reduced unnecessarily by preventable natural processes. This type of bedrock is prone to advanced weathering when exposed to the atmosphere. Once the bedrock is excavated to the required construction depth, the bedrock must be

covered by plastic mats or other forms of air-tight and water-tight protection. These protections must be placed on the bedrock subgrade immediately after a licensed Geotechnical Engineer performs the subgrade inspection for each structure, to prevent a potential reduction in bearing resistance. These protections shall also only be removed for the construction of formwork and shall then only be removed immediately prior to pouring of foundations.

9.4 Backfilling and Re-use of Native Soils

ANS Geo notes that native soils have greater than ten (10) percent of fine-grained soils (clays and silts) on site. The native soils cannot be used as structural fill underneath any foundations or load-bearing structures. This soil may be re-used across the project area as fill in landscaped areas, and above any proposed underground utilities.

It should be noted that any boulders or buried objects encountered during excavation shall not be used as backfill adjacent or above installed foundations, or other buried site features. ANS Geo recommends importing a clean granular material with less than 15 percent fine-grained content for use as general backfill. General backfill material should be screened of any cobbles, boulders, and any particles larger than three (3) inches in diameter and should not be used beneath any load-bearing structures. General backfill should be placed in loose lift thicknesses not exceeding 12 inches and be compacted to at least 90 percent of its Modified Proctor Density (ASTM D1557). Soil used as backfill should not be handled when frozen and should be free of excessive moisture, organics, and deleterious material. Removal of all cut material that will not be reused as landscaping fill shall be the responsibility of the contractor.

9.5 Recommended Services

It is recommended that ANS Geo be retained to provide continuous observation and geotechnical engineering services during the excavation and foundation construction phases including rock subgrade inspection. The purpose of this is to observe compliance with the design, project specifications and recommendations, and to facilitate design changes in the event that subsurface conditions differ from those anticipated prior to the start of construction.

9.6 Karst Mitigation Plan

While ANS Geo has performed a thorough geophysical investigation of the potential karstic conditions within the project site and submitted a Phase II Geophysical Investigation Report in compliance with the Carbonate Rock Area article of the Town of Clinton Municipal Codes, it remains a possibility that karstic conditions will be encountered during construction. In the event of karst conditions are encountered during construction, work should be halted, and the Town of Clinton and the Town Engineer shall be notified immediately. Additional erosion and sedimentation controls should be implemented to prevent surface water runoff into the encountered karst feature. A geotechnical representative or technical professional familiar with karst terrain should perform as investigation of the karst feature and conduct a detailed evaluation. If deemed necessary, the representative or professional shall develop a specific mitigation plan for the karst feature, to be implemented prior to the resumption of excavation or construction activities.

All contractors whose work will bring them in to contact with soil, bedrock, or large volumes of water onsite—including but not limited to those responsible for excavation, foundation construction, and installation of utilities—should be made to acknowledge the nature of the Carbonate Rock Area of Clinton Municipal Code, what to do if karstic conditions are encountered, the guidelines to follow which will help avoid issues related to karst formations, and the consequences of not adhering to said guidelines. If retained for Geotechnical Construction Oversight and subgrade inspection, ANS Geo will develop guidelines for contractors to observe when working on the project site.

Finally, ANS Geo recommends that a construction monitoring program consisting of survey markers in key potential karst-condition areas shall be placed prior to any construction activities, including the process of removal of the up to 20,400 cubic yards of soil and rock from the project site. The purpose of the survey markers would be to establish pre-, during, and post-construction soil movement, if any, and to understand if site activities such as rock removal are de-stabilizing the intact rock, and to determine if remedial measures are necessary.

10 Limitations

ANS Geo notes that the findings and recommendations presented within this Geotechnical Recommendations Report are based on our investigation programs conducted in May and September of 2022, and between August 21 and August 23, 2023, and our engineering judgment. Contractors intending to use this report and test boring information may do so at their own risk. Unless specifically indicated to the contrary in this report, this does not address environmental considerations (if any), which may affect development at the project site. Should the scope of the project or proposed site layout change, ANS Geo should be given the opportunity to review the applicability of the collected information and modify our recommendations, as needed.

Note, as discussed, geotechnical investigations and recommendations for the proposed Block Retaining Wall have not been provided in this report. Analysis of this site element may be performed as part of a separate memorandum or report and is not part of the scope of this Geotechnical Recommendations Report.

We sincerely appreciate the opportunity to support this project, and please feel free to contact us should you have any questions regarding the findings of this Report.

Appendix A

Investigation Location Plans
And Bearing Surface Region Plan

ANS GEO

Client:

CONCEPT ENGINEERING CONSULTANTS, PA

ANS INVESTIGATION LOCATION PLAN CLINTON COMMONS DEVELOPMENT

TOWN OF CLINTON, NEW JERSEY

Legend

- Boring Locations August 2023
- Boring Locations May 2022, September 2022
- As-Drilled Percussion Probe Locations
- As-Completed Geophysics Locations

0 75 150 ft

Absolute Scale: 1 inch = 150 feet
Scale at 11" x 17" AS SHOWN

Prepared by: Anton Luz
Date: August 24, 2023
Drawing Number: ILP-2 Rev.0

ANS GEO

Client:

CONCEPT ENGINEERING CONSULTANTS, PA

AS-DRILLED BORING LOCATION PLAN CLINTON COMMONS DEVELOPMENT

TOWN OF CLINTON, NEW JERSEY

Legend

Project Boundary

As-Drilled Borings

0 75 150 ft

Absolute Scale: 1 inch = 150 feet
Scale at 11" x 17" AS SHOWN

Prepared by: Anton Luz
Date: August 24, 2023
Drawing Number: BLP-2 Rev.0

ANS GEO

Client:

CONCEPT ENGINEERING CONSULTANTS, PA

PROPOSED SITE PLAN WITH BEARING SURFACE REGIONS CLINTON COMMONS DEVELOPMENT

TOWN OF CLINTON, NEW JERSEY

SHEET 1
SHEET 2
SHEET 3
SHEET 4
SHEET 5

Foodmarket
Gas Station
Retail
T-1
T-2
T-3
T-4
T-5
T-6
T-7
T-8
T-9
T-10
T-11

Legend

- Location of Proposed Structure
- Region 1 - Bearing On Bedrock
- Region 2 - Bearing On Gravel
- Region 3 - Bearing On Gravel And Clay

0 75 150 ft

Absolute Scale: 1 inch = 150 feet
Scale at 11" x 17" AS SHOWN

Prepared by: Anton Luz
Date: August 29, 2023
Drawing Number: BS-1 Rev.0

Appendix B

Test Boring Logs

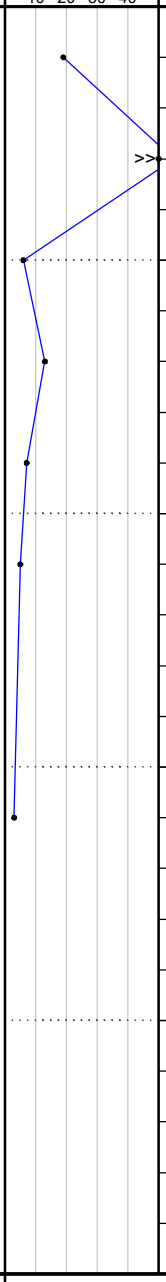
Soil Boring Log

B-02

Client:	Concept Engineering Consultants	**Drilling Firm:**	Boring Brothers, Inc	**Coordinates:**	40.642517 , -74.9076
Project:	Clinton Commons	**Drill Crew:**	Matt Daniel / David Osuch / Matt Murtagh	**Horiz. Datum:**	WGS 84
Location:	Clinton, NJ	**Boring Start:**	08/23/23 09:00 AM	**Elevation:**	Grade
Inspector:	Anton Luz / Janivel Leo	**Boring End:**	08/23/23 10:10 AM	**Vert. Datum:**	N/A

Rig Model:	CME-55LC	**Sampler Type:**	Split Spoon	**Casing Type:**	Steel
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	20 feet
Drill Method:	Mud Rotary	**Sampler I.D.:**	1.375 inches	**Casing I.D.:**	4 inches
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	140 pounds
Drilling Fluid:	Bentonite	**Hammer Fall:**	30 inches	**Hammer Fall:**	30 inches

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)	Drilling & Strata Notes
	S-1	15	3 3 16 8	19	SM	Medium dense, Brown to Gray Silty coarse to fine SAND, little coarse to fine Gravel, Moist (SM)					Began boring B-02 S-1, 0-2 feet BGS. Occasional roots encountered.
	S-2	12	14 33 32 13	> 50	SP	Very dense, Brown to Gray coarse to fine SAND, some coarse to fine Gravel, little Silt, Moist (SP)					S-2, 2-4 feet BGS.
5	S-3	0	2 3 3 2	6		NO RECOVERY					S-3, 4-6 feet BGS, No Recovery. Installed casing to 4 feet BGS. Drilled to 4 feet BGS. Gray wash with gravel.
	S-4	4	4 4 9 3	13	GM	Medium dense, Brown Silty coarse to fine GRAVEL, trace coarse to fine Sand, Wet (GM)					S-4, 6-8 feet BGS.
	S-5	0	10 5 2 2	7		NO RECOVERY					S-5, 8-10 feet BGS, No Recovery. Installed casing to 8 feet BGS. Drilled to 8 feet BGS. Brown wash.
10	S-6	6	2 3 2 5	5	GP	Very loose, Brown to Gray coarse to fine GRAVEL, trace Silt, Wet (GP)					S-6, 10-12 feet BGS. Installed casing to 15 feet BGS.Drilled to 15 feet BGS. Chatter at 11 feet BGS.
15	S-7	3	2 1 2 2	3	CL	Soft, Reddish brown CLAY, little coarse to fine Gravel, trace Silt, Wet (CL)	L	M	.8	1	S-7, 15-17 feet BGS.Driller advanced to 20 feet BGS past possible weathered rock material.Installed casing to 20 feet BGS. Drilled to 20 feet BGS. Brown wash.
20						Coring Rock at 20 feet BGS See Rock Coring Log					



In-Borehole Water Levels

Date / Time	Reading Event	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

BGS = Below Ground Surface
Ground water not observed.

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

▽ = ATD Water Level (At Time of Drilling)
▼ = AD Water Level (After Drilling - Short Term)
▼ = EOD Water Level (End of Drilling - Long Term)

Rock Coring Log

B-02

Client:	Concept Engineering Consultants	**Drilling Firm:**	Boring Brothers, Inc	**Coordinates:**	40.642517 , -74.9076
Project:	Clinton Commons	**Drill Crew:**	Matt Daniel / David Osuch / Matt Murtagh	**Horiz. Datum:**	WGS 84
Location:	Clinton, NJ	**Boring Start:**	8/23/2023 9:00:00 AM	**Elevation:**	Grade
Inspector:	Anton Luz / Janivel Leo	**Boring End:**	8/23/2023 10:10:00 AM	**Vert. Datum:**	N/A

Rig Model:	CME-55LC	**Casing Type:**	Steel	**Core Barrel Type:**	NQ	**Core Bit Type:**	Diamond
Rig Type:	Track	**Casing Length:**	20 feet	**Core Barrel Length:**	5 feet	**Core Bit Length:**	6 inches
Drill Method:	Mud Rotary	**Casing I.D.:**	4 inches	**Core Barrel I.D.:**	3 inches	**Core Bit I.D.:**	1.88 inches

Depth (ft)	Avg Core Rate (min/ft)	Run No.	Recovery (in. / %)	RQD (in. / %)	Hardness	Weathering	Graphic Log	Visual Classification	Depth (ft.)	Discontinuities: Type	Dip Angle	Roughness	Weathering	Aperture	Infilling	Drilling & Strata Notes
	5							LIMESTONE, Gray Medium grain, Slightly weathered, Strong, Partly Open spacing.	20.58	S	0	S,R	DS	PO	L	Began core run R-1 at 20 feet BGS Tan wash 20 to 23 feet BGS Applied Hydrochloric Acid to Limestone discontinuity, no Effervecsent reaction occured. Light tan wash 23 to 25 feet BGS
	4:09															
	4:13	R-1	60 100%	20 33%	R4	SL										
	4:22								23.66	F	10	S,Sm	DS		DO	
	5:05															
25								End of boring at 25 feet BGS. Backfilled boring to grade with soil cuttings and bentonite chips.								
30																
35																

In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

▼ = Water Level (if observed)

Ground water not observed.

BGS = Below Ground Surface

Figure B-02.1
B-02; R-1 (Dry)

Figure B-02.2
B-02; R-1 (Wet)

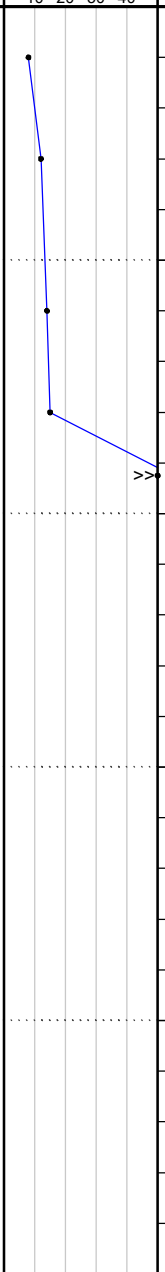
Soil Boring Log

B-14

Client:	Concept Engineering Consultants	**Drilling Firm:**	Boring Brothers, Inc	**Coordinates:**	40.642517 , -74.9076
Project:	Clinton Commons	**Drill Crew:**	Matt Daniel / David Osuch / Matt Murtagh	**Horiz. Datum:**	WGS 84
Location:	Clinton, NJ	**Boring Start:**	08/22/23 12:20 PM	**Elevation:**	Grade
Inspector:	Anton Luz / Janivel Leo	**Boring End:**	08/23/23 08:50 AM	**Vert. Datum:**	N/A

Rig Model:	CME-55LC	**Sampler Type:**	Split Spoon	**Casing Type:**	Steel
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	15 feet
Drill Method:	Mud Rotary	**Sampler I.D.:**	1.375 inches	**Casing I.D.:**	4 inches
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	140 pounds
Drilling Fluid:	Bentonite	**Hammer Fall:**	30 inches	**Hammer Fall:**	30 inches

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)	Drilling & Strata Notes
	S-1	12	1 5 3 7	8	ML	Medium stiff, Reddish brown Sandy SILT, little coarse to fine Gravel, trace Clay, Moist (ML)	M	M	2	2.5	Began boring B-02 S-1, 0-2 feet BGS. Occasional roots encountered.
	S-2	8	2 5 7 8	12	SM	Medium dense, Yellowish red to Brownish yellow Silty coarse to fine SAND, trace Clay, trace coarse to fine Gravel, moist (SM)					S-2, 2-4 feet BGS.
5	S-3	4	9 6 8 6	14	GM	Medium dense, Yellowish brown Silty coarse to fine GRAVEL, some coarse to fine Sand (GM)					Installed casing at 4 feet BGS. Drilled to 4 feet BGS. Gray wash at 3 feet BGS. Tan wash at 3.5 feet BGS. Chatter at 3 feet BGS from Rig. S-3, 5-7 feet BGS.
	S-4	15	4 6 9 10	15	SC	Stiff, Brownish yellow coarse to fine SAND, some Clay, little coarse to fine Gravel, trace Silt, Moist (SC)	M	H	-	-	S-4, 7-9 feet BGS. PP and TV testing invalid due to Gravel.
	S-5	0	50/5	> 50		NO RECOVERY					S-5, 9-9.4 feet BGS. Refusal and No Recovery. Installed casing to 9 feet BGS. Drilled to 9 feet BGS. Gray to tan wash
10						BOULDER, Gray Medium grained, Highly weathered, Very strong, Very Closely spaced discontinuities					Continued drilling through possible boulder at 9.4 feet BGS using rock coring bit. Large amount of water loss from 10-14 feet BGS.Core bit advanced to 10 feet BGS over approximately 3 minutes, then suddenly advanced to 13 feet BGS in 25 seconds. Continued drilling to 14 feet BGS. Possible soil-infilled zone beneath boulder. Due to water loss drilling resumed on 8/23/23. Drilled through weathered rock from 14 to 15 feet BGS using tricone roller bit.
15						Coring Rock at 15 feet BGS See Rock Coring Log					
20											



In-Borehole Water Levels

Date / Time	Reading Event	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

BGS = Below Ground Surface
Ground water not observed.

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

▽ = ATD Water Level (At Time of Drilling)
▼ = AD Water Level (After Drilling - Short Term)
▼ = EOD Water Level (End of Drilling - Long Term)

Rock Coring Log

B-14

Client:	Concept Engineering Consultants	**Drilling Firm:**	Boring Brothers, Inc	**Coordinates:**	40.642517 , -74.9076
Project:	Clinton Commons	**Drill Crew:**	Matt Daniel / David Osuch / Matt Murtagh	**Horiz. Datum:**	WGS 84
Location:	Clinton, NJ	**Boring Start:**	8/22/2023 12:20:00 PM	**Elevation:**	Grade
Inspector:	Anton Luz / Janivel Leo	**Boring End:**	8/23/2023 8:50:00 AM	**Vert. Datum:**	N/A

Rig Model:	CME-55LC	**Casing Type:**	Steel	**Core Barrel Type:**	NQ	**Core Bit Type:**	Diamond
Rig Type:	Track	**Casing Length:**	15 feet	**Core Barrel Length:**	5 feet	**Core Bit Length:**	6 inches
Drill Method:	Mud Rotary	**Casing I.D.:**	4 inches	**Core Barrel I.D.:**	3 inches	**Core Bit I.D.:**	1.88 inches

Depth (ft)	Avg Core Rate (min/ft)	Run No.	Recovery (in. / %)	RQD (in. / %)	Hardness	Weathering	Graphic Log	Visual Classification
	1:05							
	0:30							
	5:14	R-2	24 40%	14 23%	R5	M		LIMESTONE, Gray Fine grain, Moderately weathered, Very strong, Extremely wide to Open spacing.
	4:13							
	4:04							
20								End of boring at 20 feet BGS. Backfilled boring to grade with soil cuttings and bentonite chips.
25								
30								

Depth (ft.)	Discontinuities: Type	Dip Angle	Roughness	Weathering	Aperture	Infilling
15.42	F	0	S,R	DS	EW	FE
15.83	S	45	P,Sm	DS	O	QZ

Drilling & Strata Notes

Installed casing to 15 feet BGS. Drilled to 15 feet BGS. Began core run R-1 at 15 feet BGS.

Driller used up to 650 gallons troughout core run.

Chatter at 18 feet BGS.

In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

▼ = Water Level (if observed)

Ground water not observed.

BGS = Below Ground Surface

Figure B-14.1
B-14; R-1 (Dry)

Figure B-14.2
B-14; R-1 (Wet)

Figure B-14.3
B-14; R-2 (Dry)

Figure B-14.4
B-14; R-2 (Wet)

Soil Boring Log

B-16

Client:	Concept Engineering Consultants	**Drilling Firm:**	Boring Brothers, Inc	**Coordinates:**	40.642167 , -74.90785
Project:	Clinton Commons	**Drill Crew:**	Matt Daniel / David Osuch / Matt Murtagh	**Horiz. Datum:**	WGS 84
Location:	Clinton, NJ	**Boring Start:**	08/23/23 11:30 AM	**Elevation:**	Grade
Inspector:	Anton Luz / Janivel Leo	**Boring End:**	08/23/23 01:50 PM	**Vert. Datum:**	N/A

Rig Model:	CME-55LC	**Sampler Type:**	Split Spoon	**Casing Type:**	Steel
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	25 feet
Drill Method:	Mud Rotary	**Sampler I.D.:**	1.375 inches	**Casing I.D.:**	4 inches
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	140 pounds
Drilling Fluid:	Bentonite	**Hammer Fall:**	30 inches	**Hammer Fall:**	30 inches

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)	Drilling & Strata Notes
	S-1	11	3 3 15 8	18	ML	Very stiff, Brown SILT, some coarse to fine Gravel, little coarse to fine Sand, trace Clay, Moist (ML)	M	H	-	-	Began boring B-16 S-1, 0-2 feet BGS. Occasional roots encountered. PP and TV testing invalid due to Gravel.
	S-2	8	11 7 7 5	14		Stiff, Brownish yellow Gravely SILT, little coarse to fine Sand, trace Clay, Moist (ML)	M	H	-	-	S-2, 2-4 feet BGS. PP and TV testing invalid due to Gravel.
5	S-3	8	4 3 7 6	10	GM	Medium dense, Brown Sandy coarse to fine GRAVEL, some Silt, Moist (GM)					S-3, 4-6 feet BGS.
	S-4	4	5 7 5 4	12		Medium dense, Brown Silty coarse to fine GRAVEL, trace Silt, Wet (GM)					S-4, 6-8 feet BGS. Installed casing 6 feet BGS.
	S-5	0	10 10 6 2	16		NO RECOVERY					S-5, 8-10 feet BGS. Installed casing 8 feet BGS. Drilled to 8 feet BGS. Brown wash. Slight Chatter at 9 feet BGS from Rig.
10	S-6	2	5 8 10 4	18		Medium dense, Brown Silty coarse to fine GRAVEL, trace coarse to fine Sand, Wet (GM)					S-6, 10-12 feet BGS. Occasional roots encountered.
15	S-7	6	5 3 3 2	6	CL	Medium Stiff, Brown Silty CLAY, little coarse to fine Gravel, Wet (CL)	L	M	-	-	S-7, 15-17 feet BGS. Occasional roots in sample. PP and TV testing invalid due to Gravel. Installed casing 15 feet BGS. Drilled to 15 feet BGS. Brown wash. Slight Chatter at 16 feet BGS from Rig.
20	S-8	15	3 4 4 2	8	ML	Medium Stiff, Brown SILT, some coarse to fine Sand, litte coarse to fine Gravel, little Clay, Wet (ML)	L	M	-	-	S-8, 20-22 feet BGS. PP and TV testing invalid due to Gravel. Installed casing 20 feet BGS. Drilled Brown wash.
											Chatter at 23 feet BGS. Possible weathered bedrock surface.

N-Value: 10 20 30 40

Coring Rock at 25 feet BGS
See Rock Coring Log

In-Borehole Water Levels

Date / Time	Reading Event	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

BGS = Below Ground Surface
Ground water not observed.

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

▽ = ATD Water Level (At Time of Drilling)
▼ = AD Water Level (After Drilling - Short Term)
▼ = EOD Water Level (End of Drilling - Long Term)

Rock Coring Log

B-16

Client:	Concept Engineering Consultants	**Drilling Firm:**	Boring Brothers, Inc	**Coordinates:**	40.642167 , -74.90785
Project:	Clinton Commons	**Drill Crew:**	Matt Daniel / David Osuch / Matt Murtagh	**Horiz. Datum:**	WGS 84
Location:	Clinton, NJ	**Boring Start:**	8/23/2023 11:30:00 AM	**Elevation:**	Grade
Inspector:	Anton Luz / Janivel Leo	**Boring End:**	8/23/2023 1:50:00 PM	**Vert. Datum:**	N/A

Rig Model:	CME-55LC	**Casing Type:**	Steel	**Core Barrel Type:**	NQ	**Core Bit Type:**	Diamond
Rig Type:	Track	**Casing Length:**	25 feet	**Core Barrel Length:**	5 feet	**Core Bit Length:**	6 inches
Drill Method:	Mud Rotary	**Casing I.D.:**	4 inches	**Core Barrel I.D.:**	3 inches	**Core Bit I.D.:**	1.88 inches

Depth (ft)	Avg Core Rate (min/ft)	Run No.	Recovery (in. / %)	RQD (in. / %)	Hardness	Weathering	Graphic Log	Visual Classification	Depth (ft.)	Discontinuities: Type	Dip Angle	Roughness	Weathering	Aperture	Infilling	Drilling & Strata Notes
	4:50							LIMESTONE, Gray Medium fine grain, Strong, Very wide to Partly open spacing.	25.6	SZ	15	S,Sm	DS	O	ML	Drilling Brown wash
	3:17															
	4:14	R-1	54 90%	22 37%	R4	M			27	F	0	S,R	DS	VW	QZ	Severe water loss.
									27.7	J	10	S,R	DS	PO	DO	
	4:35								28.2	J	0	S,R	DS	VW	ML	
	3:59								28.9	F	70	S,Sm	DS		DO	
30								End of boring at 30 feet BGS. Backfilled boring to grade with soil cuttings and bentonite chips.							
35																
40																

In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

▼ = Water Level (if observed)

Ground water not observed.

BGS = Below Ground Surface

Figure B-16.1
B-16; R-1 (Dry)

Figure B-16.2
B-16; R-1 (Wet)

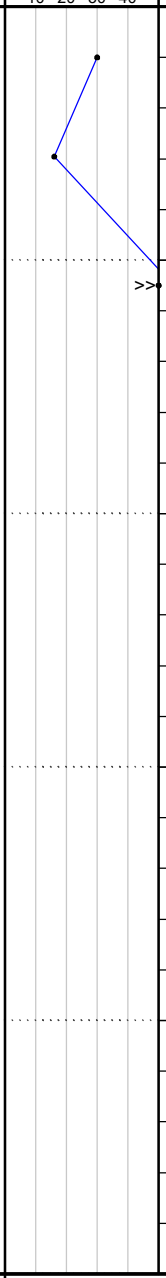
Soil Boring Log

B-17

Client:	Concept Engineering Consultants	**Drilling Firm:**	Boring Brothers, Inc	**Coordinates:**	40.6418 , -74.90545
Project:	Clinton Commons	**Drill Crew:**	Matt Daniel / David Osuch	**Horiz. Datum:**	WGS 84
Location:	Clinton, NJ	**Boring Start:**	08/21/23 08:05 AM	**Elevation:**	Grade
Inspector:	Anton Luz / Janivel Leo	**Boring End:**	08/21/23 10:30 AM	**Vert. Datum:**	N/A

Rig Model:	CME-55LC	**Sampler Type:**	Split Spoon	**Casing Type:**	Steel
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	7 feet
Drill Method:	Mud Rotary	**Sampler I.D.:**	1.375 inches	**Casing I.D.:**	4 inches
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	140 pounds
Drilling Fluid:	Bentonite	**Hammer Fall:**	30 inches	**Hammer Fall:**	30 inches

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Graphic Log	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)
	S-1	12	3 6 24 40	30	SM		Dense, Gray coarse to fine SAND, some Silt, little coarse to fine Gravel, Moist (SM)				
	S-2	18	23 6 10 50/5	16			Medium Dense, Gray Gravelly coarse to fine SAND, some Silt, Moist (SM)				
5	S-3	3	16 70/6	> 50			Very Dense, Silty coarse to fine SAND, trace fine Gravel, Moist (SM)				
	S-4	0	80/2	> 50							
							Coring Rock at 7 feet BGS See Rock Coring Log				
10											
15											
20											



Drilling & Strata Notes

Ground Surface covered in brush 1 to 4 feet high. Driller used Track Rig to flatten brush.
Began boring B-17 at 8:05 AM S-1, 0-2 feet BGS. Occasional roots encountered.
S-2, 2-3' 11" BGS. Refusal encountered on possible cobbles.

S-3, 5-6 feet BGS. Installed casing to 5 feet BGS. Drilled to 5 feet BGS. Light chatter at 4.5 feet. Gray to clear wash.
Refusal at 6 feet BGS. Drilled to 7 feet BGS.

In-Borehole Water Levels

Date / Time	Reading Event	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

BGS = Below Ground Surface
Ground water not observed.

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

▽ = ATD Water Level (At Time of Drilling)
▼ = AD Water Level (After Drilling - Short Term)
▼ = EOD Water Level (End of Drilling - Long Term)

Rock Coring Log

B-17

Client:	Concept Engineering Consultants	**Drilling Firm:**	Boring Brothers, Inc	**Coordinates:**	40.6418 , -74.90545
Project:	Clinton Commons	**Drill Crew:**	Matt Daniel / David Osuch	**Horiz. Datum:**	WGS 84
Location:	Clinton, NJ	**Boring Start:**	8/21/2023 8:05:00 AM	**Elevation:**	Grade
Inspector:	Anton Luz / Janivel Leo	**Boring End:**	8/21/2023 10:30:00 AM	**Vert. Datum:**	N/A

Rig Model:	CME-55LC	**Casing Type:**	Steel	**Core Barrel Type:**	NQ	**Core Bit Type:**	Diamond
Rig Type:	Track	**Casing Length:**	7 feet	**Core Barrel Length:**	5 feet	**Core Bit Length:**	6 inches
Drill Method:	Mud Rotary	**Casing I.D.:**	4 inches	**Core Barrel I.D.:**	3 inches	**Core Bit I.D.:**	1.88 inches

Depth (ft)	Avg Core Rate (min/ft)	Run No.	Recovery (in. / %)	RQD (in. / %)	Hardness	Weathering	Graphic Log	Visual Classification
10	7:10	R-1	28 47%	0 0%	R4	H		LIMESTONE, Gray-Blue Medium fine grain, Highly weathered, Strong
	4:35							
	8:20							
	4:10							
	4:10							
	3:05	R-2	49 82%	11 18%	R4	SL		LIMESTONE, Gray-Blue Medium fine grain, Highly weathered, Strong, Partly open spacing.
	3:15							
	3:40							
15	4:05							
	6:27							
								End of boring at 17 feet BGS. Backfilled boring to grade with soil cuttings and bentonite chips.
20								
25								

Depth (ft.)	Discontinuities: Type	Dip Angle	Roughness	Weathering	Aperture	Infilling	Drilling & Strata Notes
							Began Rock Core R-1 at 7 feet BGS. Moderate water loss, Tan wash 7-11.5'
							Gray wash 11.5-12 feet BGS.
							R-2, 12-17 feet BGS. Moderate water loss
14	J	45	P,Sm	DS	PO	DO	
15	J	70	P,Sm	DS	PO	DO	
							Applied Hydrochloric Acid to Limestone discontinuity, Effervecsent reaction occurred.

In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

▼ = Water Level (if observed)

Ground water not observed.

BGS = Below Ground Surface

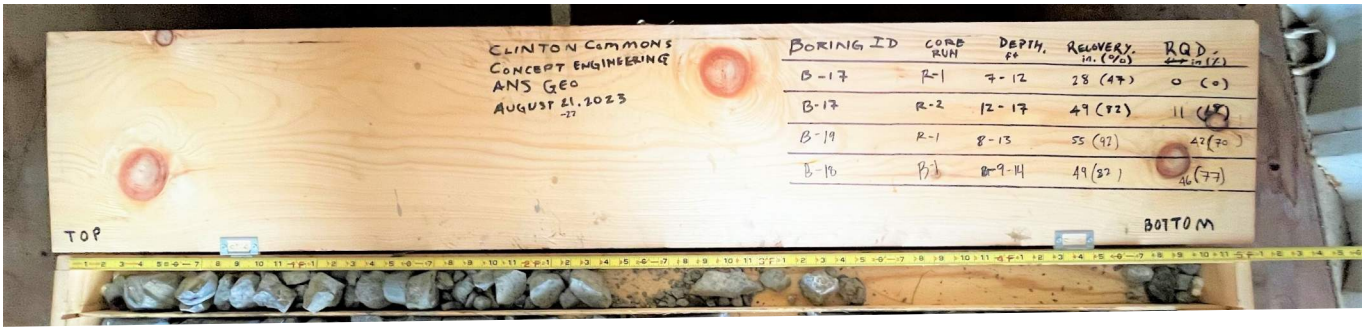


Figure B-17.1
B-17; R-1 (Dry)

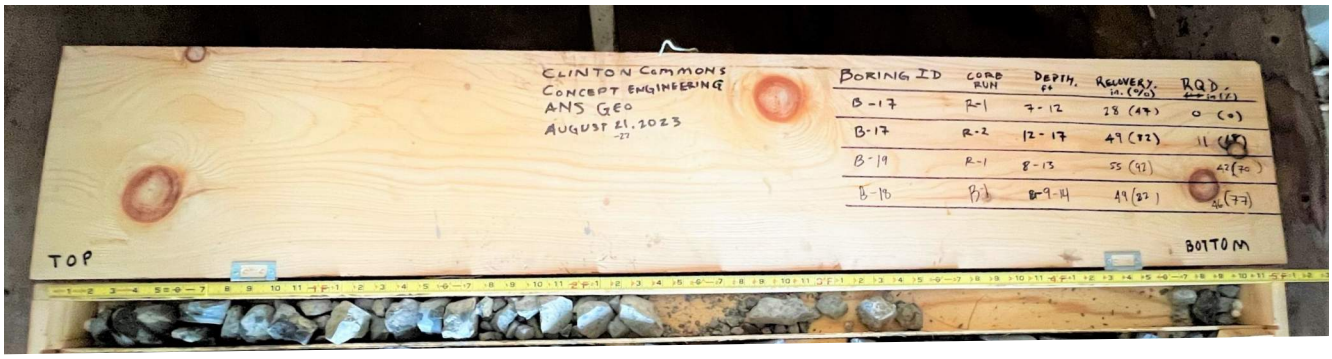


Figure B-17.2
B-17; R-1 (Wet)

Figure B-17.3
B-17; R-2 (Dry)

Figure B-017.4
B-17; R-2 (Wet)

Soil Boring Log

B-18

Client:	Concept Engineering Consultants	**Drilling Firm:**	Boring Brothers, Inc	**Coordinates:**	40.641083 , -74.905533
Project:	Clinton Commons	**Drill Crew:**	Matt Daniel / David Osuch / Matt Murtagh	**Horiz. Datum:**	WGS 84
Location:	Clinton, NJ	**Boring Start:**	08/21/23 12:50 PM	**Elevation:**	Grade
Inspector:	Anton Luz / Janivel Leo	**Boring End:**	08/22/23 09:30 AM	**Vert. Datum:**	N/A

Rig Model:	CME-55LC	**Sampler Type:**	Split Spoon	**Casing Type:**	Steel
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	9 feet
Drill Method:	Mud Rotary	**Sampler I.D.:**	1.375 inches	**Casing I.D.:**	4 inches
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	140 pounds
Drilling Fluid:	Bentonite	**Hammer Fall:**	30 inches	**Hammer Fall:**	30 inches

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)	Drilling & Strata Notes
	S-1	14	1 2 2 5	4	ML	Soft, Reddish brown Clayey SILT, trace coarse to fine Sand, trace coarse to fine Gravel, Moist (ML)	M	M	1.5	2	Began boring S-1, 0-2' at 12:50 PM. Occasional roots.
	S-2	13	4 5 11 14	16	CL	Top 7": Reddish brown to Brown Silty CLAY, trace coarse to fine Sand, Moist (CL)					S-2, 2-4 feet BGS.
					GP	Bottom 6": Brown Sandy coarse to fine GRAVEL, trace Clay, Moist (GP)					Decomposed rock encountered.
5	S-3	14	32 34 43 32	77	SM	Very Dense, Dark Brown to Brown Gravelly coarse to fine SAND, little Silt, little Clay, Moist (SM)					S-3, 4-6 feet BGS. Installed casing at 4 feet BGS. Drilled to 4 feet BGS; casing spinning.
	S-4	2	9 70/5	> 50		Dark Brown Gravely coarse to fine SAND, some Silt, Wet (SM)					S-4, 6-8 feet BGS. Drilled 6 feet BGS. Chatter at 6 feet BGS from Rig.
											Drilled to 9 feet BGS.
10						Coring Rock at 9 feet BGS See Rock Coring Log					
15											
20											

N-Value: 10 20 30 40

In-Borehole Water Levels

Date / Time	Reading Event	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

BGS = Below Ground Surface
Ground water not observed.

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

▽ = ATD Water Level (At Time of Drilling)
▼ = AD Water Level (After Drilling - Short Term)
▼ = EOD Water Level (End of Drilling - Long Term)

Rock Coring Log

B-18

Client:	Concept Engineering Consultants	**Drilling Firm:**	Boring Brothers, Inc	**Coordinates:**	40.641083 , -74.905533
Project:	Clinton Commons	**Drill Crew:**	Matt Daniel / David Osuch / Matt Murtagh	**Horiz. Datum:**	WGS 84
Location:	Clinton, NJ	**Boring Start:**	8/21/2023 12:50:00 PM	**Elevation:**	Grade
Inspector:	Anton Luz / Janivel Leo	**Boring End:**	8/22/2023 9:30:00 AM	**Vert. Datum:**	N/A

Rig Model:	CME-55LC	**Casing Type:**	Steel	**Core Barrel Type:**	NQ	**Core Bit Type:**	Diamond
Rig Type:	Track	**Casing Length:**	9 feet	**Core Barrel Length:**	5 feet	**Core Bit Length:**	6 inches
Drill Method:	Mud Rotary	**Casing I.D.:**	4 inches	**Core Barrel I.D.:**	3 inches	**Core Bit I.D.:**	1.88 inches

Depth (ft)	Avg Core Rate (min/ft)	Run No.	Recovery (in. / %)	RQD (in. / %)	Hardness	Weathering	Graphic Log	Visual Classification	Depth (ft.)	Discontinuities: Type	Dip Angle	Roughness	Weathering	Aperture	Infilling	Drilling & Strata Notes
10	7:36	R-1	49 82%	46 77%	R5	FR		LIMESTONE, Gray Medium to Fine grain, Fresh, Very Strong, Tight spacing.	9.8 10	J S	50 10	P,Sm S,R	FR DS	T	DO FE	Began coring at 9 feet BGS at 8:26 AM. Tan wash.
	5:58															
	6:27															Light tan to white wash.
	5:21															
	7:06															
15								End of boring at 14 feet BGS. Backfilled boring to grade with soil cuttings and bentonite chips.								Gray wash.
20																
25																

In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

▼ = Water Level (if observed)

Ground water not observed.

BGS = Below Ground Surface

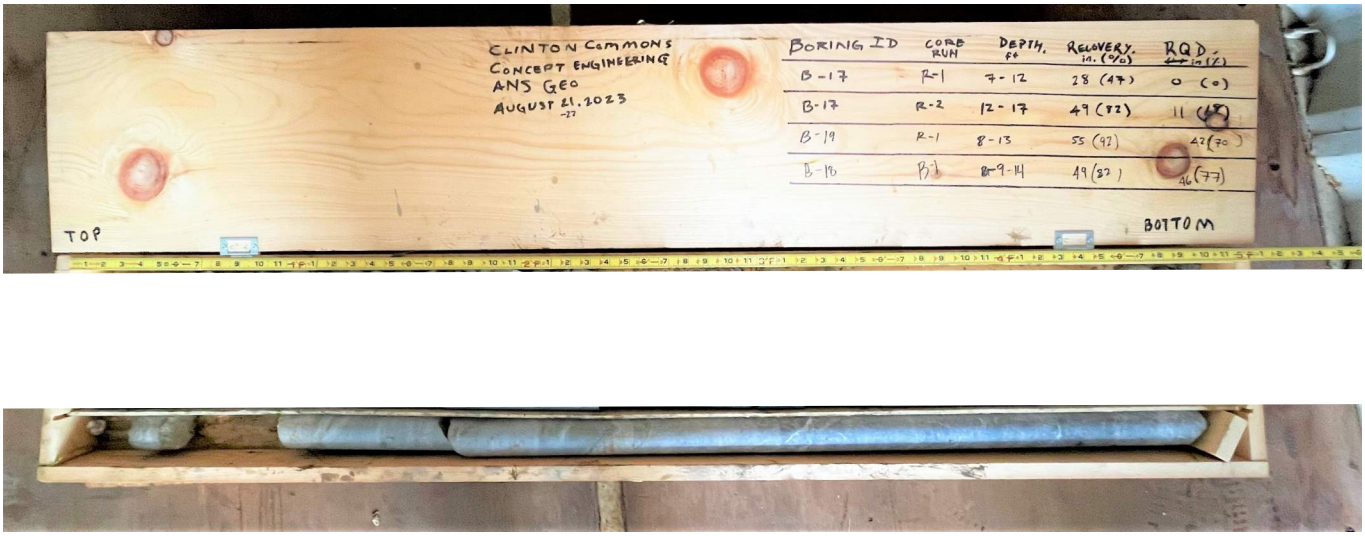


Figure B-18.1
B-18; R-1 (Dry)

Figure B-18.2
B-18; R-1 (Wet)

Soil Boring Log

B-19

Client:	Concept Engineering Consultants	**Drilling Firm:**	Boring Brothers, Inc	**Coordinates:**	40.641667 , -74.906367
Project:	Clinton Commons	**Drill Crew:**	Matt Daniel / David Osuch	**Horiz. Datum:**	WGS 84
Location:	Clinton, NJ	**Boring Start:**	08/21/23 11:00 AM	**Elevation:**	Grade
Inspector:	Anton Luz / Janivel Leo	**Boring End:**	08/21/23 12:30 PM	**Vert. Datum:**	N/A

Rig Model:	CME-55LC	**Sampler Type:**	Split Spoon	**Casing Type:**	Steel
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	8 feet
Drill Method:	Mud Rotary	**Sampler I.D.:**	1.375 inches	**Casing I.D.:**	4 inches
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	140 pounds
Drilling Fluid:	Bentonite	**Hammer Fall:**	30 inches	**Hammer Fall:**	30 inches

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)	Drilling & Strata Notes
0	S-1	15	8 7 10 6	17	ML	Top 8": Reddish brown Sandy SILT, trace Clay, Moist (ML)					Began boring at B-19 at 11:00 AM S-1, 0-2 feet BGS. Some organic; Brush from 1 to 4 feet tall.
					SP	Bottom 7": Gray coarse to fine SAND, little coarse to fine Gravel, trace Silt, Moist (SP)					
	S-2	15	10 16 67/6"	> 50	SM	Very Dense, Gray Silty coarse to fine SAND, some coarse to fine Gravel, Moist (SM)					S-2 2-4'; Refusal at 3.5 feet BGS.
5	S-3	2	50/5	> 50	GC	Gray Clayey coarse to fine GRAVEL, some coarse to fine Sand, Moist (GC)					S-3, 5-7 feet BGS. Installed casing at 5 feet BGS. Drilled Gray wash. Refusal at 5'2" BGS.
	S-4	2	50/2	> 50		Gray to Brown Clayey coarse to fine GRAVEL, trace Sand, Moist (GC)					S-4, 7-7.5 feet BGS. Refusal at 7.5 feet BGS
						Coring Rock at 8 feet BGS See Rock Coring Log					
10											
15											
20											

N-Value: 10 20 30 40

In-Borehole Water Levels

Date / Time	Reading Event	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

BGS = Below Ground Surface
Ground water not observed.

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

▽ = ATD Water Level (At Time of Drilling)
▼ = AD Water Level (After Drilling - Short Term)
▼ = EOD Water Level (End of Drilling - Long Term)

Rock Coring Log

B-19

Client:	Concept Engineering Consultants	**Drilling Firm:**	Boring Brothers, Inc	**Coordinates:**	40.641667 , -74.906367
Project:	Clinton Commons	**Drill Crew:**	Matt Daniel / David Osuch	**Horiz. Datum:**	WGS 84
Location:	Clinton, NJ	**Boring Start:**	8/21/2023 11:00:00 AM	**Elevation:**	Grade
Inspector:	Anton Luz / Janivel Leo	**Boring End:**	8/21/2023 12:30:00 PM	**Vert. Datum:**	N/A

Rig Model:	CME-55LC	**Casing Type:**	Steel	**Core Barrel Type:**	NQ	**Core Bit Type:**	Diamond
Rig Type:	Track	**Casing Length:**	8 feet	**Core Barrel Length:**	5 feet	**Core Bit Length:**	6 inches
Drill Method:	Mud Rotary	**Casing I.D.:**	4 inches	**Core Barrel I.D.:**	3 inches	**Core Bit I.D.:**	1.88 inches

Depth (ft)	Avg Core Rate (min/ft)	Run No.	Recovery (in. / %)	RQD (in. / %)	Hardness	Weathering	Graphic Log	Visual Classification	Depth (ft.)	Discontinuities: Type	Dip Angle	Roughness	Weathering	Aperture	Infilling	Drilling & Strata Notes
	3:40							LIMESTONE, Gray Fine grain, Slightly weathered, Strong, Wide to Tight spacing.	8.5	F	25	S,R	DS	W	FE	Began coring at 11:35 AM; Gray wash.
	3:19								9.25	S	20	U,Sm	DS	T	DO	
									9.58	S	15	S,Sm	DS	MW	DO	
10									10	S	30	S,Sm	DS	MW	DO	
	3:29	R-1	55 92%	42 70%	R4	SL										
	3:11								11.5	J	35	P,Sm	DS	PO	DO	
	3:51								12.2	J	15	P,Sm	DS		FE	
								End of boring at 13 feet BGS. Backfilled boring to grade with soil cuttings and bentonite chips.								
15																
20																
25																

In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

▼ = Water Level (if observed)

Ground water not observed.

BGS = Below Ground Surface

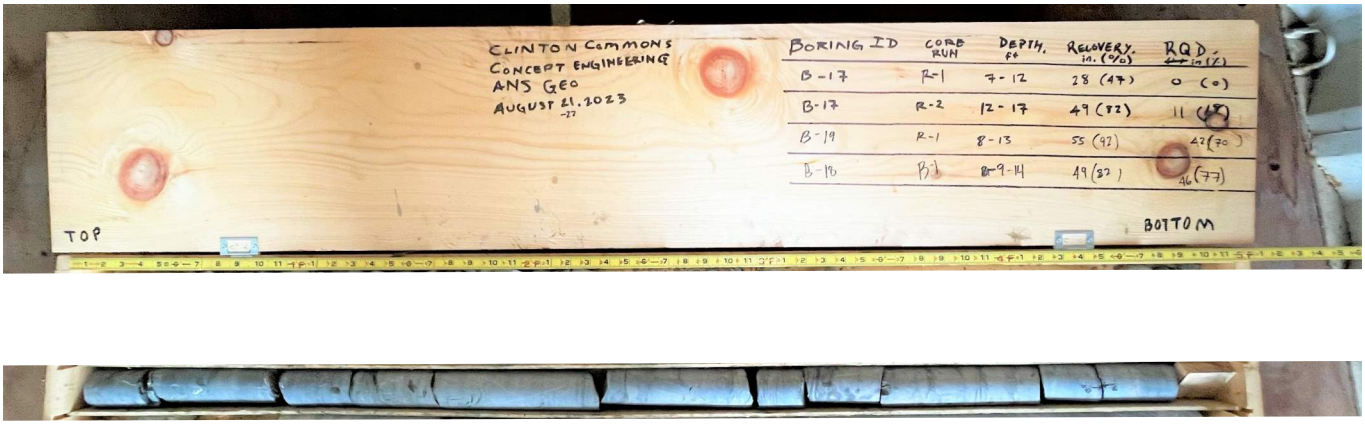


Figure B-19.1
B-19; R-1 (Dry)

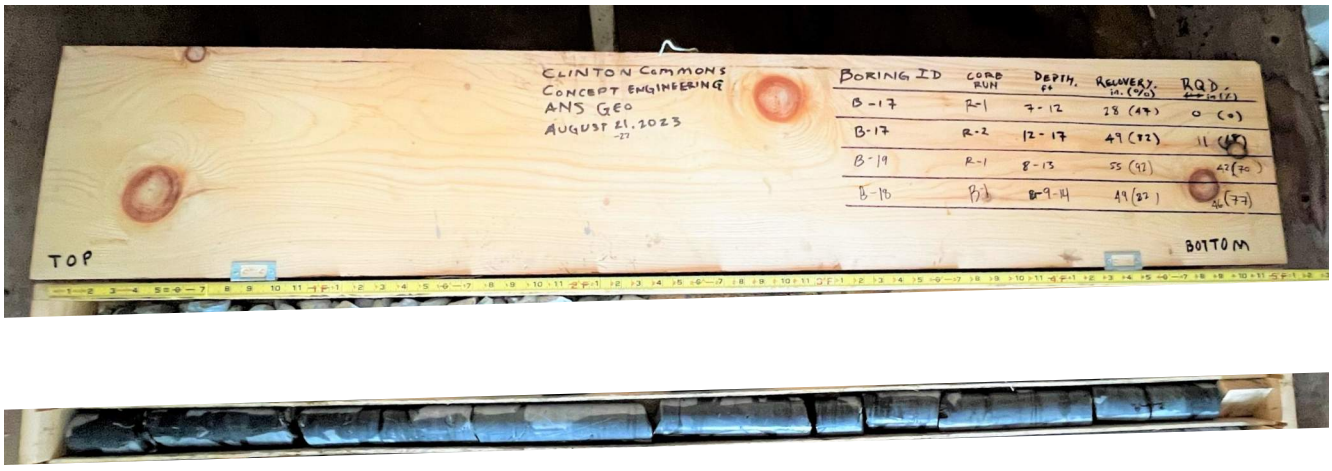


Figure B-19.2
B-19; R-2 (Wet)

Soil Boring Log

B-20

Client:	Concept Engineering Consultants	**Drilling Firm:**	Boring Brothers, Inc	**Coordinates:**	40.64255 , -74.907567
Project:	Clinton Commons	**Drill Crew:**	Matt Daniel / David Osuch / Matt Murtagh	**Horiz. Datum:**	WGS 84
Location:	Clinton, NJ	**Boring Start:**	08/22/23 09:47 AM	**Elevation:**	Grade
Inspector:	Anton Luz / Janivel Leo	**Boring End:**	08/22/23 10:30 AM	**Vert. Datum:**	N/A

Rig Model:	CME-55LC	**Sampler Type:**	Split Spoon	**Casing Type:**	Steel
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	8 feet
Drill Method:	Mud Rotary	**Sampler I.D.:**	1.375 inches	**Casing I.D.:**	4 inches
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	140 pounds
Drilling Fluid:	Bentonite	**Hammer Fall:**	30 inches	**Hammer Fall:**	30 inches

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)	Drilling & Strata Notes
0	S-1	14	4 13 27 31	40	ML	Hard, Brown coarse to fine Sandy SILT, some coarse to fine Gravel, Moist (ML)					Began boring S-1, 0-2' at 9:47 AM
	S-2	8	32 96/5	> 50	SM	Very dense, Light Brown Silty coarse to fine SAND, some coarse to fine Gravel, Moist (SM)					S-2, 2-3.5 feet BGS. Sharp sound at 3 feet BGS from Rig. Installed casing at 3.5 feet BGS. Drilled Gray wash.
5	S-3	5	32 68/6	> 50		Very dense, Gray to Light Brown Silty coarse to fine SAND, little coarse to fine Gravel, Moist (SM)					S-3, 5-7 feet BGS. Light Chatter at 6 feet BGS from Rig. No advancement of spoon. Drilled 7 feet BGS. Tan wash.
	S-4	5	50/5	> 50		Very dense, Gray to Light Brown Silty coarse to fine SAND, little coarse to fine Gravel, Wet (SM)					S-4, 7-9 feet BGS.
	S-5	4	85/2	> 50	ML	Very dense, Gray Sandy SILT, some coarse to fine Gravel, Wet (SM)					S-5, 9-9.2 feet BGS. Drilled to 11 feet BGS, Tan wash. Chatter at 10.5-11 feet BGS.
10						Coring Rock at 11 feet BGS See Rock Coring Log					
15											
20											

N-Value: 10 20 30 40

In-Borehole Water Levels

Date / Time	Reading Event	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

BGS = Below Ground Surface
Ground water not observed.

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

▽ = ATD Water Level (At Time of Drilling)
▼ = AD Water Level (After Drilling - Short Term)
▼ = EOD Water Level (End of Drilling - Long Term)

Rock Coring Log

B-20

Client:	Concept Engineering Consultants	**Drilling Firm:**	Boring Brothers, Inc	**Coordinates:**	40.64255 , -74.907567
Project:	Clinton Commons	**Drill Crew:**	Matt Daniel / David Osuch / Matt Murtagh	**Horiz. Datum:**	WGS 84
Location:	Clinton, NJ	**Boring Start:**	8/22/2023 9:47:00 AM	**Elevation:**	Grade
Inspector:	Anton Luz / Janivel Leo	**Boring End:**	8/22/2023 10:30:00 AM	**Vert. Datum:**	N/A

Rig Model:	CME-55LC	**Casing Type:**	Steel	**Core Barrel Type:**	NQ	**Core Bit Type:**	Diamond
Rig Type:	Track	**Casing Length:**	8 feet	**Core Barrel Length:**	5 feet	**Core Bit Length:**	6 inches
Drill Method:	Mud Rotary	**Casing I.D.:**	4 inches	**Core Barrel I.D.:**	3 inches	**Core Bit I.D.:**	1.88 inches

Depth (ft)	Avg Core Rate (min/ft)	Run No.	Recovery (in. / %)	RQD (in. / %)	Hardness	Weathering	Graphic Log	Visual Classification	Depth (ft.)	Discontinuities: Type	Dip Angle	Roughness	Weathering	Aperture	Infilling	Drilling & Strata Notes
	3:56							LIMESTONE, Gray Fine grain, Slightly weathered, Strong,	11.6	J	45	S,Sm	DS	PO	DO	Tan wash.
	2:47															
	2:28	R-1	60 100%	39 65%	R4	SL			13.5	S	60	S,Sm	DS	PO	DO	Drillers adjusted speed.
									13.75	S	60	S,Sm	DS	T	DO	
	2:30								14.25	S	30	S,Sm	DS	VW	DO	
15	2:31								15	S	45	S,Sm	DS	PO	DO	
									15.5	S	0	S,R	DS		DO	
	3:25							LIMESTONE, Gray Fine grain, Slightly weathered, Strong	16.2	J	20	P,Sm	DS	T	FE	Drillers adjusted speed.
	3:27								17	S	30	P,Sm	DS	T	L	Gray wash.
	4:11	R-2	56 93%	35 58%					18	S	30	S,R	DS	T	DO	
	4:54								19.2	J	30	S,R	DS	O	DO	
20	3:35								20	S	30	S,Sm	DS	VW	DO	
								End of boring at 21 feet BGS. Backfilled boring to grade with soil cuttings and bentonite chips.								
25																
30																

In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

▼ = Water Level (if observed)

Ground water not observed.

BGS = Below Ground Surface

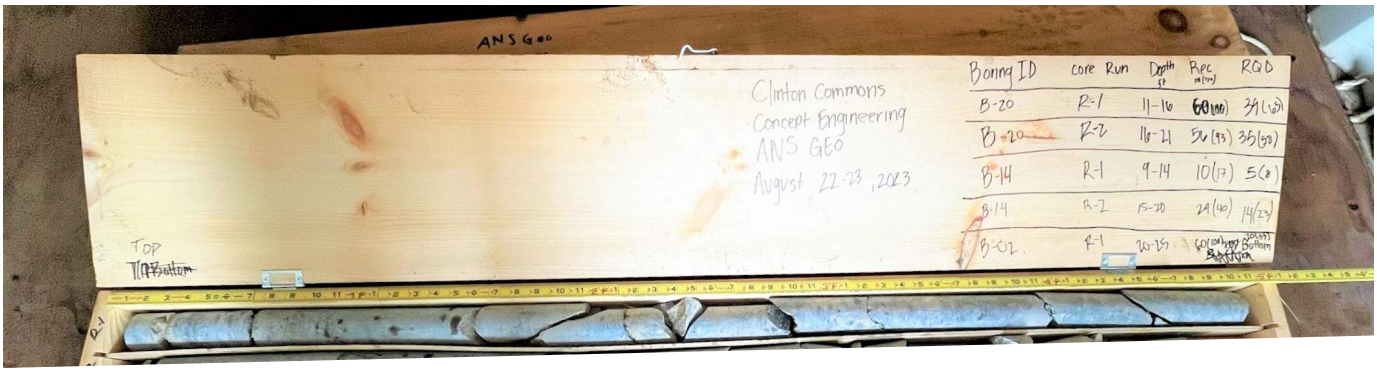


Figure B-20.1
B-20; R-1 (Dry)

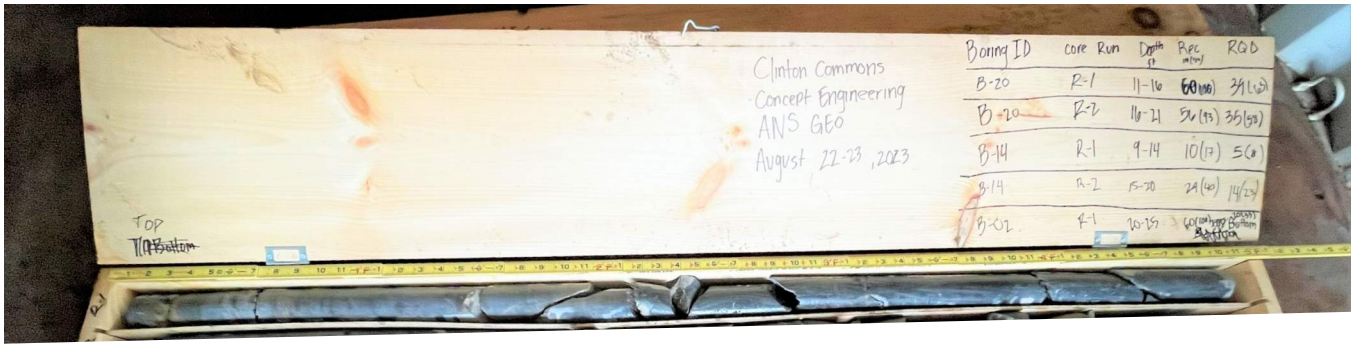


Figure B-20.2
B-20; R-1 (Wet)

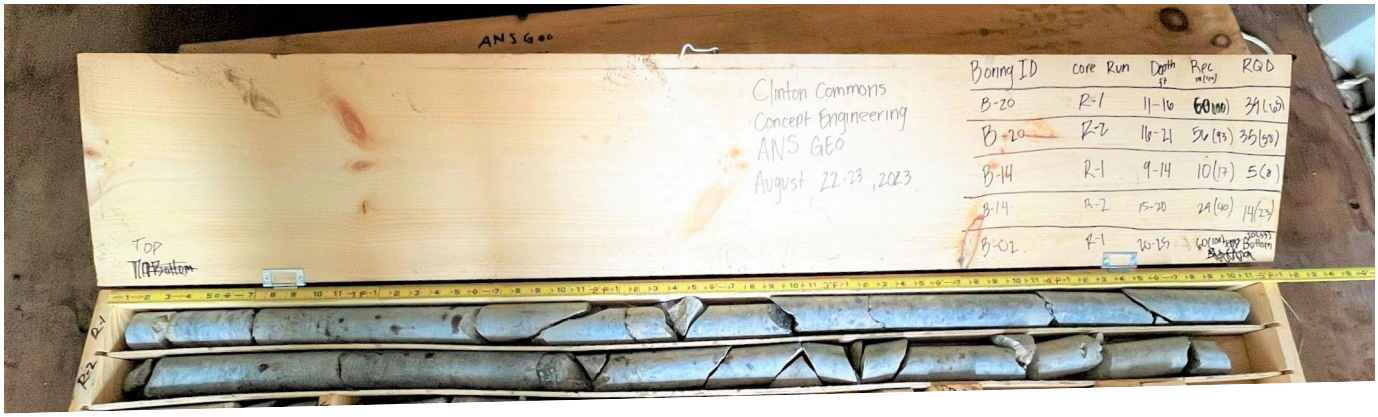


Figure B-20.3
B-20; R-2 (Dry)

Figure B-20.4
B-20; R-2 (Wet)

Appendix C

NRCS Soil Report

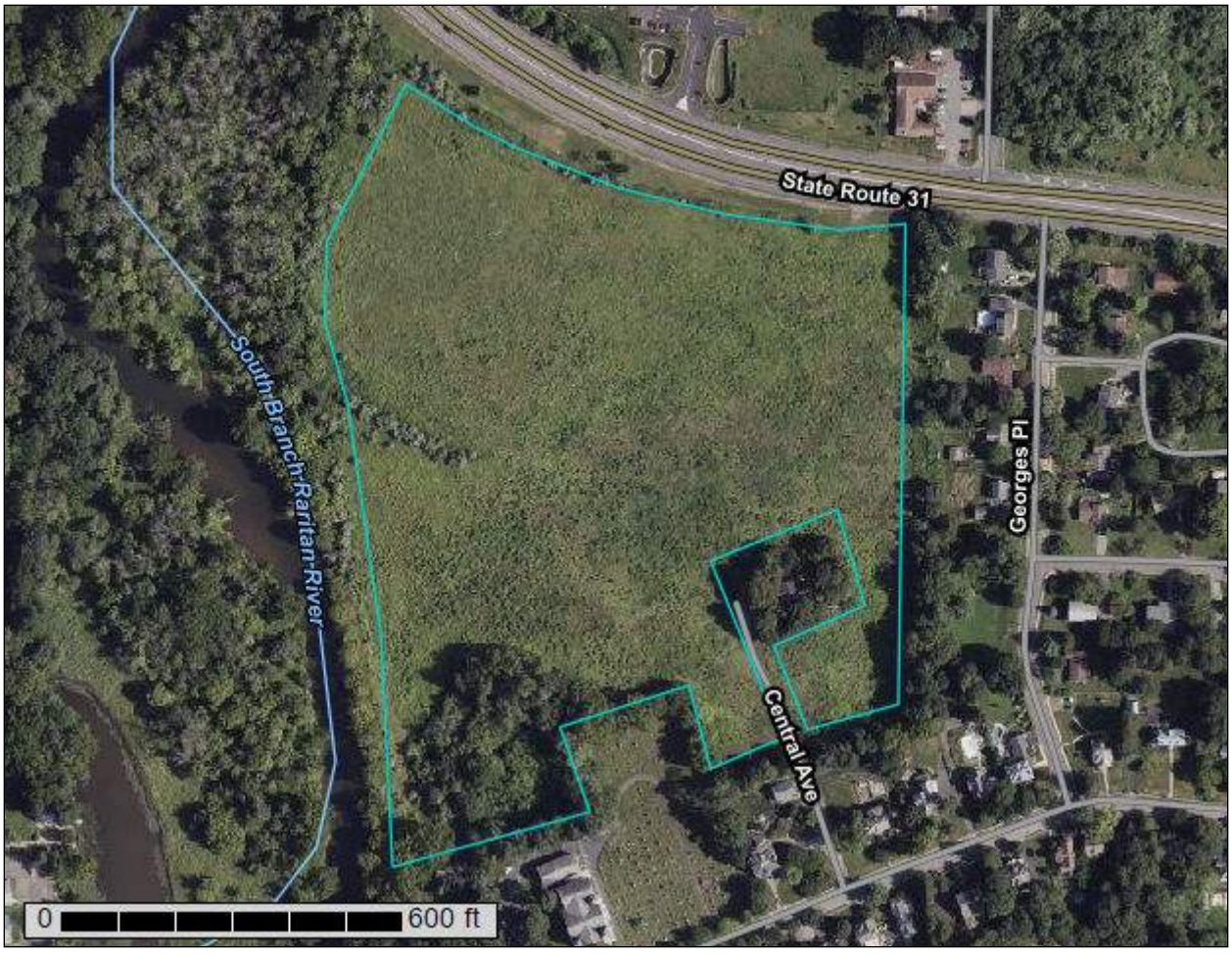
United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Hunterdon County, New Jersey



August 25, 2023

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

Map Scale: 1:2,440 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 35 70 140 210

Feet: 0 100 200 400 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Hunterdon County, New Jersey
Survey Area Data: Version 18, Aug 30, 2022

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 13, 2021—Sep 14, 2021

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
BhnB	Birdsboro silt loam, 2 to 6 percent slopes	2.8	13.0%
DufC2	Duffield silt loam, 6 to 12 percent slopes, eroded	14.6	68.2%
DugDh	Duffield silt loam, 12 to 18 percent slopes, very rocky	2.1	9.6%
HcuAt	Hatboro-Codorus complex, 0 to 3 percent slopes, frequently flooded	2.0	9.2%
Totals for Area of Interest		**21.5**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Hunterdon County, New Jersey

BhnB—Birdsboro silt loam, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: ldv5
Elevation: 200 to 1,000 feet
Mean annual precipitation: 30 to 64 inches
Mean annual air temperature: 46 to 79 degrees F
Frost-free period: 131 to 178 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Birdsboro and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Birdsboro

Setting

Landform: Stream terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Old alluvium derived from sandstone and siltstone and/or shale

Typical profile

Ap - 0 to 8 inches: silt loam
BA - 8 to 13 inches: silt loam
Bt - 13 to 29 inches: silt loam
BC - 29 to 40 inches: silt loam
C - 40 to 60 inches: stratified sand to silty clay loam
2C - 60 to 80 inches: stratified sand to fine sand

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 10.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Ecological site: F148XY025PA - Moist, Triassic, Upland, Mixed Oak - Hardwood - Conifer Forest
Hydric soil rating: No

Minor Components

Bucks

Percent of map unit: 5 percent
Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Hydric soil rating: No

Raritan, rarely flooded

Percent of map unit: 5 percent
Landform: Stream terraces
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Duffield

Percent of map unit: 5 percent
Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

DufC2—Duffield silt loam, 6 to 12 percent slopes, eroded

Map Unit Setting

National map unit symbol: 1lmfh
Elevation: 300 to 1,000 feet
Mean annual precipitation: 30 to 64 inches
Mean annual air temperature: 46 to 79 degrees F
Frost-free period: 131 to 178 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Duffield, eroded, and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Duffield, Eroded

Setting

Landform: Hills
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear

Parent material: Fine-loamy residuum weathered from limestone

Typical profile

Ap - 0 to 9 inches: silt loam
BA - 9 to 14 inches: silt loam
Bt1 - 14 to 28 inches: silt loam
Bt2 - 28 to 42 inches: silt loam
C - 42 to 56 inches: loam
R - 56 to 80 inches: unweathered bedrock

Properties and qualities

Slope: 6 to 12 percent
Depth to restrictive feature: 48 to 60 inches to lithic bedrock
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 11.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: F148XY026PA - Moist, High Base-Saturation, Upland, Mixed Oak - Hickory - Conifer Forest
Hydric soil rating: No

Minor Components

Turbotville

Percent of map unit: 5 percent
Landform: Depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: No

Washington

Percent of map unit: 5 percent
Landform: Hills
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

DugDh—Duffield silt loam, 12 to 18 percent slopes, very rocky

Map Unit Setting

National map unit symbol: 1lmfk
Elevation: 300 to 1,300 feet
Mean annual precipitation: 30 to 64 inches
Mean annual air temperature: 46 to 79 degrees F
Frost-free period: 131 to 178 days
Farmland classification: Not prime farmland

Map Unit Composition

Duffield, eroded, very rocky, and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Duffield, Eroded, Very Rocky

Setting

Landform: Hills
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Fine-loamy residuum weathered from limestone

Typical profile

Ap - 0 to 9 inches: silt loam
BA - 9 to 14 inches: silt loam
Bt1 - 14 to 28 inches: silt loam
Bt2 - 28 to 42 inches: silt loam
C - 42 to 56 inches: loam
R - 56 to 80 inches: unweathered bedrock

Properties and qualities

Slope: 12 to 18 percent
Depth to restrictive feature: 48 to 60 inches to lithic bedrock
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 11.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B

Ecological site: F148XY026PA - Moist, High Base-Saturation, Upland, Mixed Oak - Hickory - Conifer Forest
Hydric soil rating: No

Minor Components

Turbotville
Percent of map unit: 5 percent
Landform: Depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: No

Washington
Percent of map unit: 5 percent
Landform: Hills
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Klinesville
Percent of map unit: 5 percent
Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

HcuAt—Hatboro-Codorus complex, 0 to 3 percent slopes, frequently flooded

Map Unit Setting
National map unit symbol: 2w06g
Elevation: 90 to 680 feet
Mean annual precipitation: 47 to 51 inches
Mean annual air temperature: 48 to 57 degrees F
Frost-free period: 180 to 210 days
Farmland classification: Not prime farmland

Map Unit Composition
Hatboro, frequently, and similar soils: 60 percent
Codorus, occasional, and similar soils: 35 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hatboro, Frequently

Setting
Landform: Flood plains

Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Loamy alluvium derived from greenstone and/or phyllite and/or quartzite and/or schist

Typical profile

A - 0 to 11 inches: silt loam
Bg1 - 11 to 18 inches: silt loam
Bg2 - 18 to 29 inches: silt loam
BCg - 29 to 44 inches: silt loam
Cg1 - 44 to 55 inches: silty clay loam
Cg2 - 55 to 80 inches: sandy loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: NoneFrequent
Frequency of ponding: Frequent
Available water supply, 0 to 60 inches: High (about 9.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B/D
Ecological site: F148XY030PA - Hydric, Piedmont - felsic, Riparian Zone, Swamp Meadow-Shrub-Forest
Hydric soil rating: Yes

Description of Codorus, Occasional

Setting

Landform: Flood plains
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Loamy alluvium derived from phyllite and/or mica schist and/or greenstone and/or old loamy alluvium derived from phyllite and/or mica schist and/or greenstone

Typical profile

Ap - 0 to 11 inches: silt loam
Bw1 - 11 to 18 inches: silt loam
Bw2 - 18 to 40 inches: gravelly silt loam
2C - 40 to 80 inches: very gravelly silt loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained

Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 18 to 30 inches
Frequency of flooding: OccasionalNone
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 7.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: C
Ecological site: F148XY027PA - Moist, Piedmont - felsic, Riparian Zone, Ecotonal Meadow-Shrub-Forest
Hydric soil rating: No

Minor Components

Delanco

Percent of map unit: 5 percent
Landform: Stream terraces
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Convex
Hydric soil rating: No

Soil Information for All Uses

Suitabilities and Limitations for Use

The Suitabilities and Limitations for Use section includes various soil interpretations displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each interpretation.

Building Site Development

Building site development interpretations are designed to be used as tools for evaluating soil suitability and identifying soil limitations for various construction purposes. As part of the interpretation process, the rating applies to each soil in its described condition and does not consider present land use. Example interpretations can include corrosion of concrete and steel, shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping.

Corrosion of Concrete

ENG

Engineering

AGR

Agronomy

"Risk of corrosion" pertains to potential soil-induced electrochemical or chemical action that corrodes or weakens concrete. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The concrete in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than the concrete in installations that are entirely within one kind of soil or within one soil layer.

The risk of corrosion is expressed as "low," "moderate," or "high."

Map Scale: 1:2,440 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 35 70 140 210

Feet: 0 100 200 400 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- High
- Moderate
- Low
- Not rated or not available

Soil Rating Lines

- High
- Moderate
- Low
- Not rated or not available

Soil Rating Points

- High
- Moderate
- Low
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Hunterdon County, New Jersey
Survey Area Data: Version 18, Aug 30, 2022

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 13, 2021—Sep 14, 2021

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Corrosion of Concrete

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
BhnB	Birdsboro silt loam, 2 to 6 percent slopes	High	2.8	13.0%
DufC2	Duffield silt loam, 6 to 12 percent slopes, eroded	Moderate	14.6	68.2%
DugDh	Duffield silt loam, 12 to 18 percent slopes, very rocky	Moderate	2.1	9.6%
HcuAt	Hatboro-Codorus complex, 0 to 3 percent slopes, frequently flooded	Moderate	2.0	9.2%
Totals for Area of Interest			**21.5**	**100.0%**

Rating Options—Corrosion of Concrete

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Corrosion of Steel

ENG

Engineering

AGR

Agronomy

"Risk of corrosion" pertains to potential soil-induced electrochemical or chemical action that corrodes or weakens uncoated steel. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than the steel in installations that are entirely within one kind of soil or within one soil layer.

The risk of corrosion is expressed as "low," "moderate," or "high."

Map—Corrosion of Steel

Map Scale: 1:2,440 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 35 70 140 210

Feet: 0 100 200 400 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

High

Moderate

Low

Not rated or not available

Soil Rating Lines

High

Moderate

Low

Not rated or not available

Soil Rating Points

High

Moderate

Low

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Hunterdon County, New Jersey
Survey Area Data: Version 18, Aug 30, 2022

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 13, 2021—Sep 14, 2021

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Corrosion of Steel

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
BhnB	Birdsboro silt loam, 2 to 6 percent slopes	Moderate	2.8	13.0%
DufC2	Duffield silt loam, 6 to 12 percent slopes, eroded	Moderate	14.6	68.2%
DugDh	Duffield silt loam, 12 to 18 percent slopes, very rocky	Moderate	2.1	9.6%
HcuAt	Hatboro-Codorus complex, 0 to 3 percent slopes, frequently flooded	Moderate	2.0	9.2%
Totals for Area of Interest			**21.5**	**100.0%**

Rating Options—Corrosion of Steel

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Soil Reports

The Soil Reports section includes various formatted tabular and narrative reports (tables) containing data for each selected soil map unit and each component of each unit. No aggregation of data has occurred as is done in reports in the Soil Properties and Qualities and Suitabilities and Limitations sections.

The reports contain soil interpretive information as well as basic soil properties and qualities. A description of each report (table) is included.

Water Features

This folder contains tabular reports that present soil hydrology information. The reports (tables) include all selected map units and components for each map unit. Water Features include ponding frequency, flooding frequency, and depth to water table.

Water Features

This table gives estimates of various soil water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas.

Surface runoff refers to the loss of water from an area by flow over the land surface. Surface runoff classes are based on slope, climate, and vegetative cover. The concept indicates relative runoff for very specific conditions. It is assumed that the surface of the soil is bare and that the retention of surface water resulting from irregularities in the ground surface is minimal. The classes are negligible, very low, low, medium, high, and very high.

The *months* in the table indicate the portion of the year in which a water table, ponding, and/or flooding is most likely to be a concern.

Water table refers to a saturated zone in the soil. The water features table indicates, by month, depth to the top (*upper limit*) and base (*lower limit*) of the saturated zone in most years. Estimates of the upper and lower limits are based mainly on observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors or mottles (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table. The kind of water table, apparent or perched, is given if a seasonal high water table exists in the soil. A water table is perched if free water is restricted from moving downward in the soil by a restrictive feature, in most cases a hardpan; there is a dry layer of soil underneath a wet layer. A water table is apparent if free water is present in all horizons from its upper boundary to below 2 meters or to the depth of observation. The water table kind listed is for the first major component in the map unit.

Ponding is standing water in a closed depression. Unless a drainage system is installed, the water is removed only by percolation, transpiration, or evaporation. The table indicates *surface water depth* and the *duration* and *frequency* of ponding. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, *long* if 7 to 30 days, and *very long* if more than 30 days. Frequency is expressed as none, rare, occasional, and frequent. *None* means that ponding is not probable; *rare* that it is unlikely but possible under unusual weather conditions (the chance of ponding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs, on the average, once or less in 2 years (the chance of ponding is 5 to 50 percent in any year); and *frequent* that it occurs, on the average, more than once in 2 years (the chance of ponding is more than 50 percent in any year).

Flooding is the temporary inundation of an area caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, and water standing in swamps and marshes is considered ponding rather than flooding.

Duration and *frequency* are estimated. Duration is expressed as *extremely brief* if 0.1 hour to 4 hours, *very brief* if 4 hours to 2 days, *brief* if 2 to 7 days, *long* if 7 to 30 days, and *very long* if more than 30 days. Frequency is expressed as none, very rare, rare, occasional, frequent, and very frequent. *None* means that flooding is not probable; *very rare* that it is very unlikely but possible under extremely unusual weather conditions (the chance of flooding is less than 1 percent in any year); *rare* that it is unlikely but possible under unusual weather conditions (the chance of flooding is 1 to 5 percent in any year); *occasional* that it occurs infrequently under normal weather conditions (the chance of flooding is 5 to 50 percent in any year); *frequent* that it is likely to occur often under normal weather conditions (the chance of flooding is more than 50 percent in any year but is less than 50 percent in all months in any year); and *very frequent* that it is likely to occur very often under normal weather conditions (the chance of flooding is more than 50 percent in all months of any year).

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

Map unit symbol and soil name	Hydrologic group	Surface runoff	Most likely months	Water table			Ponding			Flooding	
				Upper limit	Lower limit	Kind	Surface depth	Duration	Frequency	Duration	Frequency
				Ft	*Ft*		*Ft*				
BhnB—Birdsboro silt loam, 2 to 6 percent slopes											
Birdsboro	B	Low	Jan-Dec	—	—	—	—	—	None	—	None
DufC2—Duffield silt loam, 6 to 12 percent slopes, eroded											
Duffield, eroded	B	Medium	Jan-Dec	—	—	—	—	—	None	—	None
DugDh—Duffield silt loam, 12 to 18 percent slopes, very rocky											
Duffield, eroded, very rocky	B	Medium	Jan-Dec	—	—	—	—	—	None	—	None
HcuAt—Hatboro-Codorus complex, 0 to 3 percent slopes, frequently flooded											
Hatboro, frequently	B/D	Negligible	Jan-May	0.0-0.5	6.0	Apparent	0.0-1.0	Brief (2 to 7 days)	Frequent	Very brief (4 to 48 hours)	Frequent
			Jun-Sep	0.0-0.5	6.0	Apparent	—	—	—	—	
			Oct	0.0-0.5	6.0	Apparent	0.0-1.0	Brief (2 to 7 days)	Frequent	—	
			Nov-Dec	0.0-0.5	6.0	Apparent	0.0-1.0	Brief (2 to 7 days)	Frequent	Very brief (4 to 48 hours)	Frequent
Codorus, occasional	C	Low	Jan-Apr	1.5-2.5	6.0	Apparent	—	—	None	Very brief (4 to 48 hours)	Occasional
			May-Oct	1.5-2.5	6.0	Apparent	—	—	None	—	
			Nov-Dec	1.5-2.5	6.0	Apparent	—	—	None	Very brief (4 to 48 hours)	Occasional

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Appendix D

Laboratory Test Results

ANS CONSULTANTS, INC.
4405 South Clinton Avenue
South Plainfield, NJ 07080
Tel: (800) 585-ATUL
(908) 754-8383
Fax: (908) 754-8633
NJ EDA Approved Testing Laboratory • MBE/DBE Certified • NJ DEP Certified
www.ANSConsultants.net

Laboratory Determination of Water (Moisture) Content of Soil and Rock (ASTM D2216)

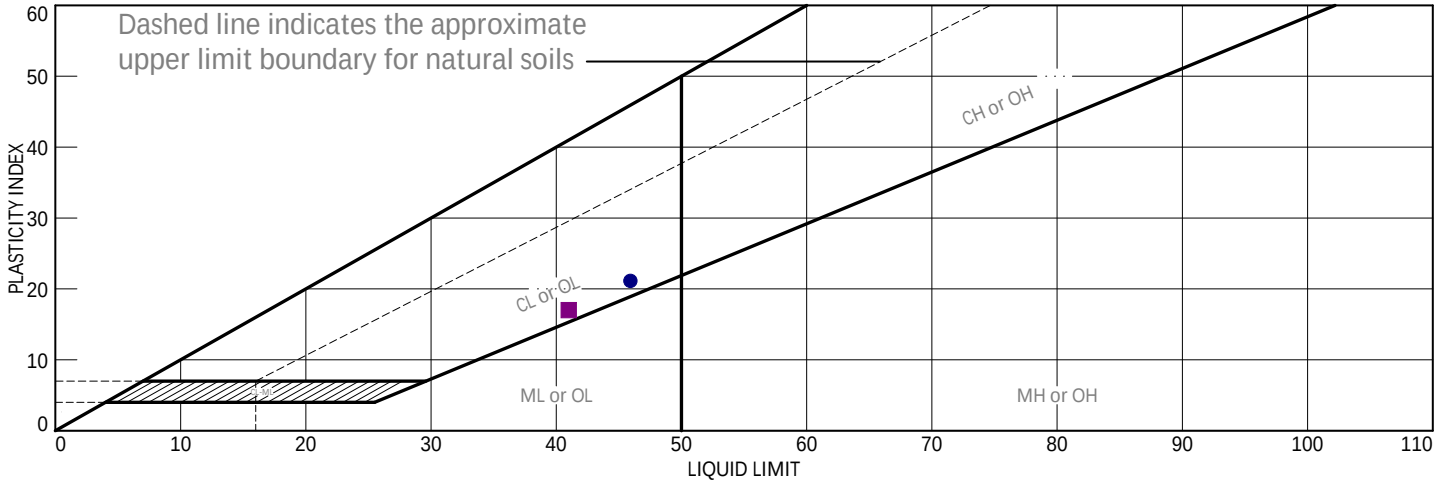
Client Name: Concept Engineering Consultants
Project Name: Clinton Commons, Clinton, NJ
LAB IRN: 23-057
Date: 8/12/2023

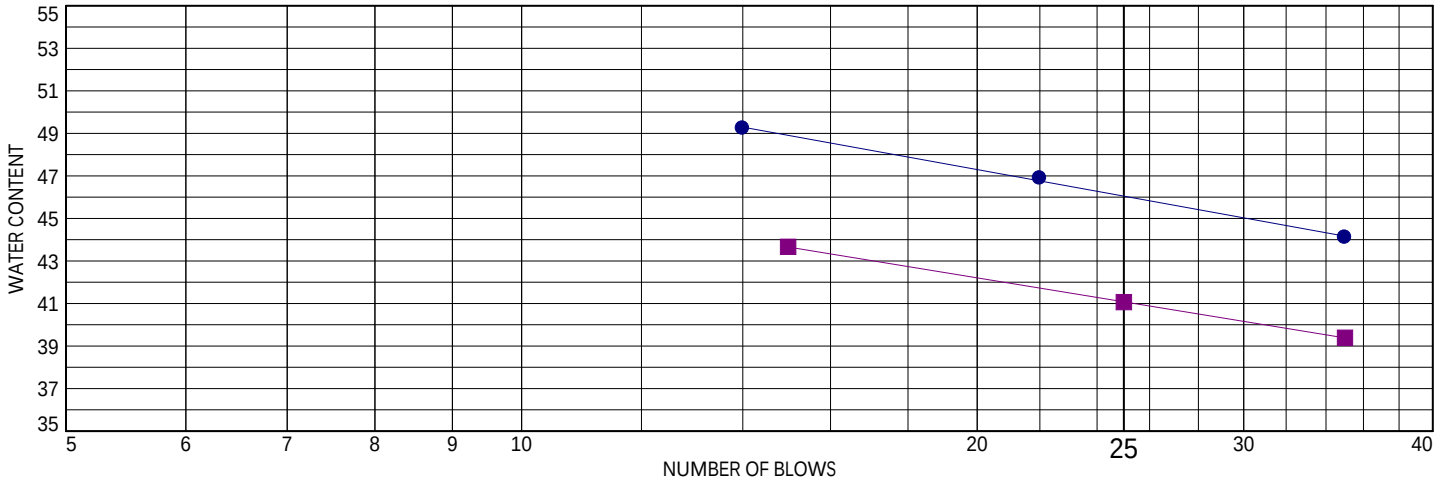
Sample ID	B-06, S-2	B-08, S-2	B-08, S-4	B-10, S-2	B-10, S-3
Depth	2'-4'	2'-4'	6'-8'	2'-4'	4'-6'
Wet soil + Tare (g)	189.2	488.6	556.7	175.2	508.7
Dry soil + Tare (g)	179.7	431.5	525.6	162.7	452.5
Wt. of Tare (g)	121.9	194.7	191.7	115.7	190.4
Moisture Content	**16.4%**	**24.1%**	**9.3%**	**26.7%**	**21.5%**

Sample ID	B-12, S-2	B-12, S-3
Depth	2'-4'	4'-6'
Wet soil + Tare (g)	563.9	563.6
Dry soil + Tare (g)	543.3	539.7
Wt. of Tare (g)	194.1	196.2
Moisture Content	**5.9%**	**7.0%**

Tested By: AG
Checked By: ANS

LIQUID AND PLASTIC LIMITS TEST REPORT (ASTM D4318)





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Light Brown Clay & Silt, trace cmf Sand (Visual)	46	25	21			
■	Brown Clay & Silt, trace cmf Sand (Visual)	41	24	17			

Project No. IRN 23-057 Client: Concept Engineering Consultants

Project: Clinton Commons, Clinton, NJ

●Depth: 2'-4' Sample Number: B-06, S-2

■Depth: 2'-4' Sample Number: B-10, S-2

Remarks:

●ASTM D4318 - Sample Air-Dried, LL Device: Manual, PL Rolling Method: Hand-Rolled, Grooving Tool: Metal
8/12/2023

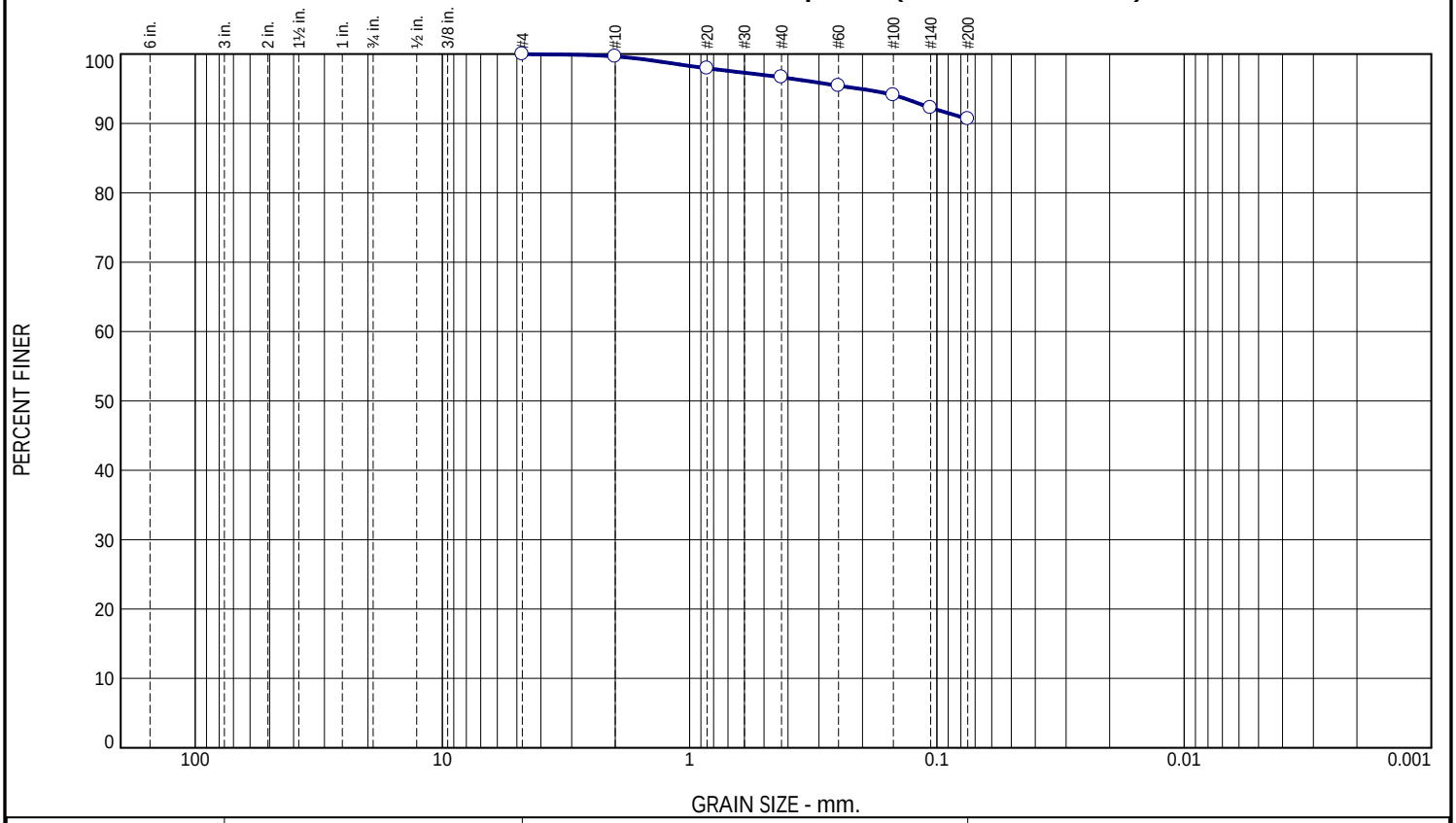
ANS CONSULTANTS, INC.

South Plainfield, New Jersey

Figure

Tested By: AM Checked By: ANS

Particle Size Distribution Report (ASTM D6913)



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.3	3.0	6.0	90.7	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.7		
#20	97.9		
#40	96.7		
#60	95.4		
#100	94.1		
#140	92.3		
#200	90.7		

* (no specification provided)

Soil Description

Dark Brown

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Sample Number: B-08, S-2 Depth: 2'-4'

Date: 8/12/2023

ANS CONSULTANTS, INC.

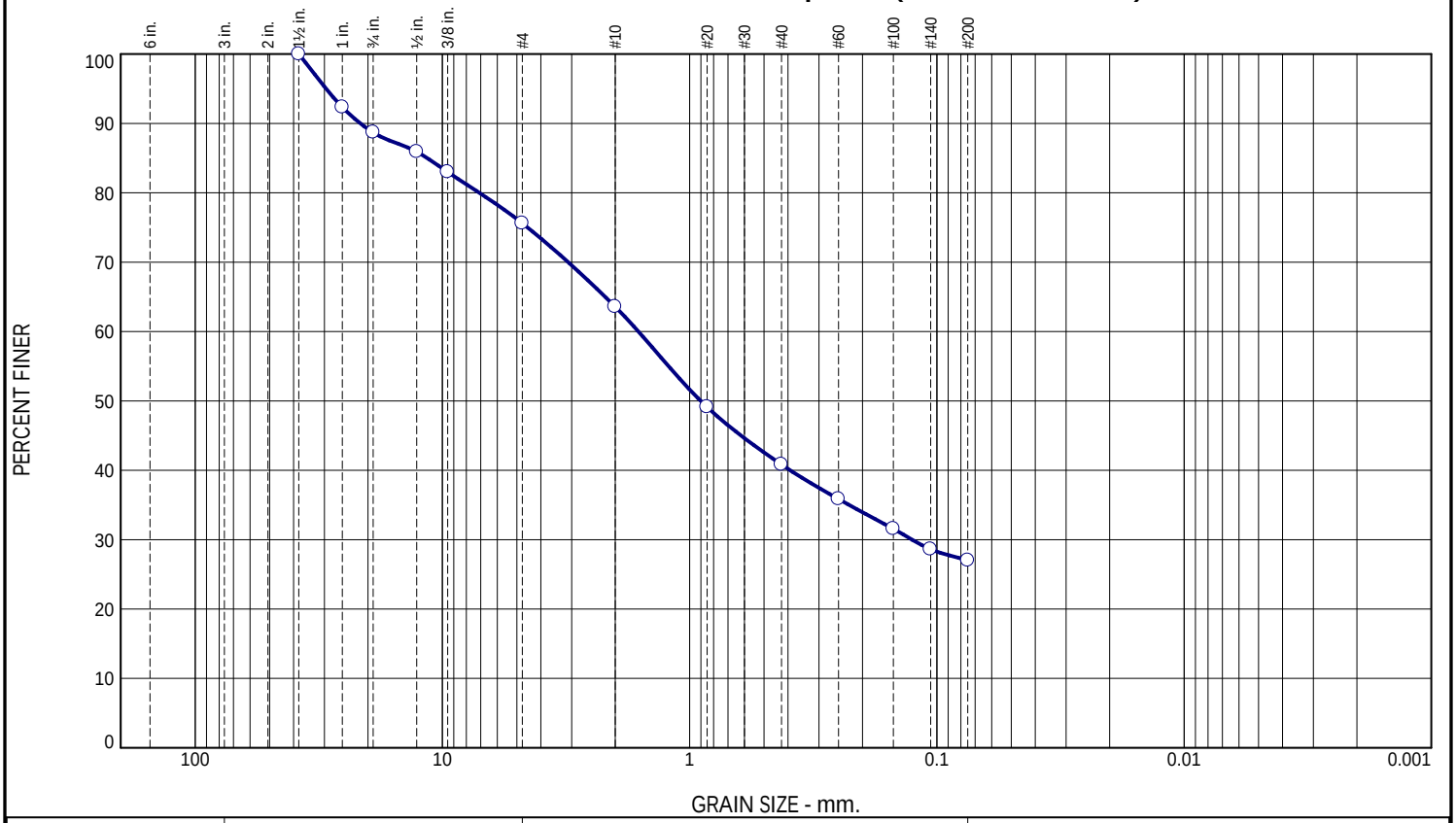
South Plainfield, New Jersey

Client: Concept Engineering Consultants
Project: Clinton Commons, Clinton, NJ

Project No: IRN 23-057 Figure

Tested By: MG Checked By: ANS

Particle Size Distribution Report (ASTM D6913)



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	11.3	13.1	12.0	22.8	13.8	27.0	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5"	100.0		
1"	92.3		
3/4"	88.7		
1/2"	85.9		
3/8"	83.0		
#4	75.6		
#10	63.6		
#20	49.1		
#40	40.8		
#60	35.9		
#100	31.6		
#140	28.6		
#200	27.0		

* (no specification provided)

Soil Description

Grayish Brown

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 21.4740 D_{85}= 11.5115 D_{60}= 1.6112
D_{50}= 0.9021 D_{30}= 0.1260 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Sample Number: B-08, S-4 Depth: 6'-8'

Date: 8/12/2023

ANS CONSULTANTS, INC.

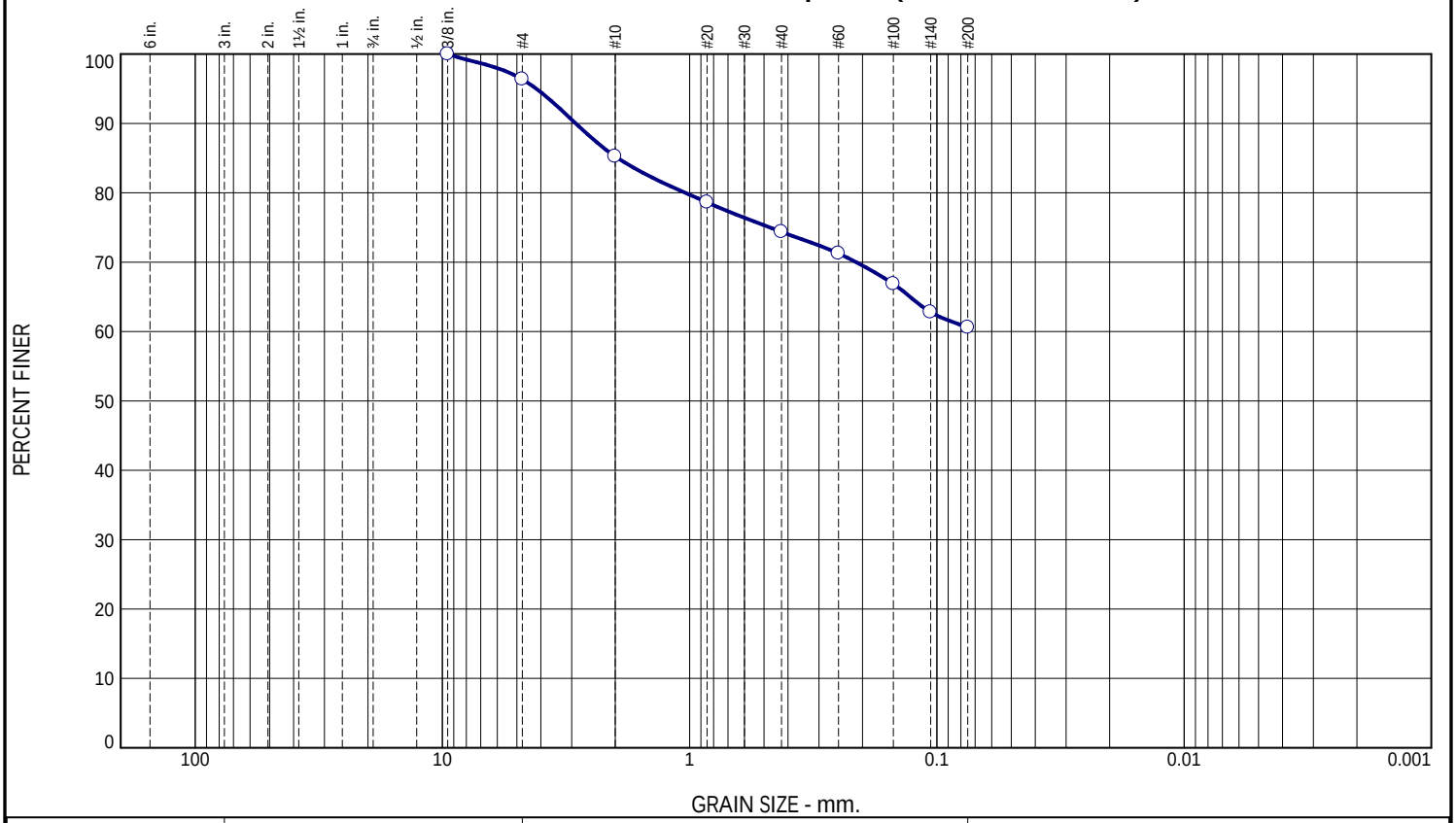
South Plainfield, New Jersey

Client: Concept Engineering Consultants
Project: Clinton Commons, Clinton, NJ

Project No: IRN 23-057 Figure

Tested By: MG Checked By: ANS

Particle Size Distribution Report (ASTM D6913)



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	3.6	11.2	10.8	13.8	60.6	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8"	100.0		
#4	96.4		
#10	85.2		
#20	78.6		
#40	74.4		
#60	71.3		
#100	66.9		
#140	62.8		
#200	60.6		

* (no specification provided)

Soil Description

Dark Brown

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 2.8873 D_{85}= 1.9518 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Sample Number: B-10, S-3 Depth: 4'-6'

Date: 8/12/2023

ANS CONSULTANTS, INC.

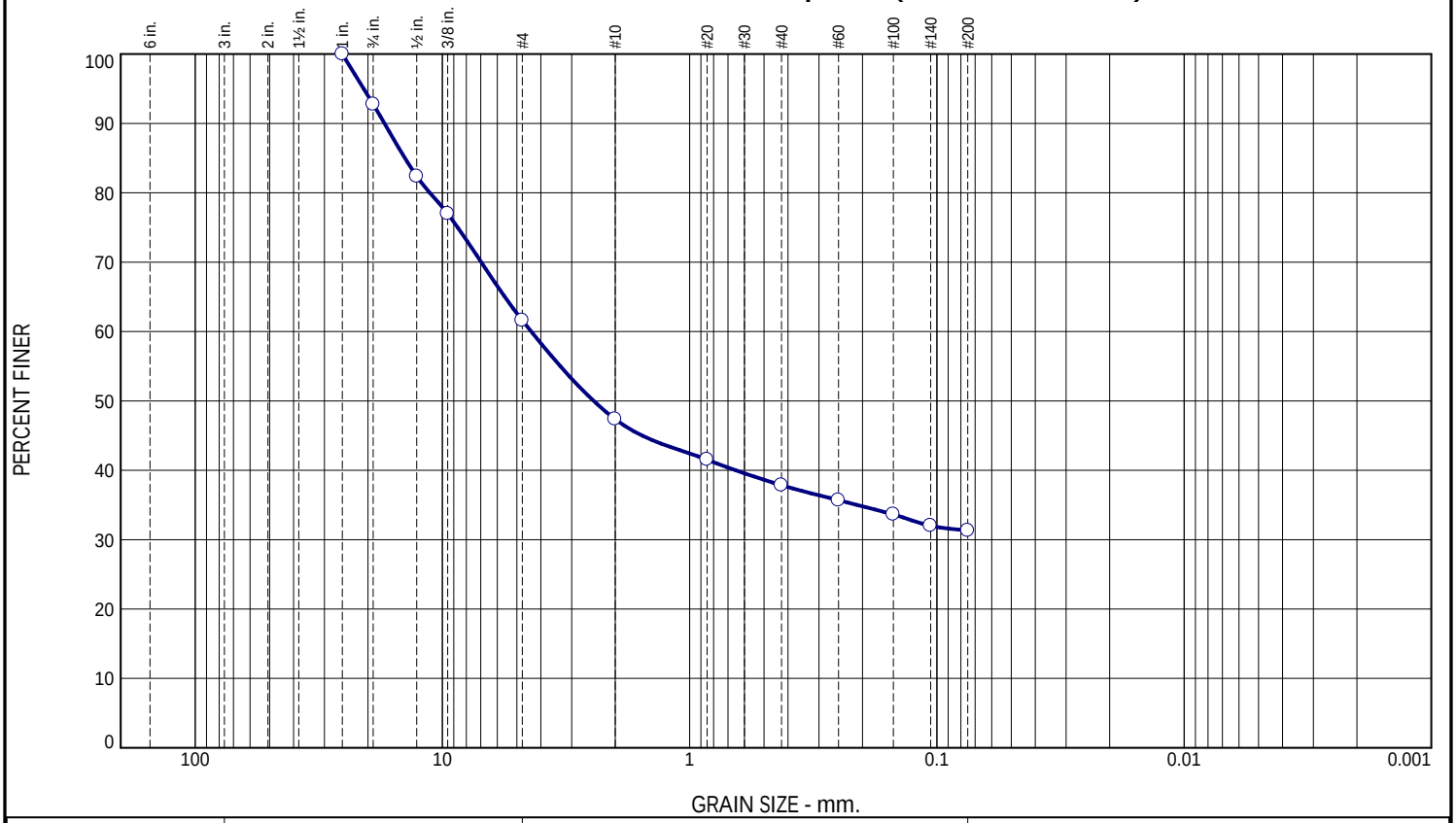
South Plainfield, New Jersey

Client: Concept Engineering Consultants
Project: Clinton Commons, Clinton, NJ

Project No: IRN 23-057 Figure

Tested By: MG Checked By: ANS

Particle Size Distribution Report (ASTM D6913)



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	7.2	31.2	14.2	9.6	6.5	31.3	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1"	100.0		
3/4"	92.8		
1/2"	82.4		
3/8"	77.0		
#4	61.6		
#10	47.4		
#20	41.5		
#40	37.8		
#60	35.7		
#100	33.6		
#140	32.0		
#200	31.3		

* (no specification provided)

Soil Description

Dark Gray silty gravel with sand

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 17.1466 D_{85}= 14.1838 D_{60}= 4.3710
D_{50}= 2.4461 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= GM AASHTO= A-2-4(0)

Remarks

Sample Number: B-12, S-2 Depth: 2'-4'

Date: 8/12/2023

ANS CONSULTANTS, INC.

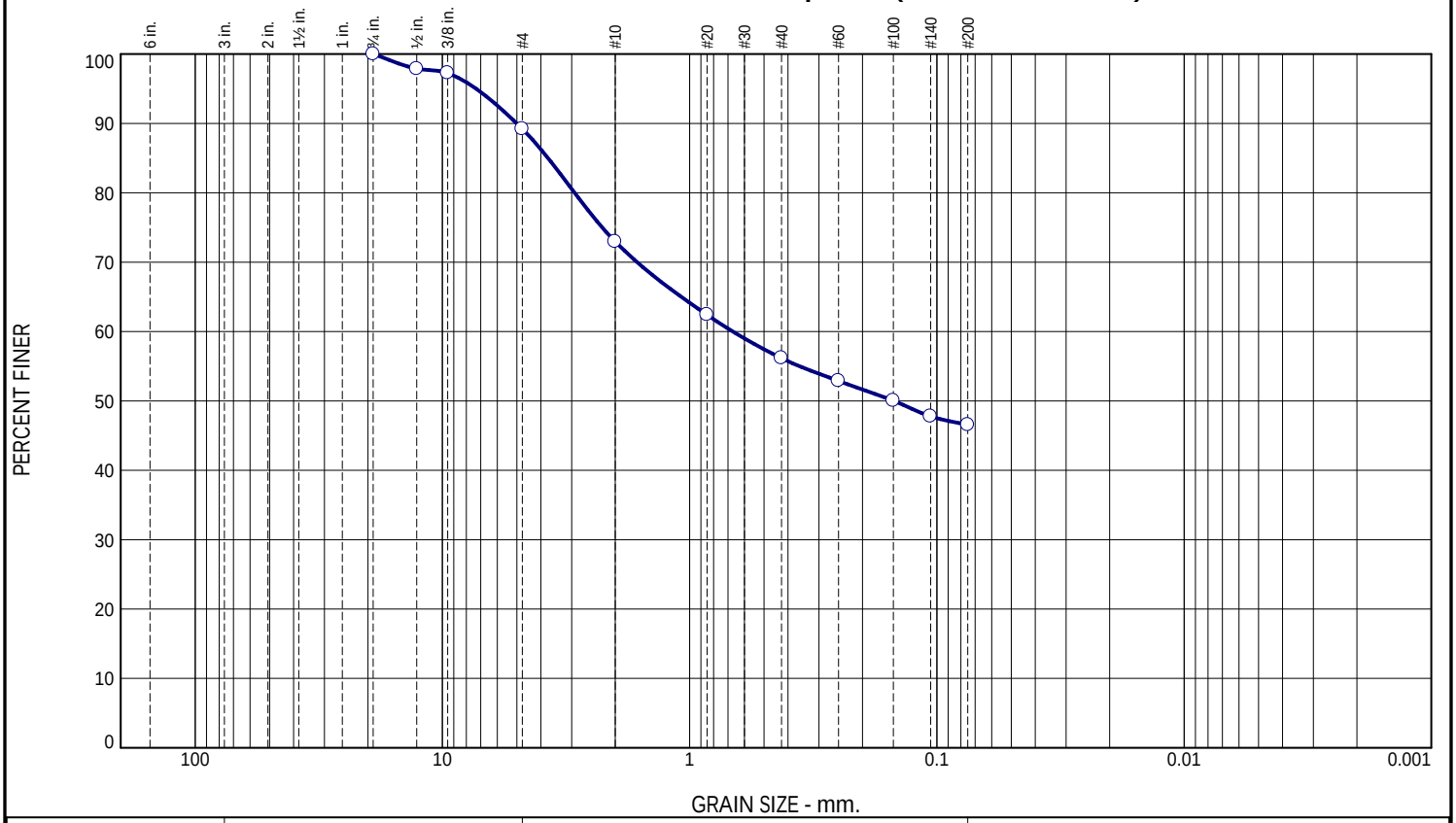
South Plainfield, New Jersey

Client: Concept Engineering Consultants
Project: Clinton Commons, Clinton, NJ

Project No: IRN 23-057 Figure

Tested By: MG Checked By: ANS

Particle Size Distribution Report (ASTM D6913)



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	10.8	16.2	16.8	9.7	46.5	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
1/2"	97.9		
3/8"	97.3		
#4	89.2		
#10	73.0		
#20	62.4		
#40	56.2		
#60	52.9		
#100	50.0		
#140	47.8		
#200	46.5		

* (no specification provided)

Soil Description

Gray silty sand

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 5.0086 D_{85}= 3.7386 D_{60}= 0.6689
D_{50}= 0.1492 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-4(0)

Remarks

Sample Number: B-12, S-3 Depth: 4'-6'

Date: 8/12/2023

ANS CONSULTANTS, INC.

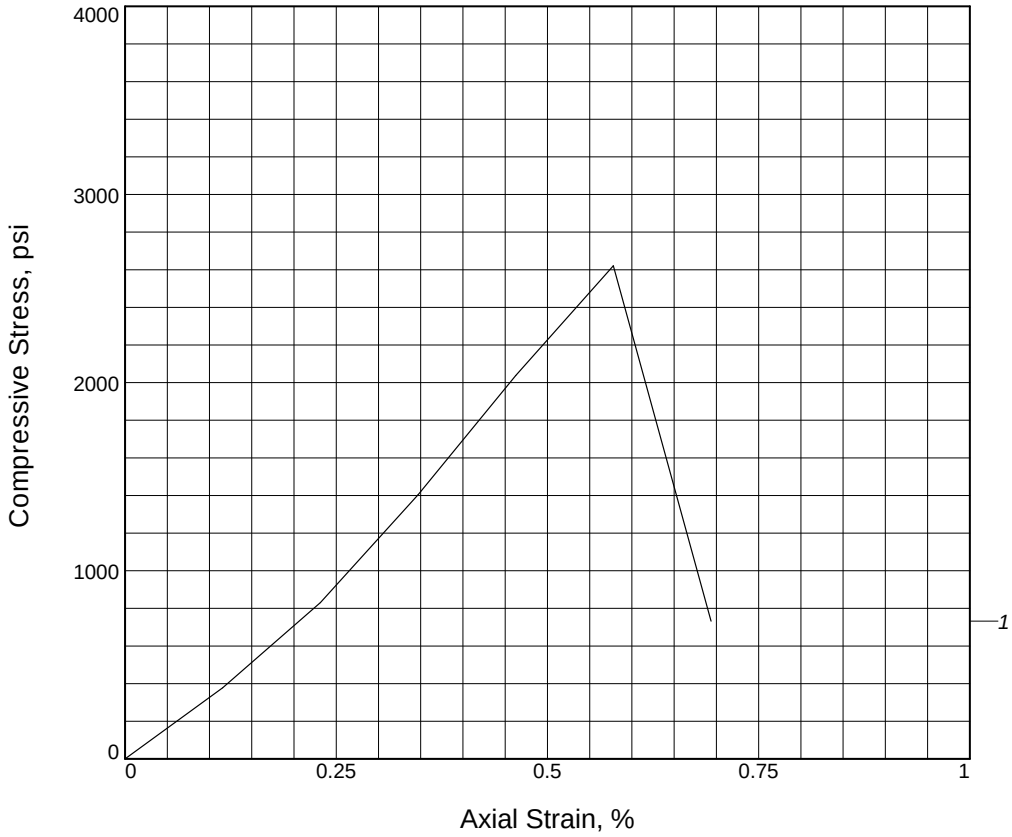
South Plainfield, New Jersey

Client: Concept Engineering Consultants
Project: Clinton Commons, Clinton, NJ

Project No: IRN 23-057 Figure

Tested By: MG Checked By: ANS

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, psi	2620.69			
Undrained shear strength, psi	1310.35			
Failure strain, %	0.6			
Strain rate, in./min.	N/A			
Water content, %	0.0			
Wet density, pcf	174.7			
Dry density, pcf	174.7			
Saturation, %	0.0			
Void ratio	0.0721			
Specimen diameter, in.	1.97			
Specimen height, in.	4.33			
Height/diameter ratio	2.20			

Description: Gray Rock Core

LL =	**PL =**	**PI =**	**Assumed GS=** 3	**Type:**

Project No.: IRN 23-057
Date Sampled: 8/12/2023

Remarks:
ASTM D7012 - Method C
Loading Manner: Constant Stress Rate (0.5 MPa/sec)

Figure _____

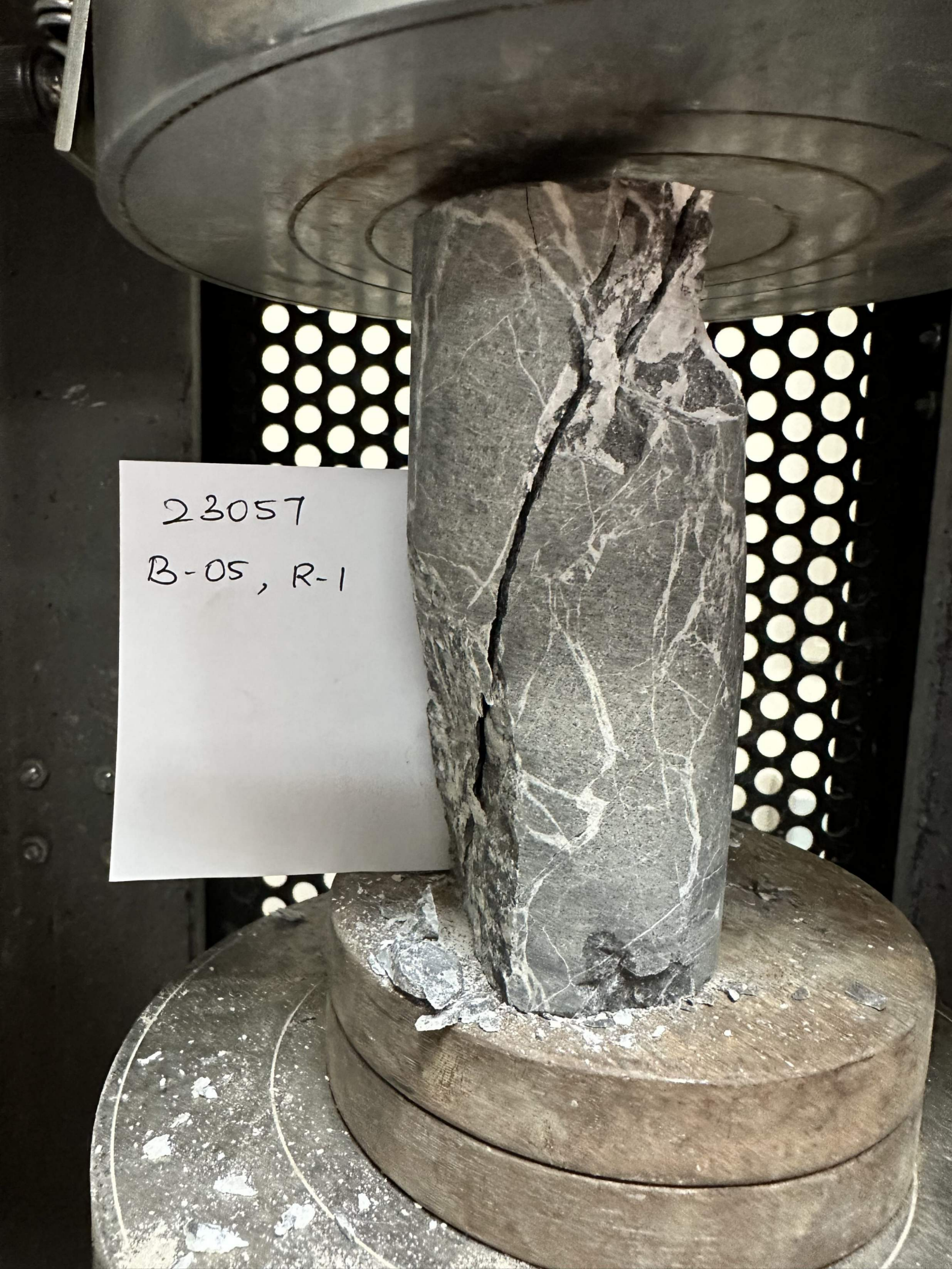
Client: Concept Engineering Consultants

Project: Clinton Commons, Clinton, NJ

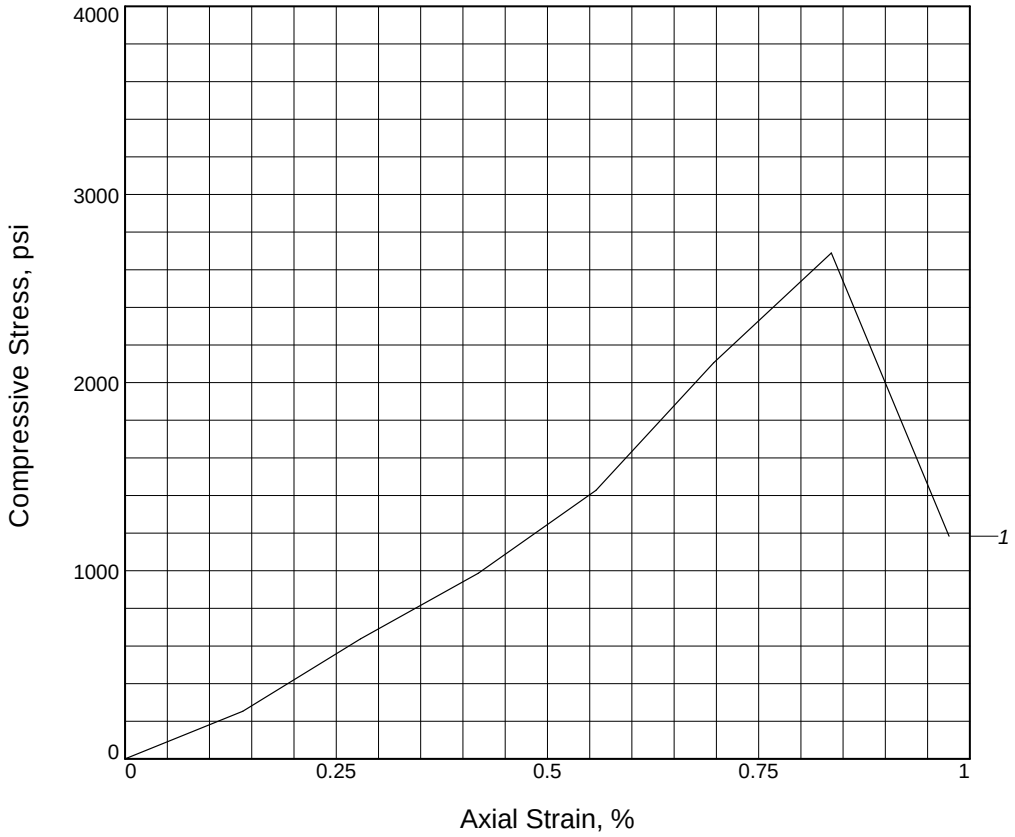
Sample Number: B-05, R-1 **Depth:** 7'7"-8'3"

UNCONFINED COMPRESSION TEST
ANS CONSULTANTS, INC.
South Plainfield, New Jersey

Tested By: MM **Checked By:** ANS


23057
B-05, R-1

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, psi	2689.18			
Undrained shear strength, psi	1344.59			
Failure strain, %	0.8			
Strain rate, in./min.	N/A			
Water content, %	0.0			
Wet density, pcf	170.7			
Dry density, pcf	170.7			
Saturation, %	0.0			
Void ratio	0.0974			
Specimen diameter, in.	1.98			
Specimen height, in.	3.59			
Height/diameter ratio	1.81			

Description: Gray Rock Core

LL =	**PL =**	**PI =**	**Assumed GS=** 3	**Type:**

Project No.: IRN 23-057
Date Sampled: 8/12/2023

Remarks:
ASTM D7012 - Method C
Loading Manner: Constant Stress Rate (0.5 MPa/sec)
H/D Ratio < 2.0

Figure _____

Client: Concept Engineering Consultants

Project: Clinton Commons, Clinton, NJ

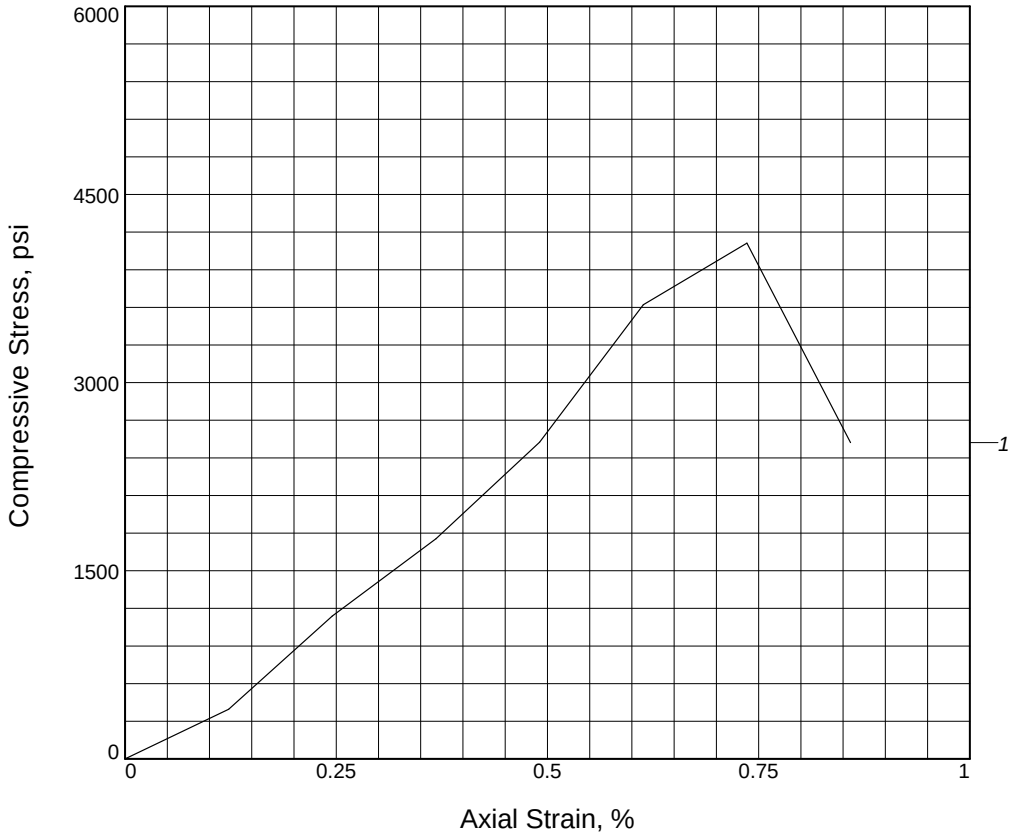
Sample Number: B-12, R-1 **Depth:** 12'2"-12'7"

UNCONFINED COMPRESSION TEST
ANS CONSULTANTS, INC.
South Plainfield, New Jersey

Tested By: MM **Checked By:** ANS


23-057
B-12, R-1
"-12'3"

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, psi	4112.66			
Undrained shear strength, psi	2056.33			
Failure strain, %	0.7			
Strain rate, in./min.	N/A			
Water content, %	0.0			
Wet density, pcf	170.1			
Dry density, pcf	170.1			
Saturation, %	0.0			
Void ratio	0.1009			
Specimen diameter, in.	1.98			
Specimen height, in.	4.08			
Height/diameter ratio	2.06			

Description: Gray Rock Core

LL =	**PL =**	**PI =**	**Assumed GS=** 3	**Type:**

Project No.: IRN 23-057
Date Sampled: 8/12/2023

Remarks:
ASTM D7012 - Method C
Loading Manner: Constant Stress Rate (0.5 MPa/sec)

Figure _____

Client: Concept Engineering Consultants

Project: Clinton Commons, Clinton, NJ

Sample Number: B-15, R-1 **Depth:** 6'5"-7'1"

UNCONFINED COMPRESSION TEST
ANS CONSULTANTS, INC.
South Plainfield, New Jersey

Tested By: MM **Checked By:** ANS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23-057
B-15, R-1
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Laboratory Determination of Water (Moisture) Content of Soil and Rock (ASTM D2216)

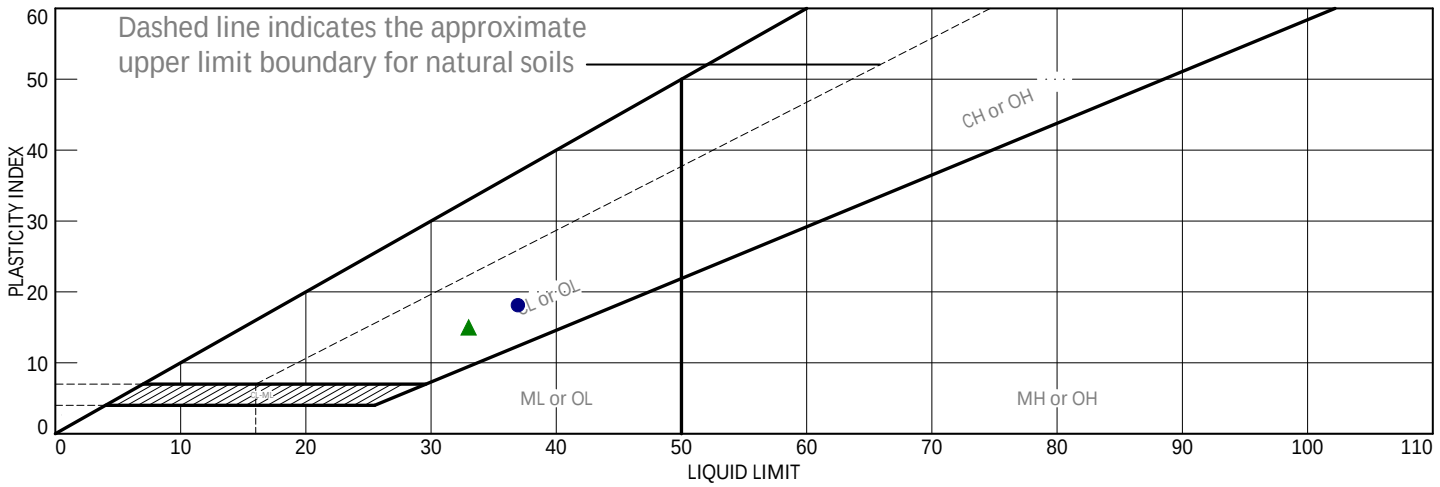
Client Name: Concept Engineering Consultants
LAB IRN: 23-082
Project Name: Clinton Commons, Clinton, NJ
Date: 8/26/2023

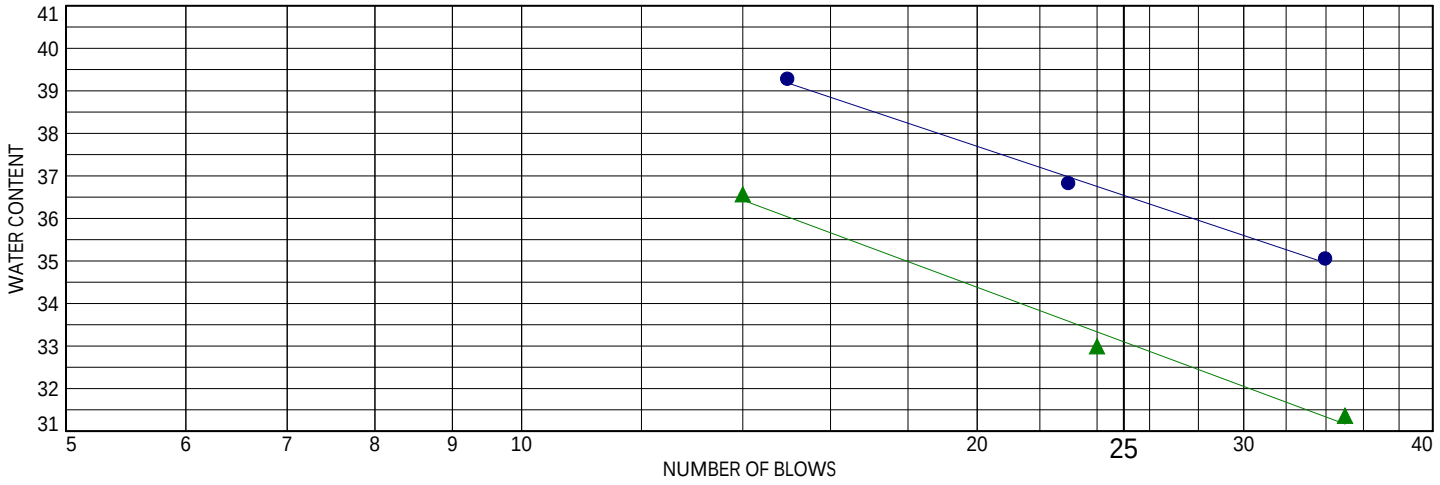
Sample ID	B-02, S-7	B-14, S-4	B-16, S-3	B-16, S-8	B-17, S-2
Depth	15'-17'	7'-9'	4'-6'	20'-22'	2'-4'
Wet soil + Tare (g)	190.5	365.0	666.0	476.0	1177.0
Dry soil + Tare (g)	160.3	295.0	625.3	399.6	1107.2
Wt. of Tare (g)	13.8	13.8	190.0	13.8	195.5
Moisture Content	**20.6%**	**24.9%**	**9.3%**	**19.8%**	**7.7%**

Sample ID	B-18, S-3	B-19, S-2	Bulk, S-1
Depth	4'-6'	2'-4'	0'-2'
Wet soil + Tare (g)	1058.0	1033.5	273.8
Dry soil + Tare (g)	964.2	963.1	230.8
Wt. of Tare (g)	198.2	191.4	13.7
Moisture Content	**12.2%**	**9.1%**	**19.8%**

Tested By: AA/CK
Checked By: ANS

LIQUID AND PLASTIC LIMITS TEST REPORT (ASTM D4318)





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown Clay & Silt, little mf Gravel, trace cmf Sand (Visual)	37	19	18			
■	Brown cmf Sand, some Silt & Clay, trace mf Gravel (Visual)	NV	NP	NP			
▲	Brown Silt & Clay, little cmf Sand, trace mf Gravel (Visual)	33	18	15			

Project No. IRN 23-082 Client: Concept Engineering Consultants

Project: Clinton Commons, Clinton, NJ

●Depth: 15'-17' Sample Number: B-02, S-7

■Depth: 7'-9' Sample Number: B-14, S-4

▲Depth: 20'-22' Sample Number: B-16, S-8

ANS CONSULTANTS, INC.

South Plainfield, New Jersey

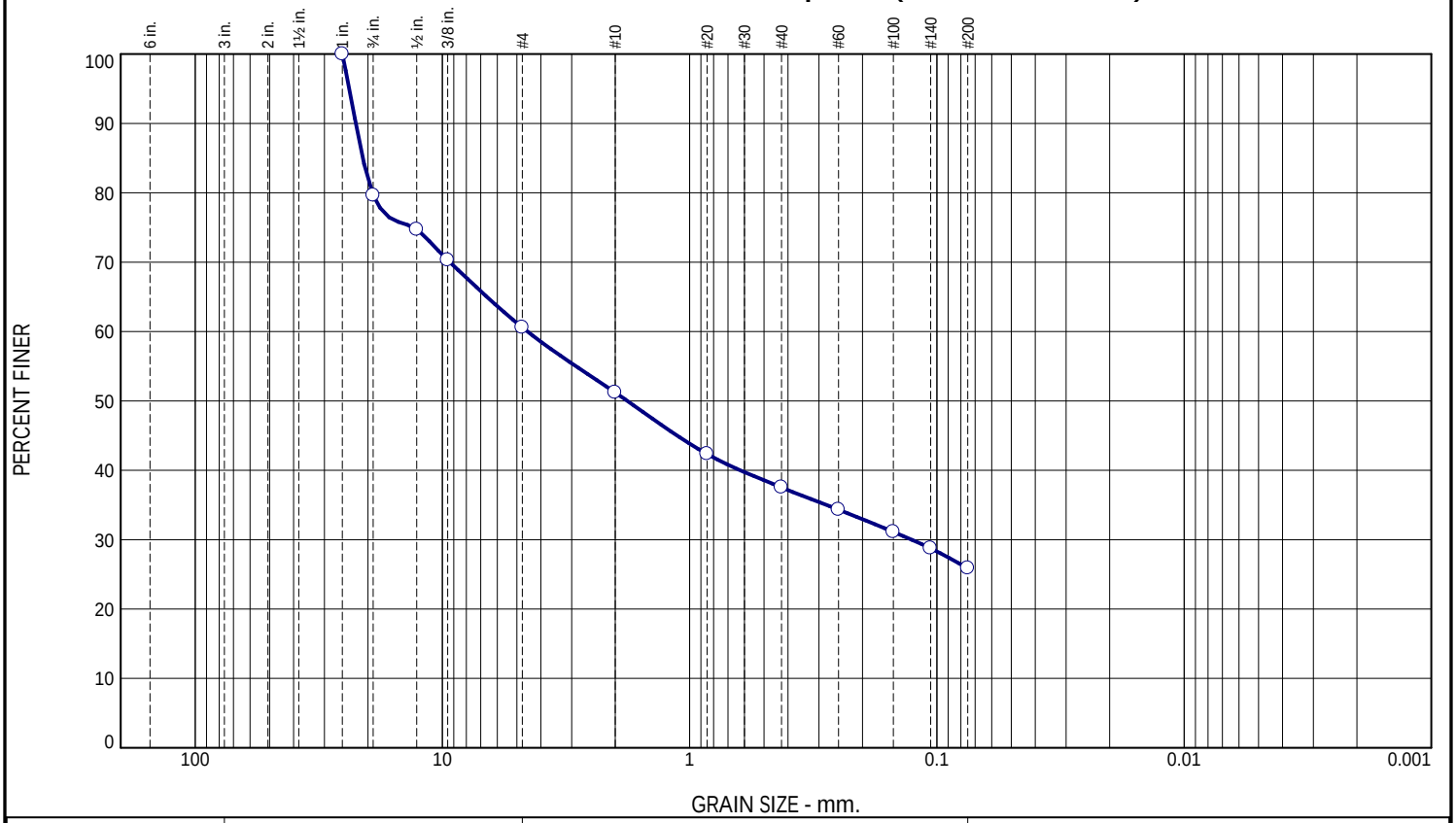
Remarks:

●ASTM D4318 - Sample Air-Dried, LL Device: Manual, PL Rolling Method: Hand-Rolled, Grooving Tool: Metal
8/26/2023

Figure

Tested By: AG Checked By: ANS

Particle Size Distribution Report (ASTM D6913)



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	20.4	19.0	9.4	13.7	11.6	25.9	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1"	100.0		
3/4"	79.6		
1/2"	74.7		
3/8"	70.3		
#4	60.6		
#10	51.2		
#20	42.3		
#40	37.5		
#60	34.3		
#100	31.1		
#140	28.7		
#200	25.9		

* (no specification provided)

Soil Description

Dark Brown silty gravel with sand

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 22.4014 D_{85}= 20.9977 D_{60}= 4.5269
D_{50}= 1.7876 D_{30}= 0.1266 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= GM AASHTO= A-2-4(0)

Remarks

Undersized specimen

Sample Number: B-16, S-3 Depth: 4'-6'

Date: 8/26/2023

ANS CONSULTANTS, INC.

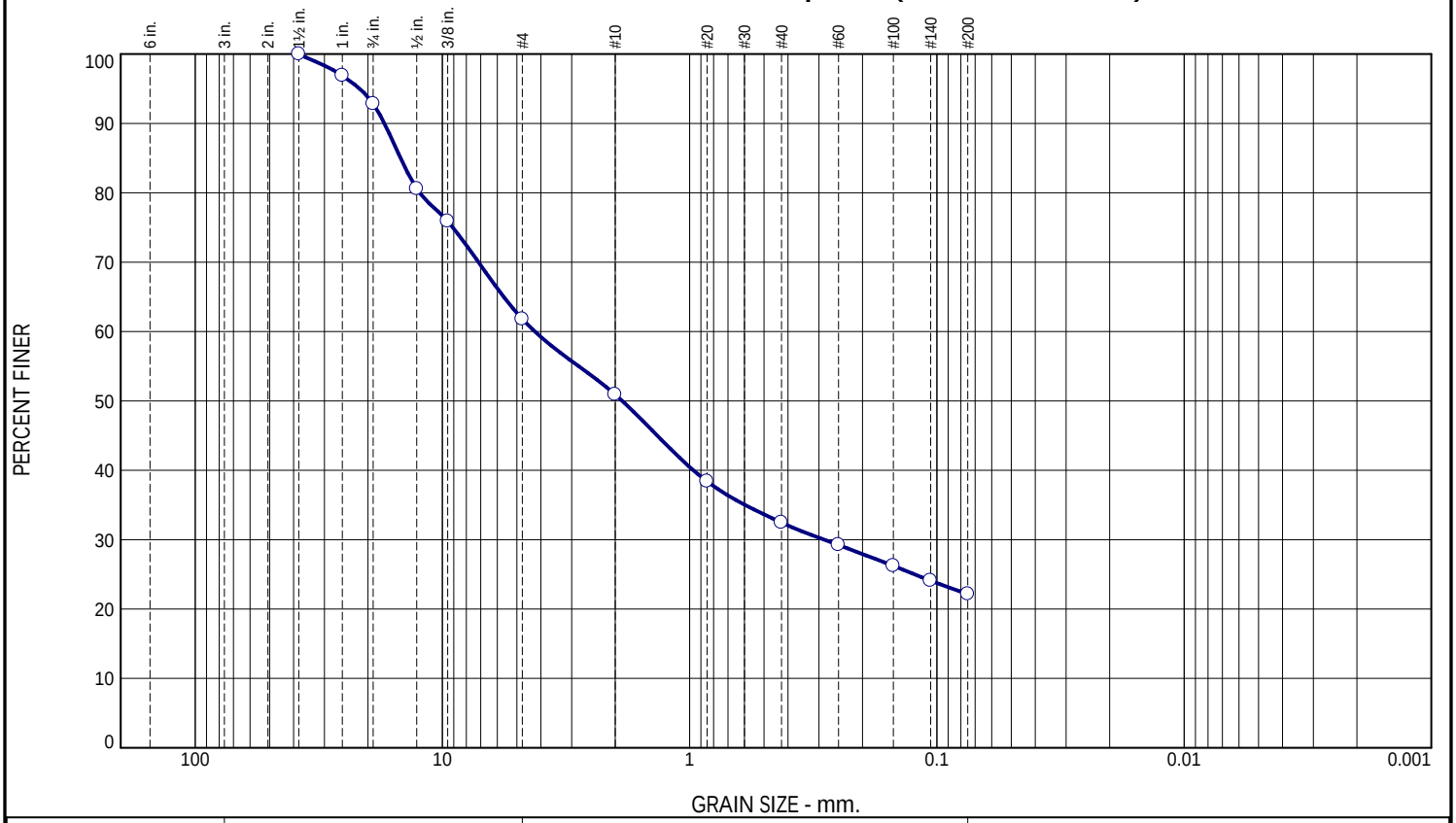
South Plainfield, New Jersey

Client: Concept Engineering Consultants
Project: Clinton Commons, Clinton, NJ

Project No: IRN 23-082 Figure

Tested By: AA Checked By: ANS

Particle Size Distribution Report (ASTM D6913)



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	7.2	31.0	10.9	18.4	10.4	22.1	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5"	100.0		
1"	96.9		
3/4"	92.8		
1/2"	80.6		
3/8"	75.9		
#4	61.8		
#10	50.9		
#20	38.4		
#40	32.5		
#60	29.2		
#100	26.2		
#140	24.1		
#200	22.1		

* (no specification provided)

Soil Description

Gray silty sand with gravel

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 17.1607 D_{85}= 14.7652 D_{60}= 4.2285
D_{50}= 1.8743 D_{30}= 0.2855 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-1-b

Remarks

Sample Number: B-17, S-2 Depth: 2'-4'

Date: 8/26/2023

ANS CONSULTANTS, INC.

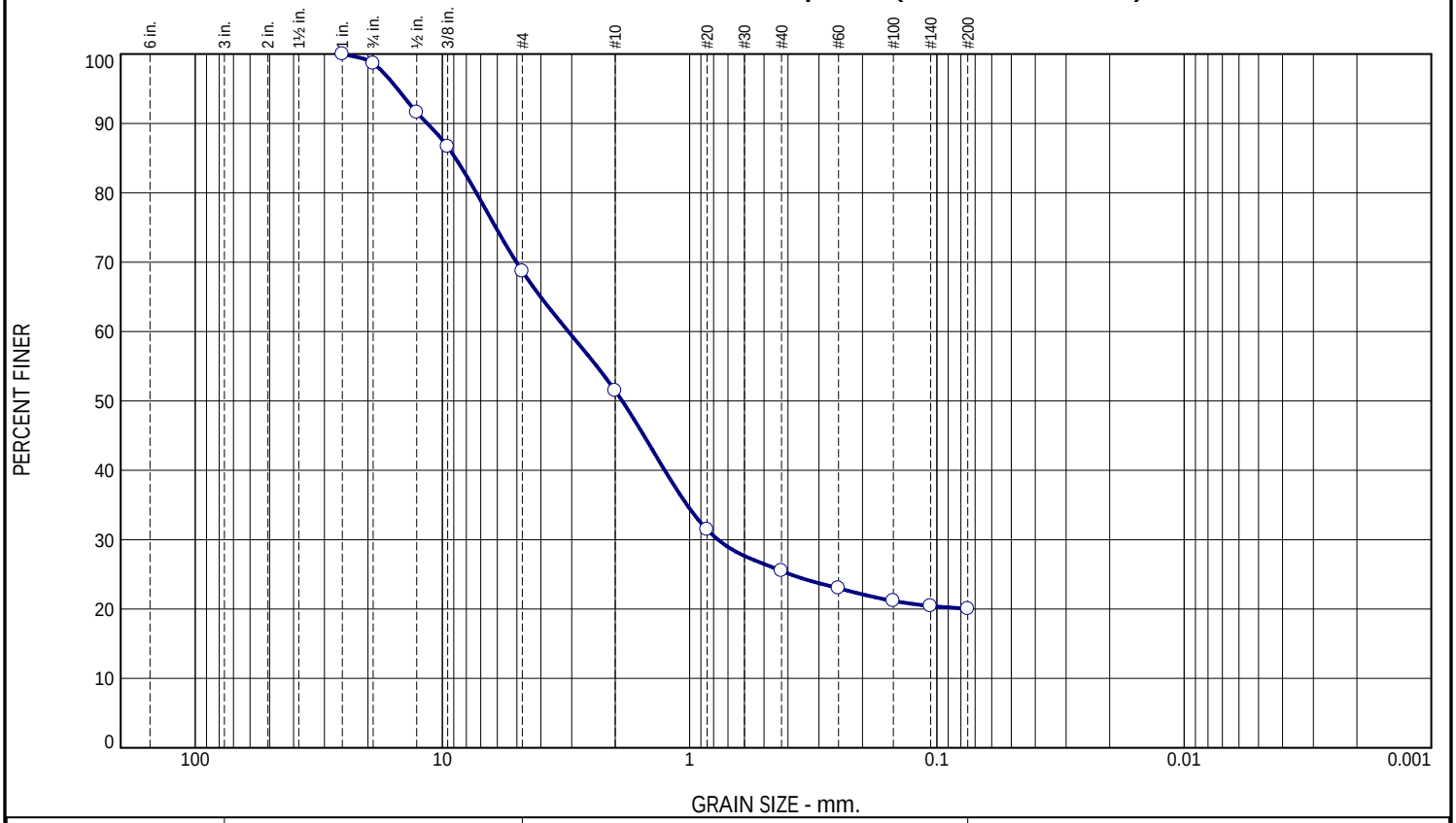
South Plainfield, New Jersey

Client: Concept Engineering Consultants
Project: Clinton Commons, Clinton, NJ

Project No: IRN 23-082 Figure

Tested By: CK Checked By: ANS

Particle Size Distribution Report (ASTM D6913)



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	1.3	30.0	17.2	26.0	5.5	20.0	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1"	100.0		
3/4"	98.7		
1/2"	91.6		
3/8"	86.7		
#4	68.7		
#10	51.5		
#20	31.4		
#40	25.5		
#60	23.0		
#100	21.2		
#140	20.4		
#200	20.0		

* (no specification provided)

Soil Description

Grayish Brown silty sand with gravel

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 11.5210 D_{85}= 8.8499 D_{60}= 3.0927
D_{50}= 1.8735 D_{30}= 0.7684 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-1-b

Remarks

Sample Number: B-18, S-3 Depth: 4'-6'

Date: 8/26/2023

ANS CONSULTANTS, INC.

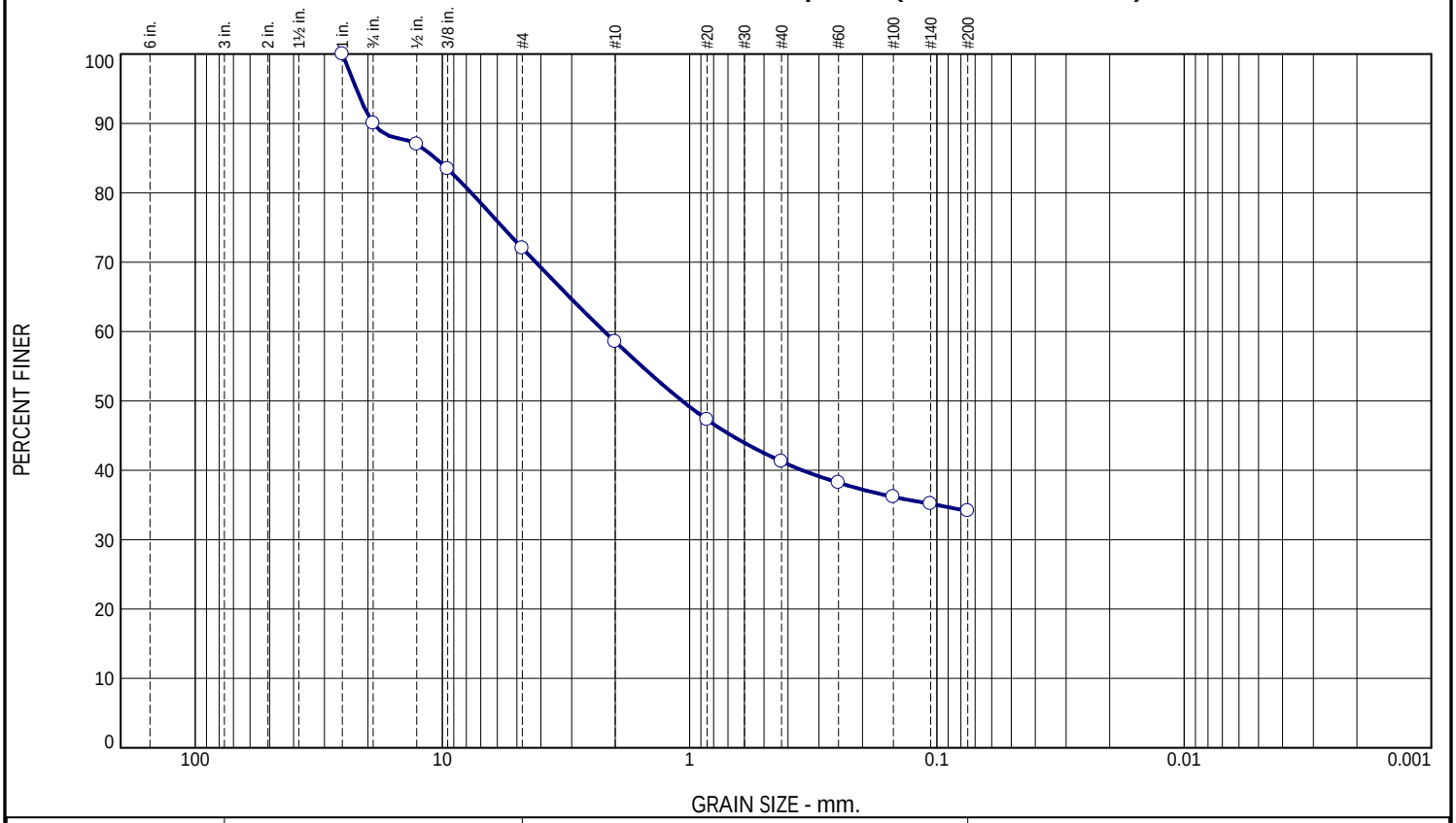
South Plainfield, New Jersey

Client: Concept Engineering Consultants
Project: Clinton Commons, Clinton, NJ

Project No: IRN 23-082 Figure

Tested By: AA Checked By: ANS

Particle Size Distribution Report (ASTM D6913)



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	10.0	18.0	13.5	17.2	7.2	34.1	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1"	100.0		
3/4"	90.0		
1/2"	87.0		
3/8"	83.4		
#4	72.0		
#10	58.5		
#20	47.3		
#40	41.3		
#60	38.2		
#100	36.2		
#140	35.2		
#200	34.1		

* (no specification provided)

Soil Description

Dark Gray silty sand with gravel

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 19.0474 D_{85}= 10.6719 D_{60}= 2.2123
D_{50}= 1.0713 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

Sample Number: B-19, S-2 Depth: 2'-4'

Date:

ANS CONSULTANTS, INC.

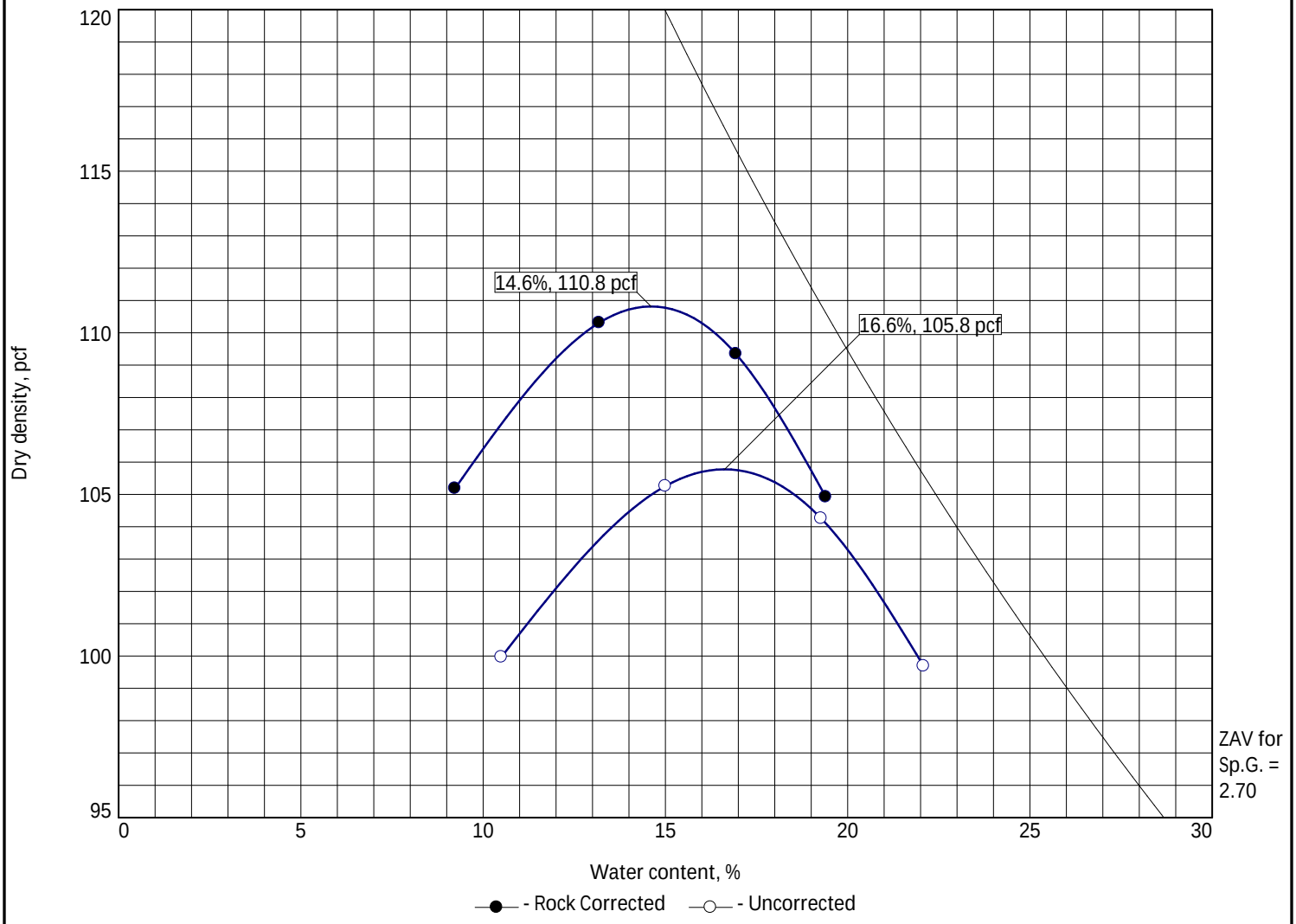
South Plainfield, New Jersey

Client: Concept Engineering Consultants
Project: Clinton Commons, Clinton, NJ

Project No: IRN 23-082 Figure

Tested By: AA Checked By: ANS

COMPACTION TEST REPORT



Test specification: ASTM D 1557-12 Method B Modified
ASTM D4718-15 Oversize Corr. Applied to Each Test Point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/8 in.	% < No.200
	USCS	AASHTO						
0'-2'				2.7			12.2	

ROCK CORRECTED TEST RESULTS	UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 110.8 pcf	105.8 pcf	Dark Brown Silt & Clay, some mf Gravel, little cmf Sand (Visual, Organics Present)
Optimum moisture = 14.6 %	16.6 %	

Project No. IRN 23-082 Client: Concept Engineering Consultants
Project: Clinton Commons, Clinton, NJ
Date: 8/26/2023
○ Sample Number: Bulk, S-1

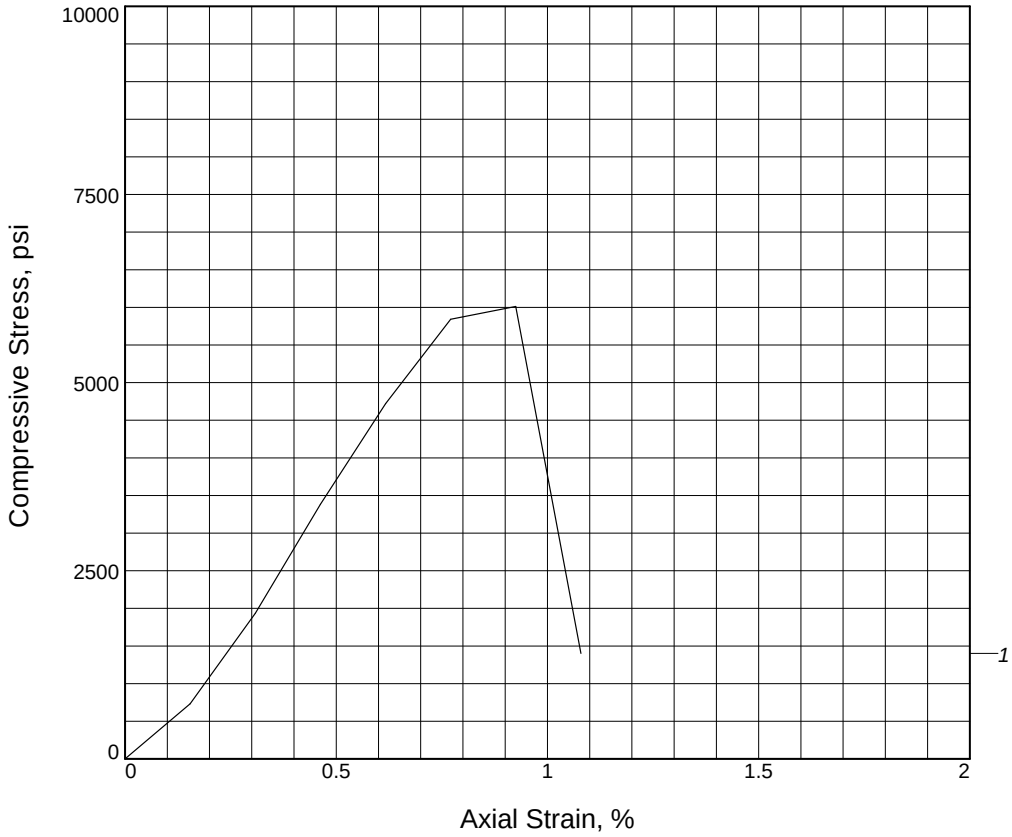
ANS CONSULTANTS, INC.
South Plainfield, New Jersey

Remarks:
SG Assumed

Figure

Tested By: MG Checked By: ANS

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, psi	6012.30			
Undrained shear strength, psi	3006.15			
Failure strain, %	0.9			
Strain rate, in./min.	N/A			
Water content, %	0.0			
Wet density, pcf	171.8			
Dry density, pcf	171.8			
Saturation, %	0.0			
Void ratio	0.0176			
Specimen diameter, in.	1.97			
Specimen height, in.	3.24			
Height/diameter ratio	1.65			

Description: Gray Limestone Rock Core

LL =	**PL =**	**PI =**	**Assumed GS=** 2.8	**Type:**

Project No.: IRN 23-082
Date Sampled: 8/26/2023

Remarks:
ASTM D7012 - Method C
Loading Manner: Constant Stress Rate (0.5 MPa/sec)
H/D Ratio < 2.0

Figure _____

Client: Concept Engineering Consultants

Project: Clinton Commons, Clinton, NJ

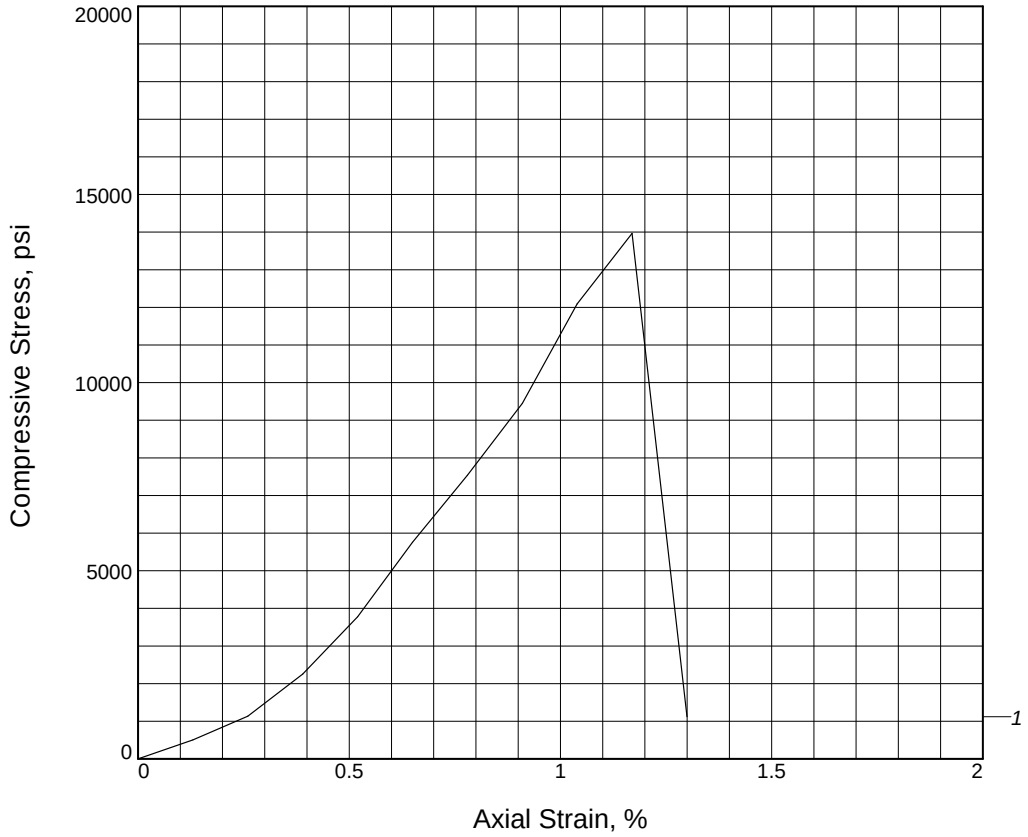
Sample Number: B-02, R-1 **Depth:** 20'8"-21'-3"

UNCONFINED COMPRESSION TEST
ANS CONSULTANTS, INC.
South Plainfield, New Jersey

Tested By: AS/NK **Checked By:** ANS


23-082
B-02, R-1

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, psi	13965.07			
Undrained shear strength, psi	6982.53			
Failure strain, %	1.2			
Strain rate, in./min.	N/A			
Water content, %	0.0			
Wet density, pcf	172.7			
Dry density, pcf	172.7			
Saturation, %	0.0			
Void ratio	0.0122			
Specimen diameter, in.	1.96			
Specimen height, in.	3.85			
Height/diameter ratio	1.97			

Description: Gray Limestone Rock Core

LL =	**PL =**	**PI =**	**Assumed GS=** 2.8	**Type:**

Project No.: IRN 23-082
Date Sampled: 8/26/2023

Remarks:
ASTM D7012 - Method C
Loading Manner: Constant Stress Rate (0.5 MPa/sec)
H/D Ratio < 2.0

Figure _____

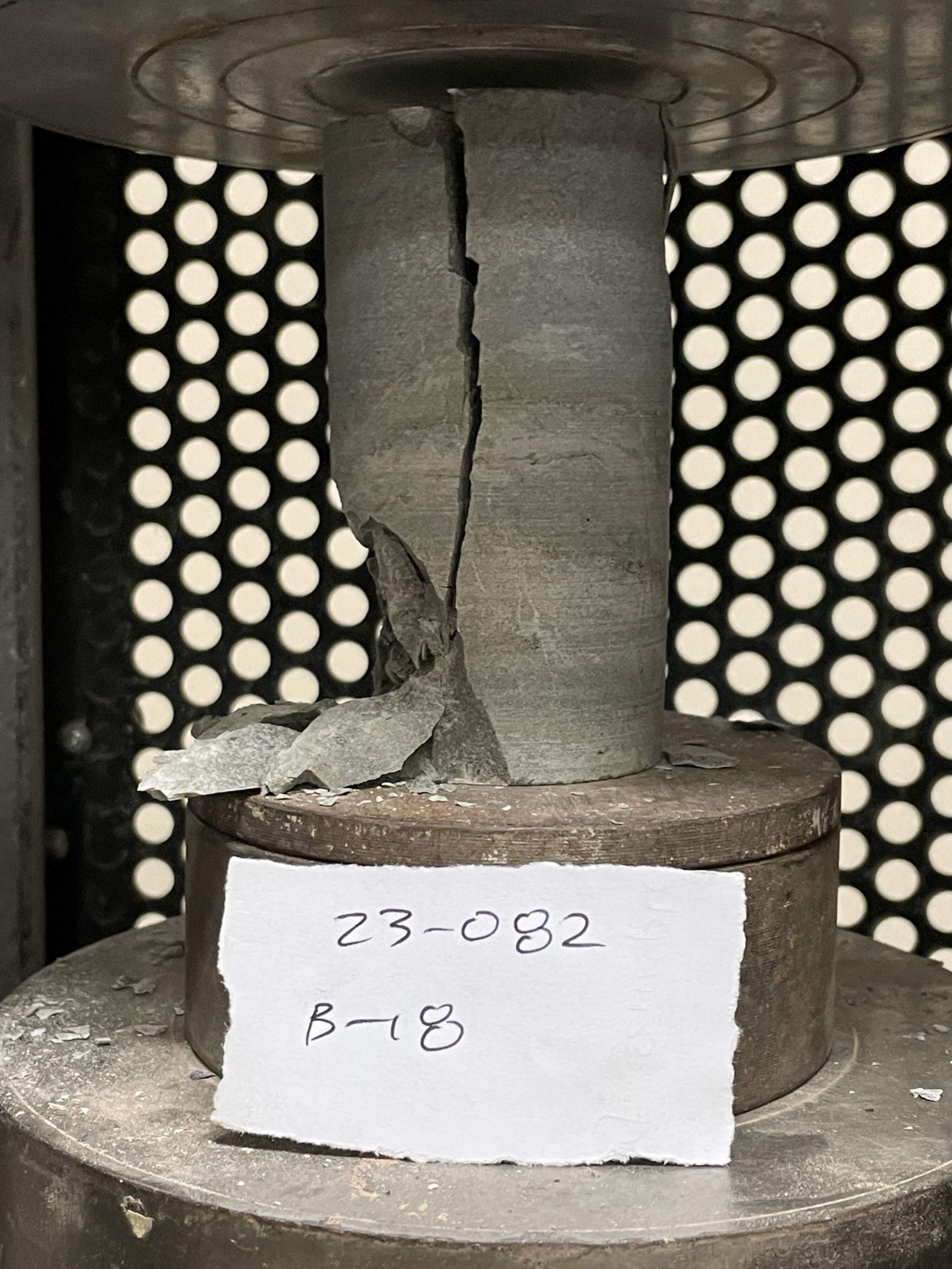
Client: Concept Engineering Consultants

Project: Clinton Commons, Clinton, NJ

Sample Number: B-18 **Depth:** 9'2"

UNCONFINED COMPRESSION TEST
ANS CONSULTANTS, INC.
South Plainfield, New Jersey

Tested By: AS/NK **Checked By:** ANS


23-082
B-18

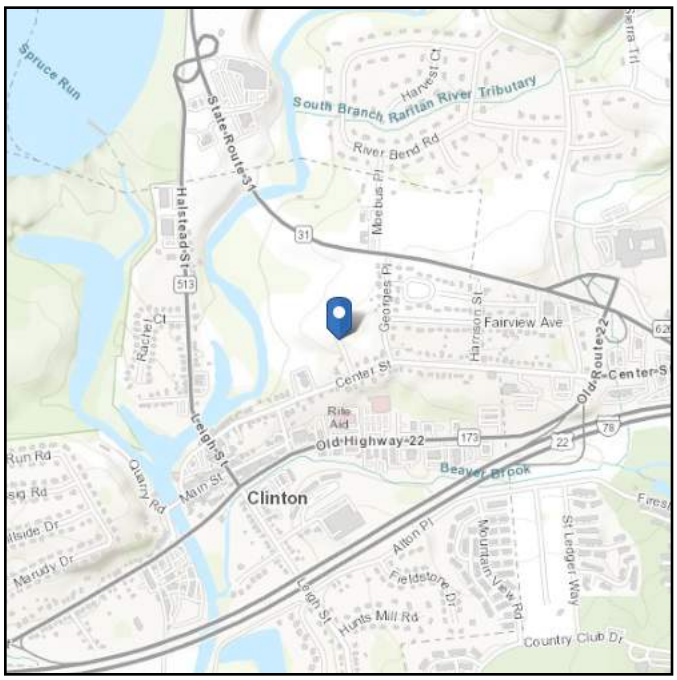
Appendix E

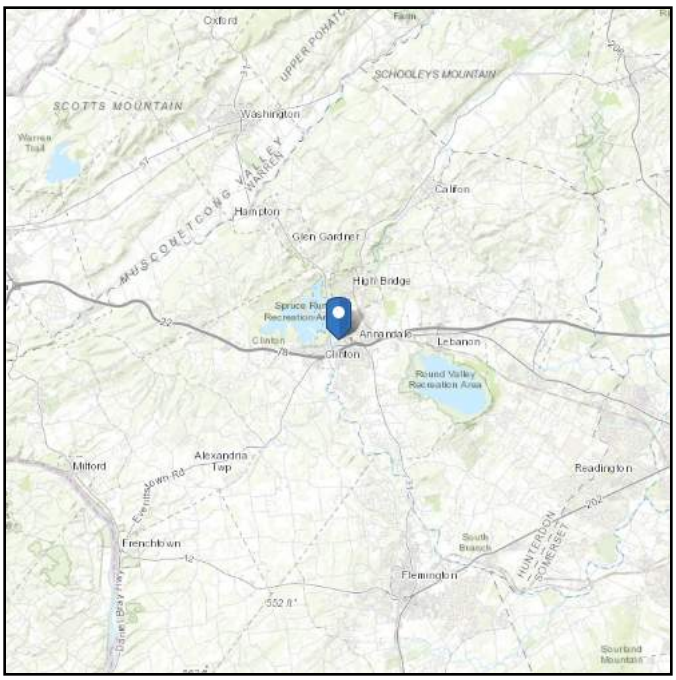
Seismic Site Class Data

ASCE 7 Hazards Report

Address:
Central Ave
Clinton, New Jersey
08809

Standard:	ASCE/SEI 7-22	**Latitude:**	40.64042
Risk Category:	III	**Longitude:**	-74.90622
Soil Class:	C - Very Dense Soil and Soft Rock	**Elevation:**	253.0334333365709 ft (NAVD 88)





Seismic

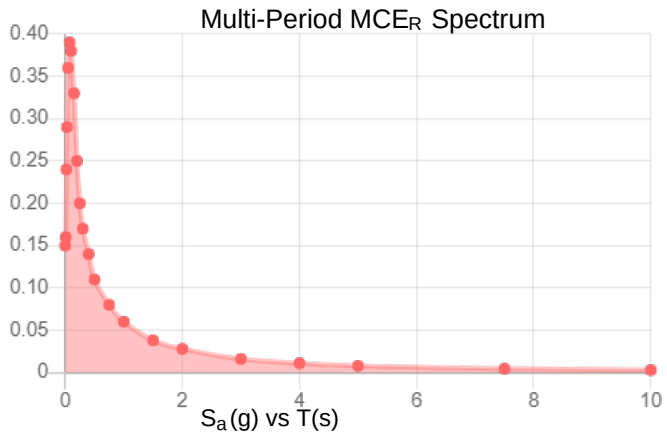
C - Very Dense Soil and Soft Rock

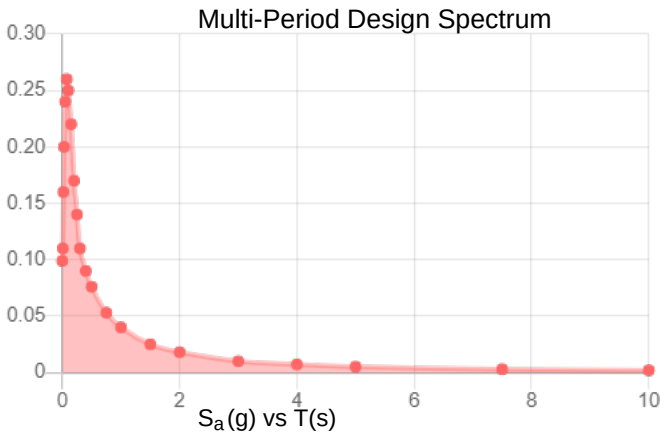
Site Soil Class:

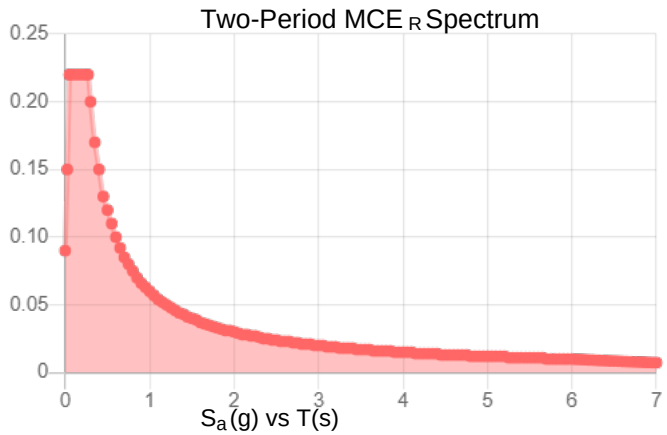
Results:

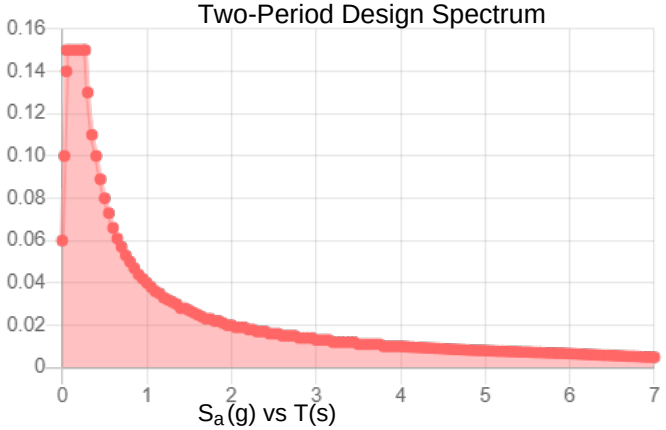
PGA_M :	0.13	T_L :	6
S_{MS} :	0.22	S_S :	0.22
S_{M1} :	0.06	S_1 :	0.047
S_{DS} :	0.15	V_{S30} :	530
S_{D1} :	0.04		

Seismic Design Category: A









MCE_R Vertical Response Spectrum

Vertical ground motion data has not yet been made available by USGS.

Design Vertical Response Spectrum

Vertical ground motion data has not yet been made available by USGS.

Data Accessed: **Thu Aug 17 2023**

Date Source:
USGS Seismic Design Maps based on ASCE/SEI 7-22 and ASCE/SEI 7-22 Table 1.5-2. Additional data for site-specific ground motion procedures in accordance with ASCE/SEI 7-22 Ch. 21 are available from USGS.

The ASCE 7 Hazard Tool is provided for your convenience, for informational purposes only, and is provided “as is” and without warranties of any kind. The location data included herein has been obtained from information developed, produced, and maintained by third party providers; or has been extrapolated from maps incorporated in the ASCE 7 standard. While ASCE has made every effort to use data obtained from reliable sources or methodologies, ASCE does not make any representations or warranties as to the accuracy, completeness, reliability, currency, or quality of any data provided herein. Any third-party links provided by this Tool should not be construed as an endorsement, affiliation, relationship, or sponsorship of such third-party content by or from ASCE.

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Appendix F

ANS Geo
Phase II Geophysical Investigation Report

GEOPHYSICAL INVESTIGATION REPORT

Concept Engineering Consultants

Clinton Commons Project
Clinton, New Jersey

December 23, 2022 (REV. 4)

Table of Contents

Appendices

1 Executive Summary

ANS Geo was retained by Concept Engineering Consultants to complete a broad-scale geophysical investigation to evaluate potential karst conditions at the proposed Clinton Commons project site located in the Town of Clinton, New Jersey. Our geophysical survey was completed as a supplemental investigation behind a previous investigation completed by Engineering and Land Planning Associates in June 2009 and April 2020, and ahead of an ANS Geo's 2022 Geotechnical investigation consisting of percussion probes and test borings. Through review of Engineering & Land Planning Associates 2020 "*Karstic Geology Investigation Report*", USGS NAPP color infra-red (CIR) imagery was evaluated and eight (8) possible karstic locations were delineated based off of that imagery.

Based on our review of available information, we identified the project site is mapped by the United States Geological Survey (USGS) as being underlain by the Allentown Formation and Lower Beekmantown Group consisting primarily of Dolomite with some Shale and Orthoquartzite bedding. Dolomite bedrock, while not typically as prone as Limestone, can be generally susceptible to karst. To better evaluate the presence or absence of karst anomalies at the project site, ANS Geo completed a geophysical investigation program consisting of Electrical Resistivity Imaging (ERI), to characterize the type, depth, and extent of karst features at representative locations across the site. The geophysical program was not an exhaustive evaluation of the entire site, but intended to gain a general understanding of the subsurface conditions and the impact of karst on the design, siting, and construction of the project.

ANS Geo completed the ERI geophysical survey at the project site on February 28 and March 1, 2022. In total, nine (9) ERI survey transects were completed at locations depicted as potential karst zones as well as along a northwest-southeast running fault line and within the projects planned SWM Recharge Basin.

The surveys conducted generally showed steep trends in depths between upper soil horizons, weathered bedrock, and competent bedrock. Survey interpretations identified interbedded upper clay and soil-like residuum and possible "epi-karst" consisting of a gravel-clay-sand mixture. These soil-like residuum zones were sporadic and were observed through analysis of ERI results, to different degrees, within all the profiles surveyed. Weathered top of bedrock was generally observed between ground surface and approximately 5 to 10 feet below grade. As expected, our surveys indicate that the quality of the bedrock generally improves with increased depth. Top of bedrock was moderately to highly pinnacled or abruptly changing in depth, with particular locations exhibiting possible deep soil or soil-residuum horizons, most likely caused by deep weathering of the bedrock over time and possible karst zones.

Based on our preliminary evaluation of the geophysics results, it appeared that karst may be of low-risk to design and construction within the broader project boundaries. Karst features, such as pinnacled top of bedrock, and areas of possible soil infilling were observed within the majority of the ERI profiles. Therefore, these existing conditions shall be considered for the proposed foundations of structures and design and location of proposed stormwater basin.

Apparent resistivity values above approximately 10,000 ohm-meters can generally be categorized as possible "air-filled" karst anomalies. These values can also be associated with "massive" bedrock, or extremely fractured bedrock. Zones depicting bedrock, then decreasing below resistivities of 100 ohm-meters may represent clay or soil-infilled anomalies.

To further investigate and confirm ERI survey results, ANS Geo completed a Geotechnical Investigation Program between May 2022 and September 2022 consisting of 12 test borings and ten percussion probes. The detailed summary of the findings is included in Section 3.2 and 3.3.

2 Introduction

ANS Geo was retained by Concept Engineering Consultants to assist with Phase II investigation program as requested by Engineer for Town of Clinton. The Town Engineer's request included the following:

- Borings shall include 10-foot rock cores as described in the Ordinance to properly assess the condition of the underlying site bedrock.
- All identified sinkhole locations shall be investigated, since all eight (8) of potential areas are either within the footprints of the proposed structures or within proximity of the proposed stormwater basin.
- The northeast corner of the proposed Food Market where two (2) USGS mapped fracture traces and a fault intersect will require further assessment.
- The plan proposes several deep cuts (18 ft. +/-) for sewer utility installation near the proposed northern site entrance. The soil and bedrock conditions along those alignments need to be investigated to assess the potential impact of the installation.
- A major area of concern is near the single SWM Recharge Basin that is proposed for this project. The Phase I study identified possible sinkholes on three (3) sides of the proposed stormwater basin and as such, the bedrock condition underlying the proposed stormwater basin requires a thorough investigation to assess any potential impacts. This area is of high concern given its proximity to residential structures and lack of any explorations into the bedrock. Consideration must be given to the fact that more than one SWM Basin may be required (ref: G-3) to meet the Highlands requirements.

To be cost efficient, ANS Geo proposed completing non-invasive geophysical investigation to evaluate karst conditions at the proposed Clinton Commons project site in the Town of Clinton, New Jersey prior to performing test borings and/or test pits at specific locations. As part of our initial review process prior to mobilizing on the project site, ANS Geo reviewed geotechnical reports from previous investigations on the project, which identified certain areas prone to the potential for karst features such as sinkholes and faults within the project boundary.

ANS Geo placed Electrical Resistivity Imaging (ERI) locations at localized locations within the project site to obtain a specified set of data which was used to characterize the type, depth, and extent of karst features at select representative locations across the site. It should be noted the purpose of the geophysical program was not intended to be an exhaustive evaluation of the entirety of the site, as that intent would require extensive and comprehensive canvassing and investigation across the entirety of the project site. However, the investigation was intended to gain a general understanding of the subsurface conditions near locations identified in previous investigations by others and requested by the Town Engineer to gauge the impact which karst geohazards may or may not contribute to the design, siting, and construction of the proposed project. **Figure 1** below depicts a project vicinity map.

Figure 1: Project Vicinity Map

(Source: Google Earth Imagery 2021)

3 Field Investigation

3.1 Electrical Resistivity Imaging (ERI)

ANS Geo completed ERI survey at the project site on February 28th and March 1st, 2022. A Geophysics Investigation Location Plan, which shows the location of all geophysical survey transects (lines) as they correspond to the proposed site development layout is provided as **Appendix A**. ERI survey methods used for this field investigation were a combination of Dipole-Dipole and Strong Gradient. The methods were completed using an array of electrodes positioned in a linear fashion along the proposed survey locations. In total, nine (9) ERI survey transects were completed within the project area. **Appendix B** includes **Figures 1** through **6**, which represent each of the nine surveyed locations with an associated profile. ANS Geo's ERI surveys were cross-referenced against previous test boring data completed by Engineering and Land Planning Associates. **Table 1** summarizes the geophysical survey method and ID number, reporting Figure number, distance, and orientation of each line, as well as their spacing distances used for ERI testing.

Table 1 – Geophysical Survey Parameters

Method-ID	Figure No.	Profile Orientation	Survey Distance (ft)	Electrode Configuration/Qty	Electrode Spacing (ft)
ERI-1	1	North to south	270	28	10
ERI-2	1	Northwest to southeast	270	28	10
ERI-3	2	Northwest to southeast	270	28	10
ERI-4	3	Northwest to southeast	270	28	10
ERI-5	4	Northwest to southeast	270	28	10
ERI-6	4	Southwest to northeast	275	56	5
ERI-7	5	Southwest to northeast	270	28	10
ERI-8	5	West to east	560	56	10
ERI-9	6	North to south	270	28	10

3.2 Percussion Probes

The percussion probes were completed by Hayduk Enterprises of Factoryville, Pennsylvania between May 4th, and May 10th, 2022. Percussion probes were advanced using ECM-590 Self-Contained Hydraulic Crawler Drill, which uses a drilling hammer with compressed air and a down-the-hole hammer with drilling bit that is advanced by this hammering and rotation action. All percussion probes were advanced a depth of 49 feet BGS and estimated top of rock is based on drilling timing is provided in **Table 2** below.

Table 2 – Percussion Probe

Percussion Probe ID	Estimated Top of Rock (feet)	Completed Depth (feet)
PP-01	7	49
PP-02	7	49
PP-03	7	49
PP-04	4	49
PP-05	24	49
PP-06	7	49
PP-07	12	49
PP-08	18	49
PP-09	6	49
PP-10	5	49

Sudden drops of drilling rod, which is a typical indication of karst features such as air-void or soil-filled void were not encountered in all completed percussions probes. The ERI survey results from ERI-5, ERI-6, ERI-8, and ERI-9 indicated overburden soil to be thicker than other ERI survey locations. This was confirmed by percussion probes PP-05, PP-07 and PP-08, where the overburden soil was encountered as deep as 24 feet BGS, 12 feet BGS, and 18 feet BGS, respectively. All percussion probes were backfilled as per NJDEP well abandonment requirements. Investigation Location Plan and percussion probe logs are provided in **Appendix C and Appendix D,** respectively.

3.3 Test Borings

ANS Geo retained Boring Brothers, Inc. of Egg Harbor, New Jersey to advance the test borings. The first mobilization of test borings was completed between May 11th and May 13th, 2022, and the second mobilization of test boring were completed between September 12th and September 20th, 2022 using a CME-55LC track-mounted drill rig with a 3-7/8-inch diameter tri-cone roller bit mud-rotary techniques to the proposed borehole termination depth or top of rock. Once estimated bedrock was encountered, minimum 10 feet of rock coring was performed in accordance with Town of Clinton's Chapter 88 Land Use Article VII Zoning Regulations 88-64.2 Carbonate Area District requirements. Soil samples were collected using the Standard Penetration Test (SPT) Method in accordance with American Society for Testing Materials (ASTM) Standard D1586 – Standard Test Method for SPT and Split-Barrel Sampling of soils. Rock coring was completed using ASTM D2113-08 – Standard Practice for Rock Core Drilling. All boreholes were backfilled as per NJDEP well abandonment requirements. It should be noted that NJDEP requested that test borings shall not be performed within 1,000 feet of existing bald eagle's nest once ANS Geo's test boring crew mobilized on site in May 2022. Therefore, only six test borings were completed in the previous report submitted by ANS Geo. As of this report, remaining six test Borings were completed in September 2022. This report comprises of all the Borings which is summarized in **Table 3** below.

Table 3 – Test Borings

Borehole ID	Approx. Existing Elevation (feet)	Approx. Proposed Elevation (feet)	Approx. Elevation Difference (feet)	Proposed Boring Depth (feet)	Encountered Top of Rock (feet)	Total Depth of Rock Coring (feet)	Borehole Termination Depth (feet)
B-01	235	241	-6	40	17	10	27
B-02	234	241	-7	40	Borehole Removed from Scope of Work		
B-03	253	256	-3	40	20	10	30
B-04	222	224	-2	40	23	10	33
B-05	246	246	0	40	4	10	14
B-06	269	264	5	40	10	30	40
B-07	245	244	1	40	5	10	15
B-08	264	263	1	40	10	10	20
B-09	249	242	7	40	3	10	13
B-10	258	256	2	40	10	10	20
B-11	222	224	-2	40	Borehole Removed from Scope of Work		
B-12	260	261	-1	40	10	10	20
B-13	235	225	10	40	10	10	20
B-14	245	251	6	40	Borehole Removed from Scope of Work		
B-15	253	252	1	40	4	10	14

3.3.1 Encountered Subsurface Conditions in Test Borings

Total 12 of 15 proposed test borings were completed in this report. Three borings were removed from our scope of work due to sufficient test borings and percussion probes. As completed boring locations are included in the Investigation Location Plan in **Appendix C**. The overburden material encountered consisted of sand and clay underlain by gravel stratum before encountering bedrock. Average N-values ranged from 6 to 15 blows per foot (bpf) within the sand and clay stratums, and greater than 50 bpf within the gravel stratum. Groundwater was not encountered within the overburden soil.

Top of bedrock within the completed twelve test borings ranged from 4 to 23 feet BGS. Recovered rock cores were classified as Limestone moderately weathered, weak to medium strong rock, and very close to close discontinuities spacing. Rock core recovery ranged from 13% to 100% and Rock Quality Designation (RQD) ranged from 0% to 97%. Fractured rock zones were generally encountered within the low RQD zones.

Based on ERI-4 survey results, potential karst anomaly may exist between 25 to 37 feet BGS on the southern end of the ERI survey. Therefore, test boring B-06 was advanced to minimum 40 feet BGS at the location to determine if karst features such as soil infilled or air-void will be encountered. In test boring B-06, top of bedrock was encountered at 10 feet BGS and 30 feet of bedrock was cored. Rock core recoveries ranged from 98% to 100% and RQDs ranged from 45% to 97%. Fractured rock was encountered between 31.3 to 34.4 feet BGS, but loss of drilling water, drill rod drops, or residual soil zones were not encountered within test boring B-06, which are typical indications of karst anomalies. In addition, ANS Geo attempted use a borehole camera to confirm any anomalies, but water in the open borehole prevented recording any clear images of cored borehole. For additional details, refer to **Appendix E** for test boring logs and rock core photos.

4 Geophysical Investigation Method

4.1 Electrical Resistivity Imaging (ERI)

ERI is a geophysical survey method that measures electrical resistivity in soil and rock based off the principles of Ohm's Law. Data obtained through an ERI investigation acquires a series of voltage and current measurements from surface electrode arrays. The electrode arrays consist of a series of dipoles that communicate with other dipoles. The arrays can be spaced close or very far apart depending on necessary survey resolution. Resistivity is dependent on the material property and geometry and thus is measured in Ohm-meters.

4.1.1 Theory

Electrical resistance is based upon Ohm's Law:

$$R = \frac{V}{I} \quad [ohms]$$

Where, resistance, **R**, is equal to the ratio of potential, **V** (volts) to current flow, **I** (amperes).

Resistivity is the measure of the resistance along a linear distance of a material with a known cross-sectional area. Consequently, resistivity is measured in Ohm-meters. This Report presents the geophysical results as geo-electrical profiles of modeled resistance plotted as two-dimensional profiles of distance and depth, in units of feet.

Electrical currents propagate as a function of three material properties: (1) ohmic conductivity, (2) electrolytic conductivity, and (3) dielectric conductivity. Ohmic conductivity is a property exhibited by metals. Electrolytic conductivity is a function of the concentration of total dissolved solids and chlorides in the groundwater that exists in the pore spaces of a material. Dielectric conductivity is a function of the permittivity of the matrix of the material. Therefore, the matrix of most soil and bedrock is highly resistive. Of these three properties, electrolytic conductivity is the dominant material characteristic that influences the apparent resistivity values collected by this method. In general, resistivity values decrease in water-bearing rocks and soil with increasing:

a. Fractional volume of the rock occupied by groundwater;
b. Total dissolved solid and chloride content of the groundwater;
c. Permeability of the pore spaces; and,
d. Temperature.

Materials with minimal primary pore space (i.e., limestone, dolomite) or those which lack groundwater in the pore spaces will exhibit high resistivity values (Mooney, 1980). Factors contributing to low resistivity:

- Degree of water bearing void space within soil and rock (only if water exists);
- Chloride content of water bearing within soil and rock pore space;
- Available pore space within material (i.e., low pore space will decrease resistivity);
- Temperature.

Highly porous, moist, or saturated soil will exhibit very low resistivity values. Additionally, high resistivity values will result from generally inverse conditions (i.e., highly-porous and dry conditions). This is, of course, a range, and most earthen materials falls within the range of low to medium resistivity depending on their properties. For these reasons, cavities, voids, highly fractured bedrock and groundwater can often have definable values observed through the methods of ERI.

In homogeneous ground, the apparent resistivity is the true ground resistivity; however, in heterogeneous ground, the apparent resistivity represents a weighted average of all formations through which the current passes.

4.1.2 Methods

Different acquisition algorithms can be implemented during an investigation. For this investigation, the Dipole-Dipole / Strong-Gradient array combination methods, which have proven to be an effective configuration for imaging voids in shallow bedrock settings, were implemented. The measurements were collected to create a two-dimensional image. The image is developed using an inversion algorithm. The inversion algorithm uses the collected apparent resistivity data to create a model space of resistivity values that would replicate the collected data.

While homogeneous ground conditions represent the true apparent ground resistivity, non-unique values represent a weighted average of the multiple formation variations (Reynolds, 1997). Apparent resistivity values are computed with a forward modelling subroutine, and a smoothness-constrained least-squares optimization routine, creating a pseudosection using finite-difference or finite-element approaches. The pseudosection model is compared to the actual measurements for consistency. A measure of the inversion progress and difference is given by the root-mean-squared error.

4.1.3 Data Collection and Data Processing

Six total ERI profiles were acquired using an AGI SuperSting R8 Resistivity meter. Seven (7) of the ERI surveys were completed with a 28-electrode setup at 10-feet spacings. One (1) ERI profile was acquired in conjunction with a 56-electrode setup at 5-foot spacings and another at 10-foot spacings. Measurements were obtained through a combined Dipole-Dipole and Strong Gradient paired array setup. Locational data were recorded using a Trimble Geo7X global positioning system. The approximate depth of penetration of the survey is contingent on a few factors, most of which relate to the overall survey line length. Each test reached an approximate penetration depth of 60 feet below existing grade. Two-dimensional profiles have been provided within **Appendix B**.

5 Background Geology

Prior to site mobilization, ANS Geo reviewed geologic mapping made publicly available by the United States Geologic Survey (USGS), which indicates the site is underlain by Allentown Dolomite and the Lower Beekmantown Group. These groups both generally consist of light gray to medium-gray dolomite with minor orthoquartzite and shale beds. These rock types are known for their susceptibility of karst formation which is addressed in Section 5.3.

5.1 Surficial Geology

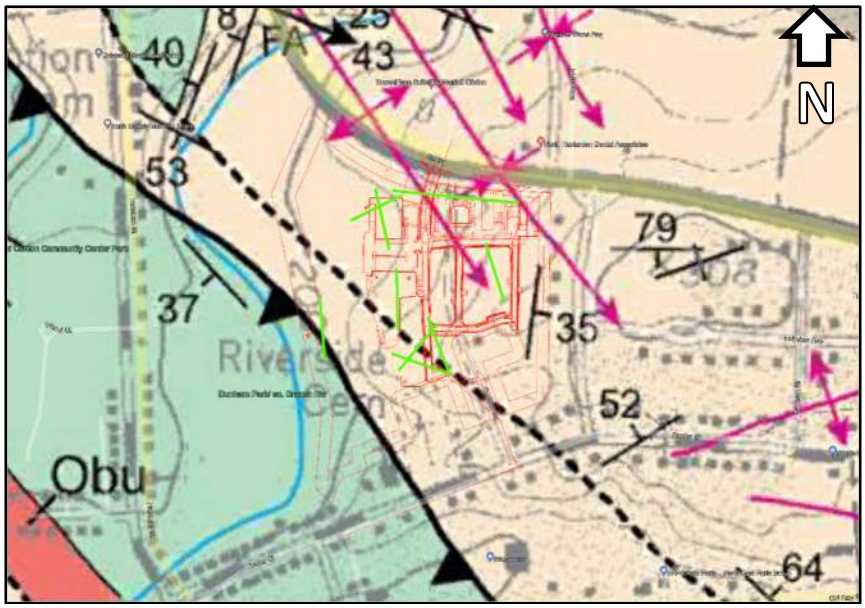
ANS Geo also conducted a desktop study of the surficial geology in the project area using the National Resource Conservation Service (NRCS) Web Soil Survey. The Web Soil Survey only evaluates the upper five feet of soils, as it is generally used for agricultural purposes. However, reviewing this information can indicate what soil properties can be expected on site. The NRCS mapping indicates that the project area consists primarily as material of the Duffield silt loam unit, which is comprised primarily of silts and clays and shallow unweathered bedrock.

5.2 Bedrock Geology

A desktop review of the local bedrock geology was conducted using publicly available mapping and literature published by the New Jersey Geological and Water Survey and the USGS. Based on this mapping, the predominant bedrock formation within the project boundary is the Allentown Formation consisting primarily of Dolomite. The Lower Beekmantown Group exists within the southwestern portion of

the site and also consists of Dolomite. Due to the degree of folding and fracturing of the bedrock, bedrock may generally present a high degree of dipping. Additionally, a thrust-fault was mapped within the northwest corner of the project site heading southeast. After reviewing the New Jersey Geological Society's latest (2015) *Bedrock Geologic Map of the High Bridge Quadrangle*, it appears that the previously mapped "Thrust Fault" as depicted within E&LP's Report has been updated and moved southwest of the project site. The updated mapping does place a thrust fault within the proposed developments. However, it now runs northwest to southeast along the southwest boundaries of the project site, as depicted within **Figure 2** below. In addition, Concealed Fault, Anticline, and Syncline are mapped within the project site.

Figure 2: Updated Geologic Map



Based on our knowledge and experience, concealed faults can be small and are difficult to identify compared to thrust faults. The "dipping" direction or dip angle is unknown compared to identified thrust faults unless bedrock is exposed above ground surface.

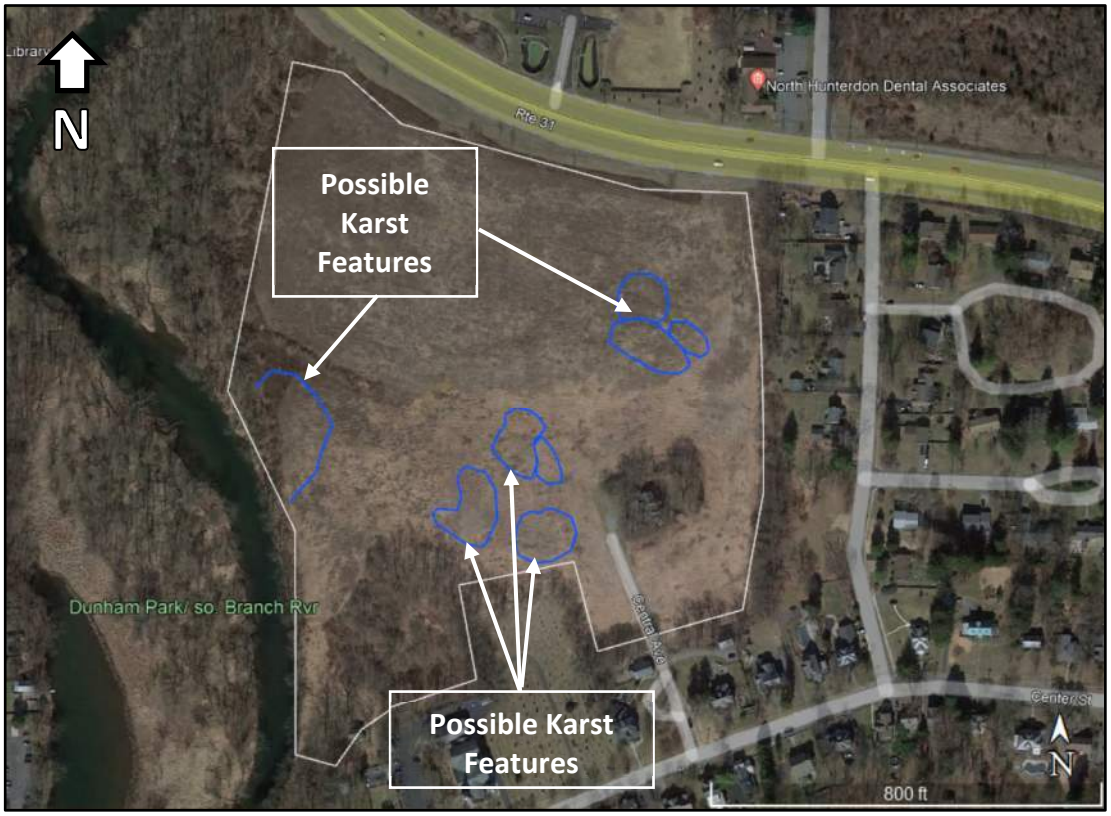
5.3 Karst Geology

Ground subsidence, commonly referred to as "sinkholes", is the local downward movement of surface material with little or no horizontal movement. Subsidence is a potential geologic hazard in areas where karst terrain occurs, or where underground mining has taken place. In karst terrain, limestone and dolomite bedrock (carbonate rock formations) are eroded by water and create karst features such as subsurface channels, caves, and sinkholes. Within the Allentown Formation, karst can be prevalent. Due to the project site having multiple mapped fracture sets, these are areas where a higher amount of dissolution may occur as they become preferential pathways for groundwater drainage.

5.4 Aerial Imagery Evaluation for Previous On-Site Subsidence Events

ANS Geo conducted a review of aerial images across the site to create a map of potential subsidence events that have occurred or are currently active within the project boundaries. Potential subsidence incidences can be identified by reviewing site topography, looking at shading on the ground surface of aerial images, surface water drainage pathways, and looking for pooling or standing water. No identifiable subsidence occurrence within the project boundaries could be confirmed visually via aerial imagery. Through review of Engineering & Land Planning Associates 2020 "*Karstic Geology Investigation Report*", USGS NAPP color infra-red (CIR) imagery was evaluated, and eight (8) possible karstic locations were delineated based off of that imagery. Those locations are depicted in **Figure 3**.

Figure 3 – Potential On-Site Subsidence Incidents



(Source: Google Earth 2021 Imagery)

6 Geophysical Analysis

Limestone and Dolomite that matures within karstic or dissolution prone conditions undergoes a variable maturation process. When younger, the features represent small caves, short caves, and uniform rockhead. As the karst matures, so does its complexity. Cover-subsidence and cover-collapse sinkholes, irregular or pinnacled rockhead, buried sinkholes, all become more prevalent. The surveys conducted showed variability in the presence, depth, and characteristics of karst features across the site; however, they were also consistent on multiple fronts.

6.1 Electrical Resistivity Imaging Analysis

The depth to interpreted bedrock ranged from approximately at existing grade to 10 feet below existing grade with the results of the ERI surveys and previous completed soil borings correlating well (showing similar depths). ANS Geo's planned geotechnical investigation will provide more data from test borings and/or test pits to correlate and confirm ERI results.

Top of bedrock was observed to generally fluctuate along the ERI profiles. This is indicative of "pinnacled" top of bedrock and usually occurs over extended dissolution and weathering of the bedrock surface. As expected, our surveys indicate that the quality of the bedrock generally gets better with increased depth. There were indications of past dissolution, collapse and soil-infilling within a six of the ERI surveys completed. As these zones are soil-infilled and have already disintegrated, it is in our opinion that they will not provide a large risk to the project's development.

ERI methods provide indications of overall stratigraphy type and change, possible anomalies such as voids or caverns, and water bearing zones. Apparent resistivity values obtained through the ERI surveys

portrayed variable subsurface conditions with apparent resistivities ranging from less than 1 ohm-meters to over 13,000 ohm-meters. The subsurface profiles generally exhibited a moist lower resistivity clay and silt layer within the upper approximately 5 to 10 feet below grade which then varied in material type between decomposed dolomite and zones of variable resistivities within the upper approximately 5 to 30 feet below grade. A zone of very high (>10,000 ohm-m) resistivity within the upper 12 to 327 feet below existing grade existed within ERI-4. Competent bedrock was generally observed with increasing depth.

6.2 Geology Analysis

A top layer of clay with frequent areas of gravel inclusion was generally observed within the five to 30 feet below existing grade. Where subsidence has occurred, these soils can be very loose, indicating raveling of soils (into previously-formed voids) with one moderate sized possible open void. Particular trends were observed within the ERI data showing that portions of profiles may have experienced some degree of "raveling". These zones will typically exhibit lower bearing strengths as the soils have experienced loosening due to possible subsidence in the past. This upper soil transitioned into a weathered dolomite that has predominantly weathered to clay, silt and gravel with sections of intact rock. This zone of weathered bedrock extended to variable depths and had transitions to pinnacled top of rock with abrupt change.

No indications of surface depressions were visible at the time of our ERI surveys.

7 Risk Evaluation and Conclusions

ANS Geo understands that the project site is intended to support commercial development, which will consist of residential buildings and commercial buildings such as retail stores, food market store, gas station and convenience store. In addition, new development supporting systems such as stormwater recharge basin, water lines, gas line, and stormwater and sewer lines are proposed to be constructed. To aid in site planning and development, it is important to identify the relative potential for risk across certain portions of the site to help minimize the potential for siting critical project components and structures (i.e. building foundations) within these areas with higher geologic risk of settlement and movement.

Through our investigation, it does not appear that significant representations of sinkholes or air-filled karst appear within the ERI survey data. However, karst features such as pinnacled top of bedrock, and areas of potential sinking and infilling were observed. Percussion probes and test borings were completed at select locations to confirm the presence or lack thereof karst features depicted within the geophysics results. The follow-up investigation consisting of percussion probes and test borings did not indicate that any of these features exist. Typically, if a feature exists, while drilling, drilling water loss or a sudden drop of drilling rods or soft zones would be encountered. Drilling water loss, rod drops, and soft zones were not encountered in the completed percussion probes and test borings. Additionally, the previously mapped fault locations, depicted within ERI-5 and ERI-6 were looked at closer during the geotechnical subsurface investigation consisting of a percussion probe along the two geophysical surveyed lines. The probe did not indicate any rod drops or clear indications of subsurface variation. Due to this location's proximity to a nearby bald eagle's nest and as per NJDEP's request, no test borings within confirmatory rock core were completed at time of this report.

Through our preliminary evaluation of geophysics survey results, it is in our opinion that there are karstic features onsite; however, they appear to be relic and soil-infilled features. These karstic conditions should be considered while designing foundations for the proposed developments and planning for the stormwater basin. **Table 4** provides a summary of the inferred depth to bedrock, as well as subsurface profile, evaluated as part of our geophysical investigation.

Table 4 – Geophysics Survey Notes

Geophysics ID	Topographic & Geologic Setting	Inferred Approximate Depth to Top of Bedrock [feet]	Notes
ERI-1	Mild sloping	~ 0' ~ 20'	Clay/Silt overburden layer with possible inclusions of gravel and sand generally 0 to 20 feet thick. Bedrock abruptly changes with depth "pinnacled". Bedrock quality is variable across the survey's length and depth.
ERI-2	Moderate sloping	~ 3' – 10'	Shallow bedrock that abruptly changes in depth.
ERI-3	Moderate sloping	~ 5' – 10'	Pinnacled top of bedrock. Generally shallow competent rock. A possible dissolution and weathered rock zone exists at approximately 190 to 270 feet horizontal distance along the ERI line.
ERI-4	Moderate sloping	~ 0' – 10'	Discontinuous overburden soils with shallow bedrock. The bedrock is highly pinnacled.
ERI-5	Mild sloping	~ 3' – 25'	Bedrock dips steeply from the northwest to southeast. Fine-grained material present as overburden soil. A possible discontinuous zone of gravel or floating bedrock exists between 3 to 25 feet. The bedrock appears to dip northwest to southeast at an approximate depth of 20 to 40 feet along the ERI line. No indications of a fault were represented within the data or follow-up percussion probe completed.
ERI-6	Mild sloping	~ 3' – 20'	Overburden soils appear to be "epi-karst" with remnants of fine-grained soils as well as granular soil and floating bedrock. Competent bedrock appears at an approximate depth of 20 to 30 feet below grade.
ERI-7	Moderate sloping	~ 0' – 10'	Bedrock quality fluctuates along the horizontal and vertical extents of the ERI survey. A highly weathered zone exists at an approximate horizontal distance of 110 to 190 feet.
ERI-8	Mild sloping	~ 0' – 30'	There may be a deep soil horizon up to 30 feet deep. The soils would most likely be a combination of fine-grained and coarse-grained material including bedrock remnants.
ERI-9	Steep sloping	~ 3' – 25'	Abruptly changing top of bedrock. Multiple dissolution and soil-infilled zones exist across the extents of the survey line.

8 Limitations

ANS Geo notes that the findings and recommendations presented with this Report are based on investigation program completed by ANS Geo between February and September 2022, and our engineering judgement. Geophysical investigations are a non-invasive method of interpreting physical properties of the shallow earth using electrical, electromagnetic, or mechanical energy. This document contains geophysical interpretations of responses to induced or real-world phenomena. As such, the measured phenomenon may be impacted by variables not readily identified in the field that can result in a false-positive and/or false negative interpretations. ANS Geo makes no representations or warranties as to the accuracy of the interpretations. The extent of reliability of the survey is based on the specific areas where surveys were conducted; areas outside surveyed alignments may have variations in the conditions noted. We also understand that the current investigation is considered preliminary, and that traditional geotechnical investigations including an appropriate number of borings, and associated laboratory testing of soil material have been or will be completed prior to detailed design and construction.

9 References

AGI. 2017 EarthImager Program. Advanced Geosciences Inc., Austin, Texas.

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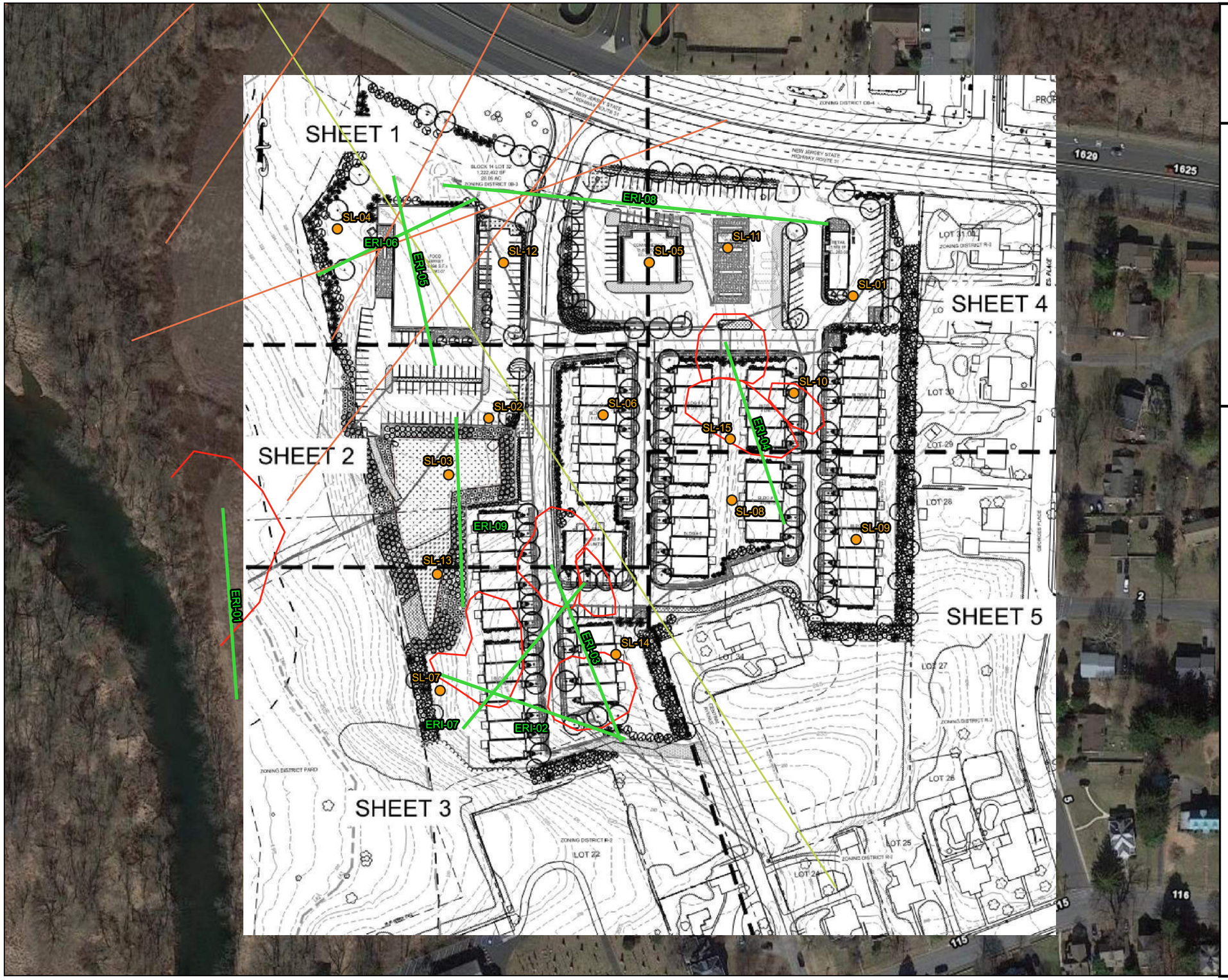
Reynolds, J.M. (1997) An Introduction to Applied and Environmental Geophysics, John Wiley, Chichester, New York, 796 p.

Xia, J.; Miller, R. D.; Park, C. B.; Hunter J. A.; Harris, J. B.; and Ivanov, J., (2002), Comparing shearwave velocity profiles inverted from multi-channel surface wave with borehole measurements: *Soil Dynamics Earthquake Engineering*, Vol. 22, pp. 181-190.

APPENDIX A

Geophysical Investigation Survey Location Plans



ANS GEO

Client:

CONCEPT ENGINEERING CONSULTANTS, PA

GEOPHYSICS INVESTIGATION LOCATION PLAN
CLINTON COMMONS DEVELOPMENT

TOWN OF CLINTON, NEW JERSEY

Legend

- As-Completed E&LP Soil Borings
- As-Completed Geophysics Locations
- Possible Karst Locations
- Fractures as per E&LP's Report
- Fault as per E&LP's Report
- Project Boundary

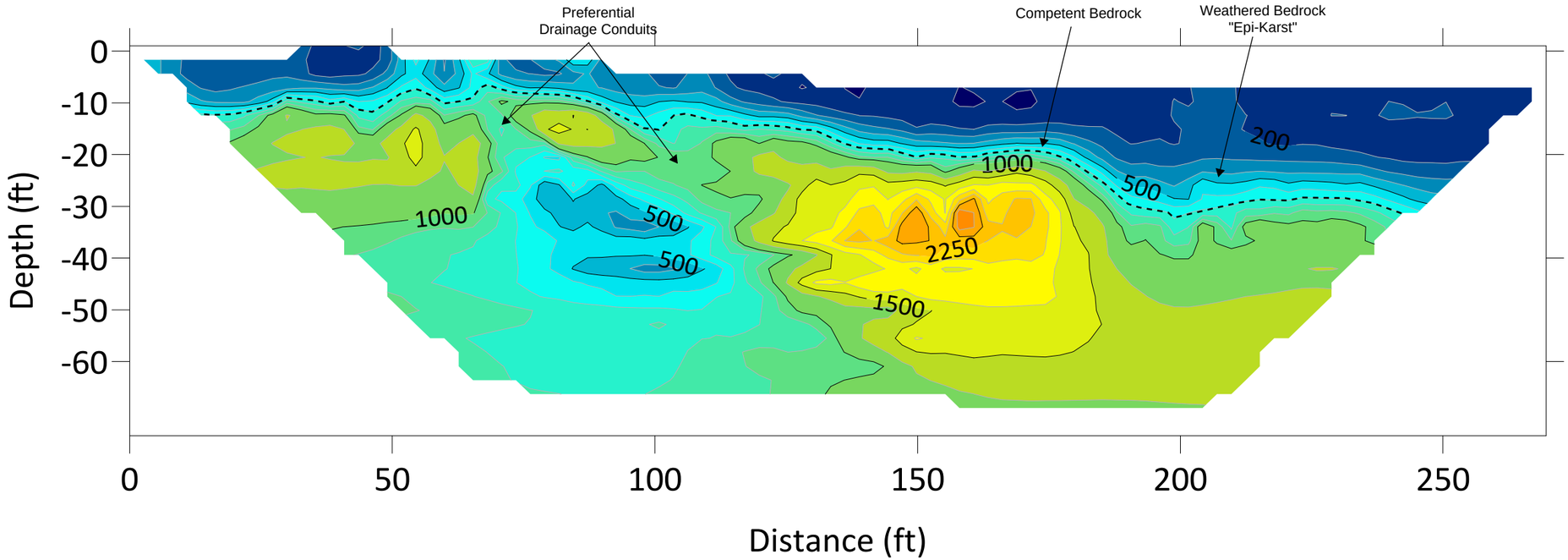
0 70 140 ft

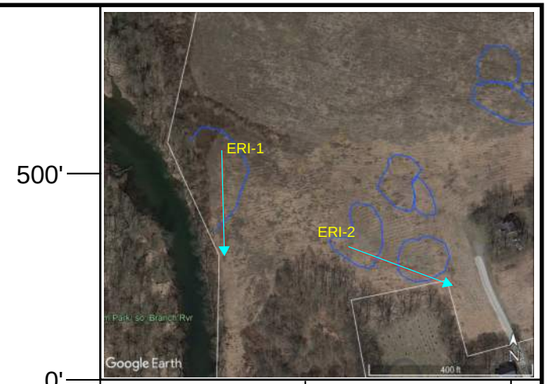
Absolute Scale: 1 inch = 150 feet
Scale at 11" x 17" AS SHOWN

Prepared by: Jonathan Nelson
Date: April 7, 2022
Drawing Number: PIP-1 Rev.1

APPENDIX B
Electrical Resistivity Imaging Profiles

ERI-1





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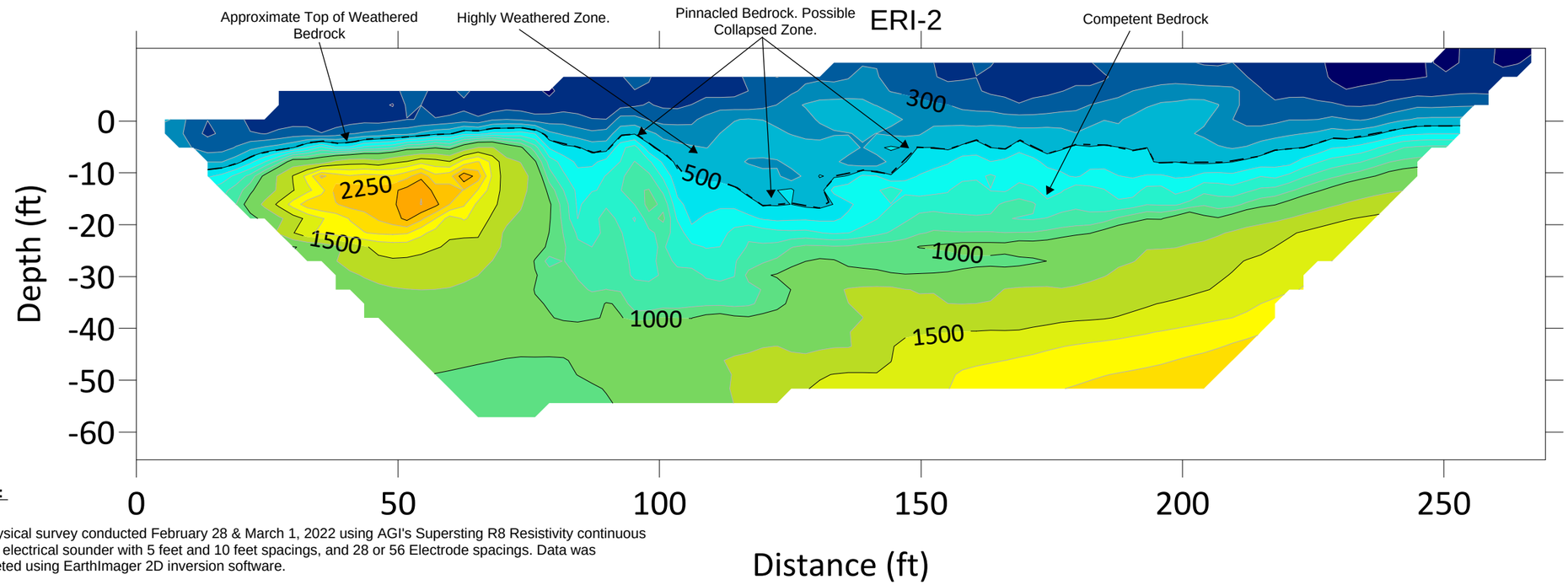
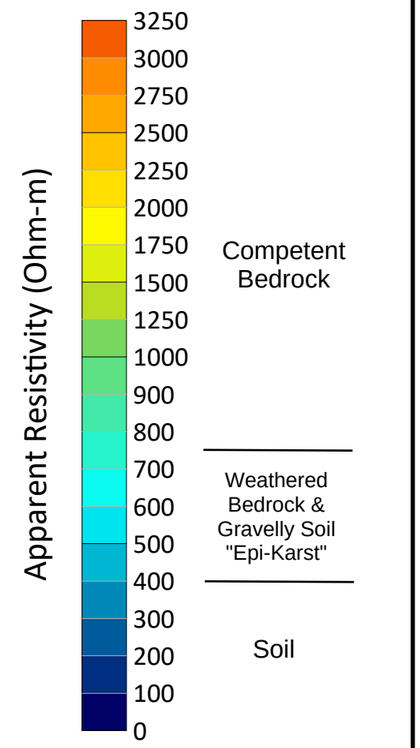




Notes:

Geophysical survey conducted February 28 & March 1, 2022 using AGI's Supersting R8 Resistivity continuous vertical electrical sounder with 5 feet and 10 feet spacings, and 28 or 56 Electrode spacings. Data was interpreted using EarthImager 2D inversion software.

No vertical exaggeration.

Real-time positioning of data using fully integrated Trimble Geo-7X global positioning system set to NAD 1983 New Jersey State coordinate system (US Survey feet).

Locations are approximate.

ANS GEO
4405 S Clinton Ave
South Plainfield, New Jersey 07080
(908) 754-8800
www.ansgeo.com

DRN	JWN	3/17/2022
DES	JWN	3/17/2022
CHK	TR	3/18/2022
REV		
PROJ. MGR.	TR	3/18/2022

SCALE:

SOURCE: AGI EarthImager 2D

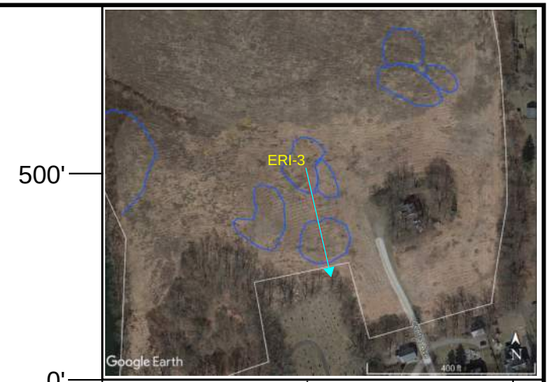
PROJECT:
Geophysical Investigation
Clinton Commons Project
Town of Clinton, New Jersey

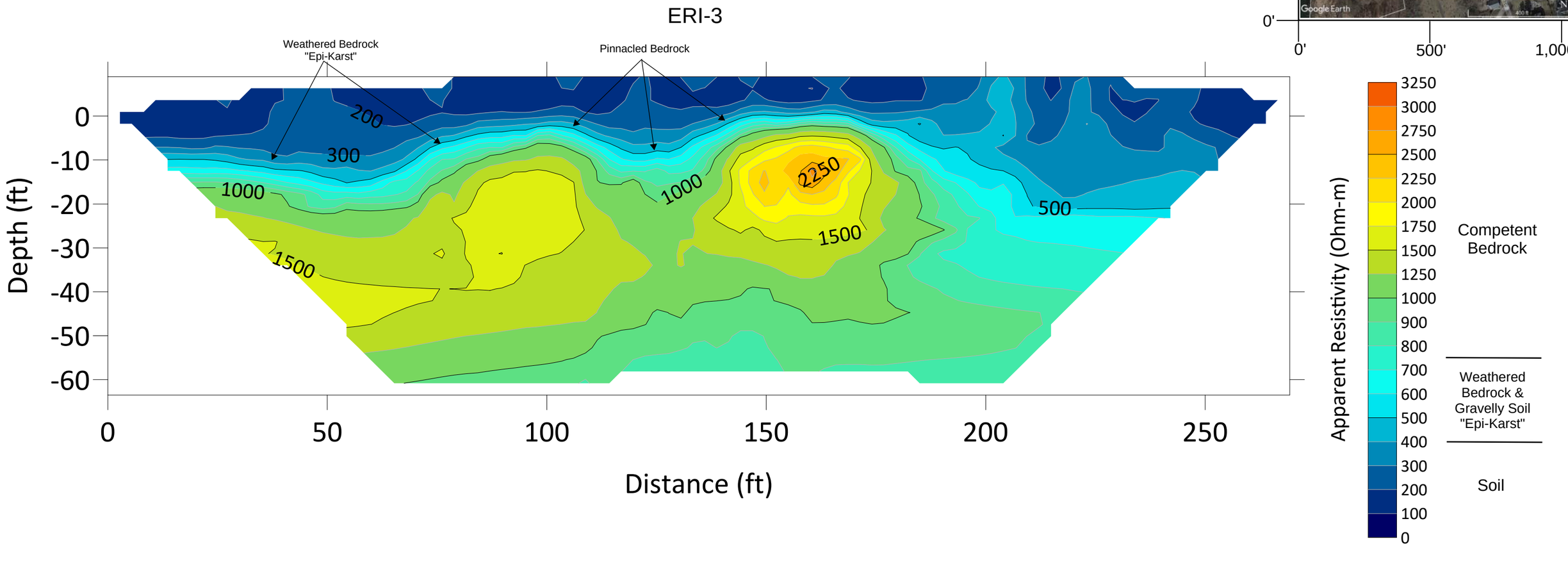
DRAWING NO.:
Figure 1
Electrical Resistivity Imaging Profile
Location 1 & 2 (ERI-1 & ERI-2)

PREPARED FOR:
CONCEPT ENGINEERING CONSULTANTS, PA

PROJECT NO.:

SHEET TITLE:





Notes:

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PROJ. MGR.	TR	3/18/2022

SCALE:

SOURCE: AGI EarthImager 2D

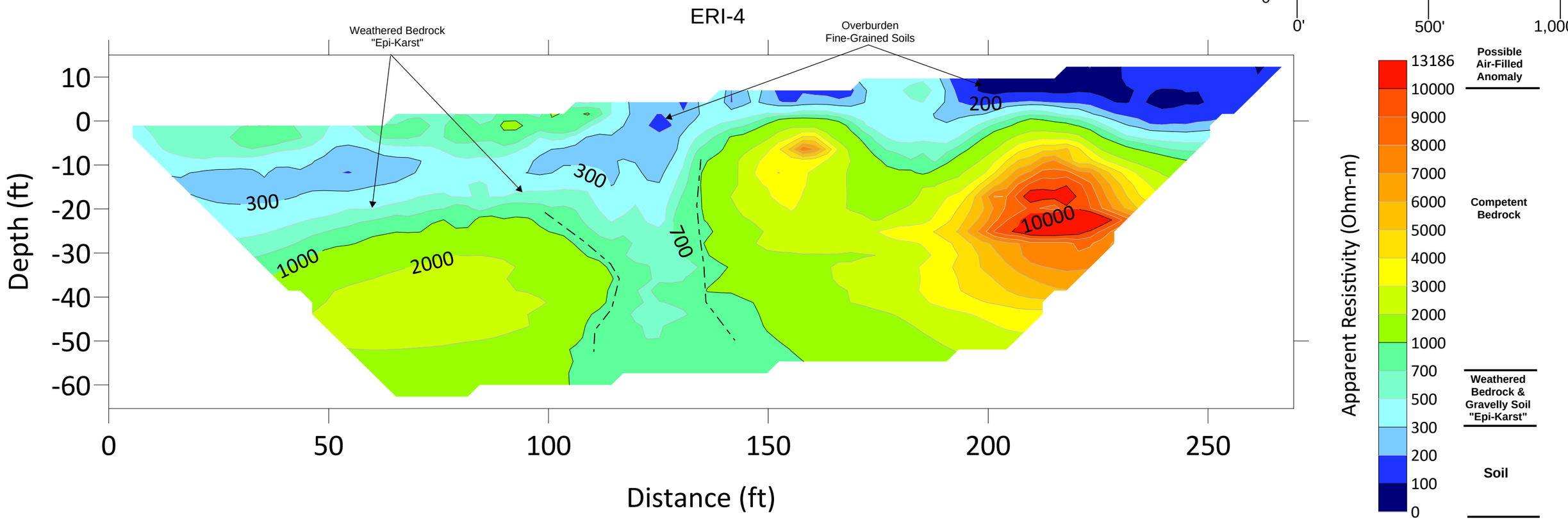
PROJECT:
Geophysical Investigation
Clinton Commons Project
Town of Clinton, New Jersey

DRAWING NO.:
Figure 2
Electrical Resistivity Imaging Profile
Location 3 (ERI-3)

PREPARED FOR:
CONCEPT ENGINEERING CONSULTANTS, PA

PROJECT NO.:

SHEET TITLE:



Notes:

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REV		
PROJ. MGR.	TR	3/18/2022

SCALE:

SOURCE: AGI EarthImager 2D

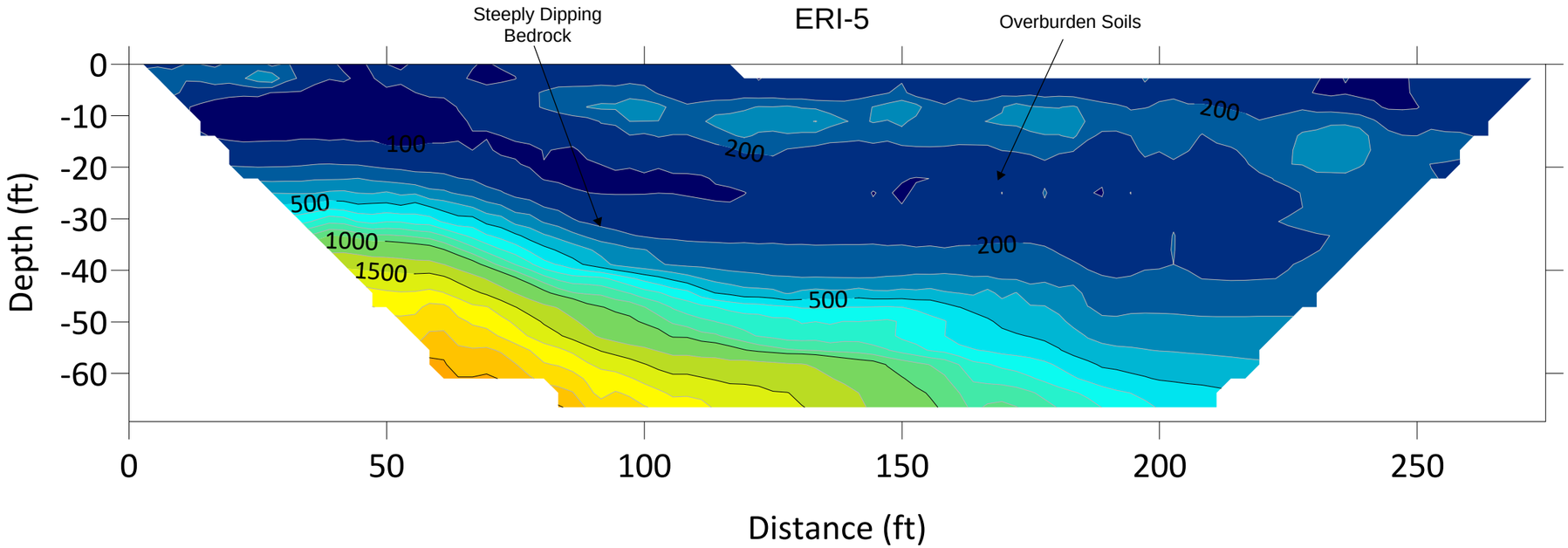
PROJECT:
Geophysical Investigation
Clinton Commons Project
Town of Clinton, New Jersey

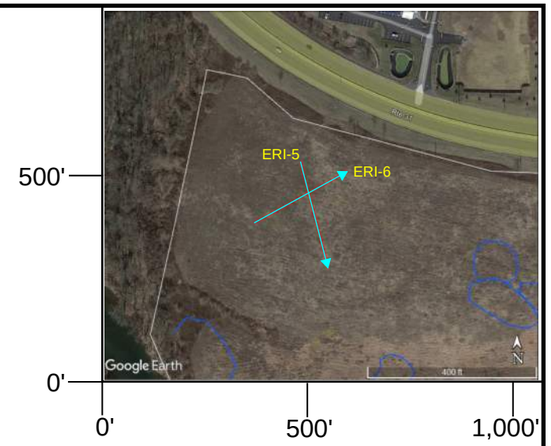
DRAWING NO.:
Figure 3
Electrical Resistivity Imaging Profile
Location 4 (ERI-4)

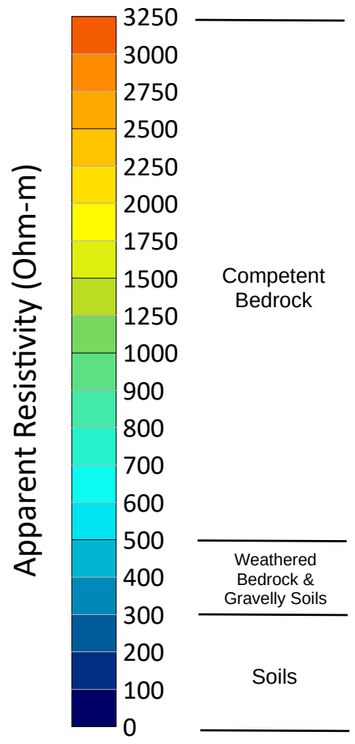
PREPARED FOR:
CONCEPT ENGINEERING CONSULTANTS, PA

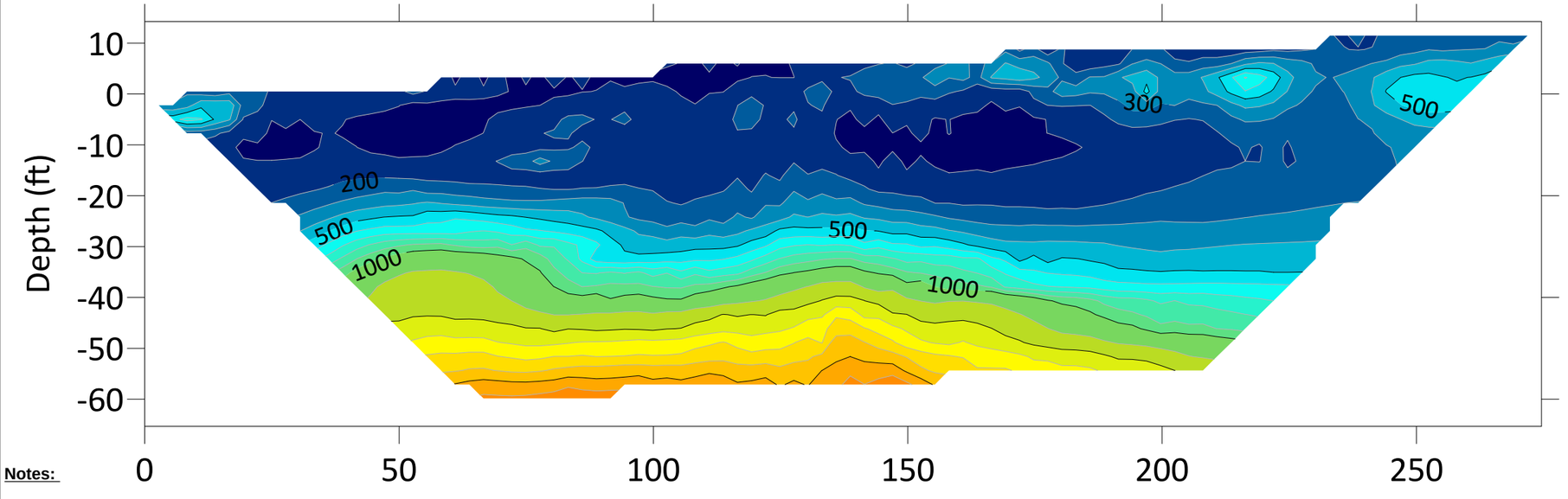
PROJECT NO.:

SHEET TITLE:









Notes:

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PROJ. MGR.	TR	3/18/2022

SCALE:

SOURCE: AGI EarthImager 2D

PROJECT:

Geophysical Investigation
Clinton Commons Project
Town of Clinton, New Jersey

DRAWING NO.:

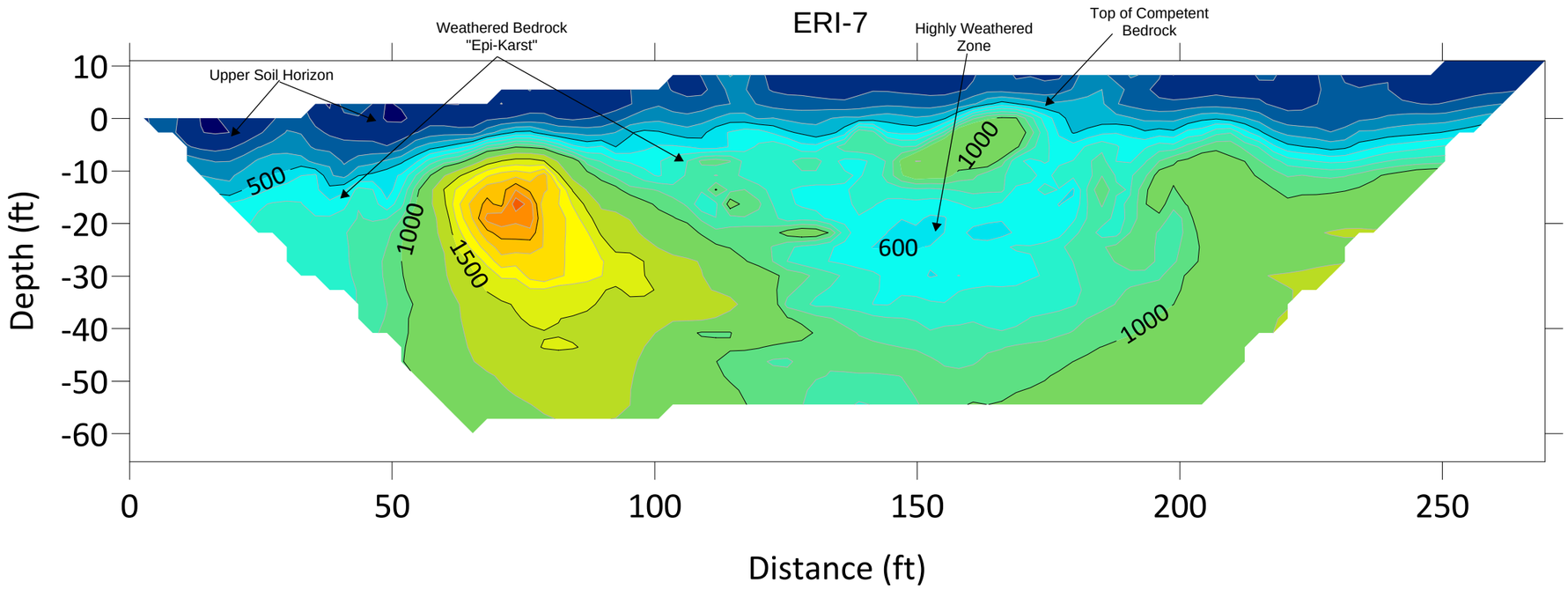
Figure 4
Electrical Resistivity Imaging Profile
Location 5 & 6 (ERI-5 & ERI-6)

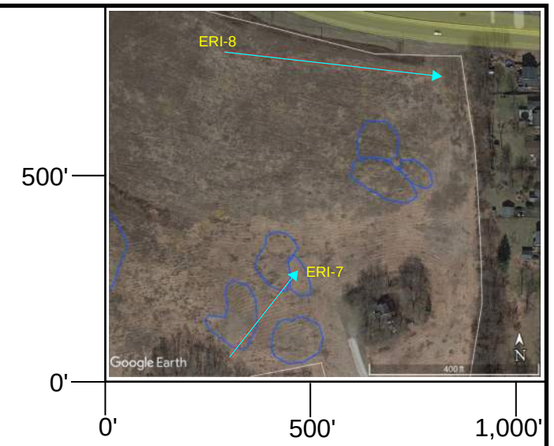
PREPARED FOR:

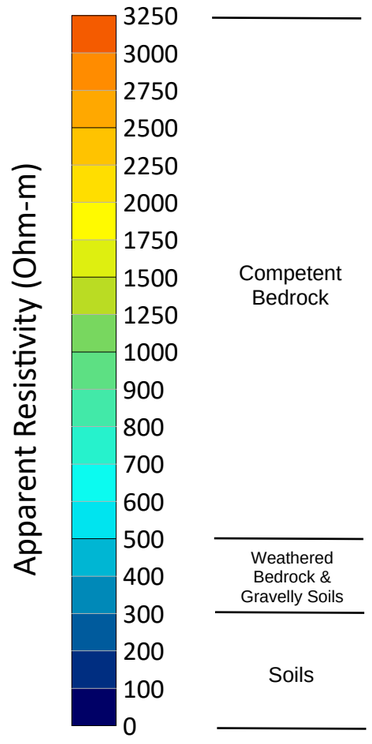
CONCEPT ENGINEERING CONSULTANTS, PA

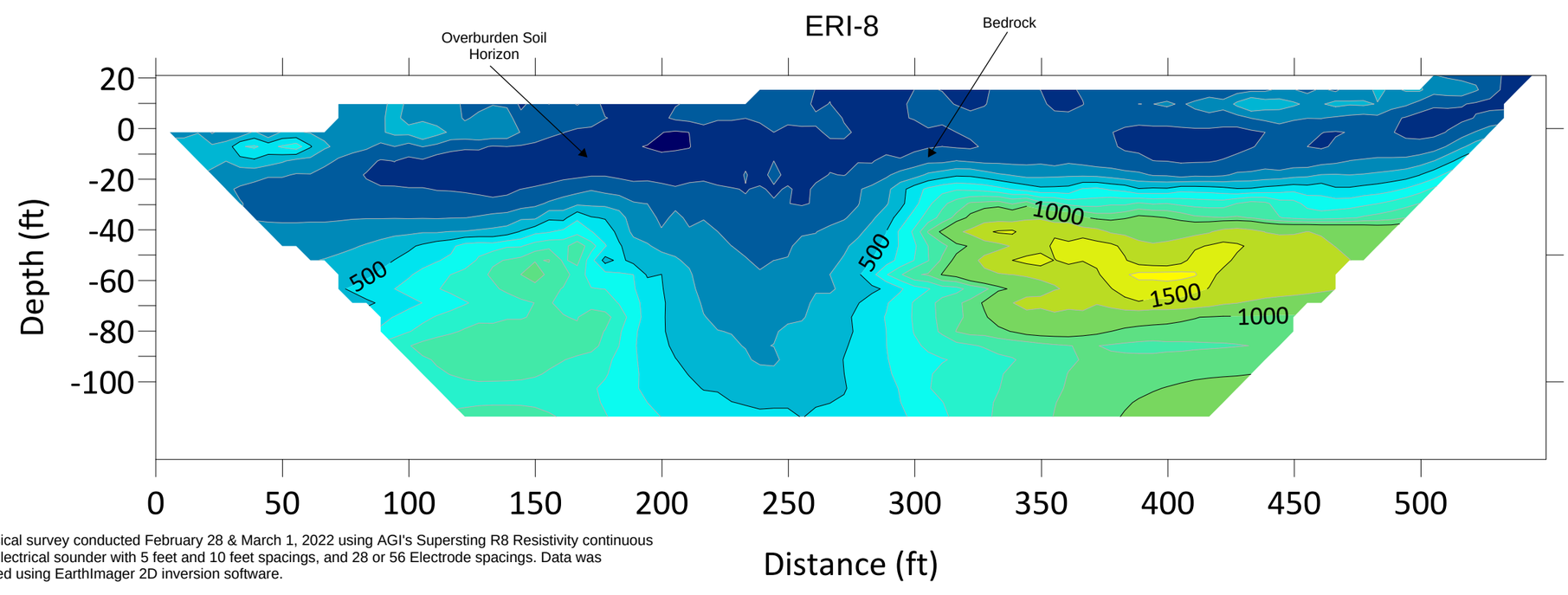
PROJECT NO.:

SHEET TITLE:









Soils

Notes:

Geophysical survey conducted February 28 & March 1, 2022 using AGI's Supersting R8 Resistivity continuous vertical electrical sounder with 5 feet and 10 feet spacings, and 28 or 56 Electrode spacings. Data was interpreted using EarthImager 2D inversion software.

No vertical exaggeration.

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Locations are approximate.

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REV		
PROJ. MGR.	TR	3/18/2022

SCALE:

SOURCE: AGI EarthImager 2D

PROJECT:

Geophysical Investigation
Clinton Commons Project
Town of Clinton, New Jersey

DRAWING NO.:

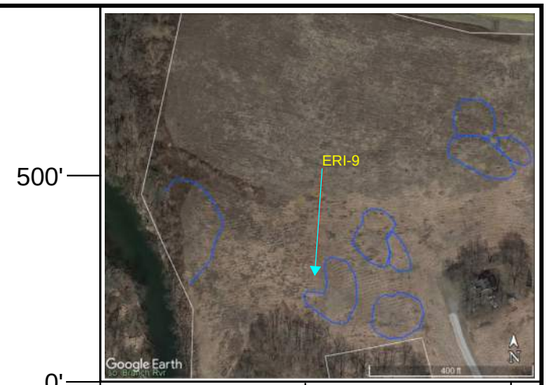
Figure 5
Electrical Resistivity Imaging Profile
Location 7 & 8 (ERI-7 & ERI-8)

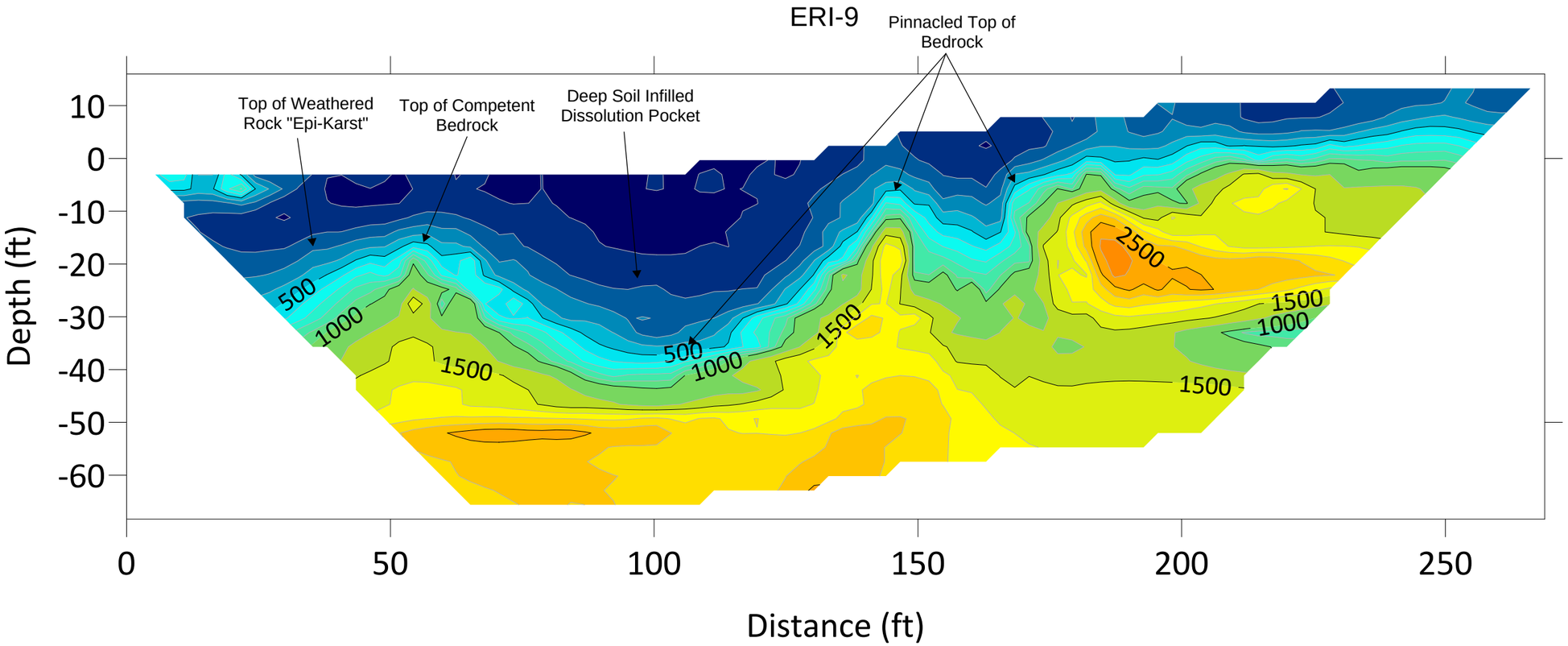
PREPARED FOR:

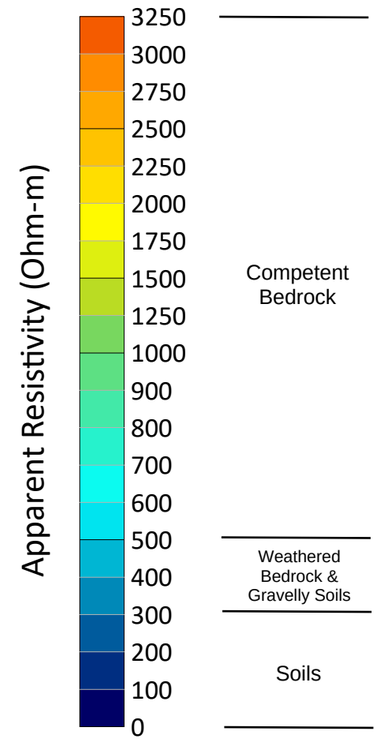
CONCEPT ENGINEERING CONSULTANTS, PA

PROJECT NO.:

SHEET TITLE:







Notes:

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REV		
PROJ. MGR.	TR	3/18/2022

SCALE:

SOURCE: AGI EarthImager 2D

PROJECT:
Geophysical Investigation
Clinton Commons Project
Town of Clinton, New Jersey

DRAWING NO.:
Figure 6
Electrical Resistivity Imaging Profile
Location 9 (ERI-9)

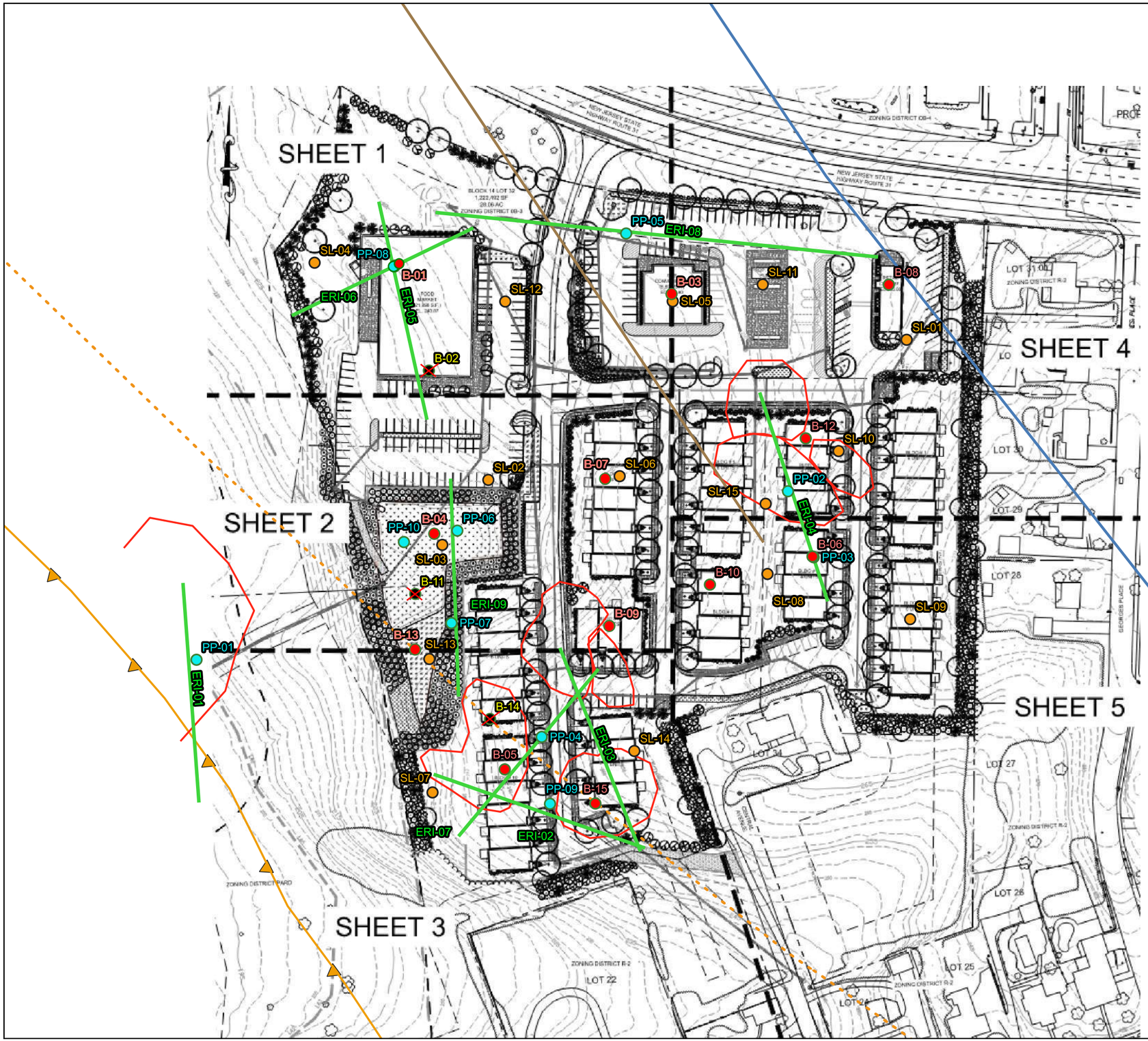
PREPARED FOR:
CONCEPT ENGINEERING CONSULTANTS, PA

PROJECT NO.:

SHEET TITLE:

APPENDIX C

Investigation Location Plan



ANS GEO

Client:

CONCEPT ENGINEERING CONSULTANTS, PA

INVESTIGATION LOCATION PLAN

CLINTON COMMONS DEVELOPMENT

TOWN OF CLINTON, NEW JERSEY

Legend

- As-Completed ANS Geo Soil Boring Location
- Cancelled Soil Boring Location
- As-Completed Percussion Probe Location
- As Completed E&LP Soil Borings
- As-Completed Geophysics Locations
- Syncline
- Anticline
- Possible Karst Locations
- Concealed Fault
- Thrust Fault

0 130 260 ft

Absolute Scale: 1 inch = 130 feet
Scale at 11" x 17" AS SHOWN

Prepared by: Michael Lionikis
Date: Oct. 07, 2022
Drawing Number: PIP-1 Rev. 4

APPENDIX D

As-Completed Percussion Probe Logs

Percussion Drilling Log

PP - 01

Client:	Concept Engineering Consultants	**Drilling Firm:**	Hayduk Enterprises	**Coordinates:**	40.641144, -74.90875
Project:	Clinton Commons	**Drill Crew:**	Garth Devlia	**Horiz. Datum:**	WGS 84
Location:	Clinton , NJ	**Boring Start:**	12:45 am 5/09/2022	**Elevation:**	Grade
Inspector:	Michael Garcia	**Boring End:**	2:00 pm 5/09/2022	**Vert. Datum:**	N/A
Rig Model:	Ingersoll-Rand ECM-590	**Drill Bit Type:**	Percussion Drill Bit	**Drill Rod Type:**	N/A
Rig Type:	Hydraulic Rock Drill	**Drill Bit Length:**	6 inches	**Drill Rod Length:**	12 feet
Drill Method:	Top Hammer	**Drill Bit I.D.:**	3 inches	**Drill Rod I.D.:**	N/A

Depth (ft)	Average Drilling Rate (sec/ft)	Drilling & Observation Notes	Additional Notes
1	6	Light brown coarse to fine SAND, trace Silt	- 0 to 7 feet BGS Drill Time : 0.75 minutes
2	6		
3	6		
4	6		
5	6		
6	6		
7	9		
8	20	Top of bedrock ~ 7 Ft. BGS.	- 7 to 10 feet BGS Drill Time : 1 minute
9	20		
10	20		
11	20		- 10 to 15 feet BGS Drill Time : 1.52 minutes
12	20		
13	17		
14	17		
15	17		
16	17		- 15 to 20 feet BGS Drill Time : 1.91 minutes
17	17		
18	17		
19	32		
20	32		
21	36		- 20 to 25 feet BGS Drill Time : 3.03 minutes
22	38		
23	38		
24	38		
	32		

In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

BGS = Below Grade Surface
No groundwater observed.

Percussion Drilling Log

PP - 01
(continued)

Client:	Concept Engineering Consultants	**Drilling Firm:**	Hayduk Enterprises	**Coordinates:**	40.641144, -74.90875
Project:	Clinton Commons	**Drill Crew:**	Garth Devlia	**Horiz. Datum:**	WGS 84
Location:	Clinton , NJ	**Boring Start:**	12:45 am 5/09/2022	**Elevation:**	Grade
Inspector:	Michael Garcia	**Boring End:**	2:00 pm 5/09/2022	**Vert. Datum:**	N/A

Depth (ft)	Average Drilling Rate (sec/ft)	Drilling & Observation Notes	Additional Notes
26	32		- 25 to 30 feet BGS Drill Time : 2.67 minutes
27	32		
28	32		
29	32		
30	32		
31	30		- 30 to 35 feet BGS Drill Time : 2.92 minutes
32	30		
33	35		
34	40		
35	40		
36	40		- 35 to 40 feet BGS Drill Time : 3.67 minutes
37	45		
38	45		
39	45		
40	45		
41	42		- 40 to 45 feet BGS Drill Time : 3 minutes
42	42		
43	36		
44	30		
45	30		
46	30		- 45 to 49 feet BGS Drill Time : 2 minutes
47	30		
48	30		
49	30		Total Drill Time in Rocks : 21.72 minutes
50		End of Percussion Drilling at 49 feet BGS. Backfilled with cuttings and bentonite holeplug	

In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

BGS = Below Grade Surface
No groundwater observed.

Percussion Drilling Log

PP - 02

Client:	Concept Engineering Consultants	**Drilling Firm:**	Hayduk Enterprises	**Coordinates:**	40.641723, -74.906078
Project:	Clinton Commons	**Drill Crew:**	Garth Devlia	**Horiz. Datum:**	WGS 84
Location:	Clinton , NJ	**Boring Start:**	2:45 pm 5/10/2022	**Elevation:**	Grade
Inspector:	Michael Garcia	**Boring End:**	3:20 pm 5/10/2022	**Vert. Datum:**	N/A
Rig Model:	Ingersoll-Rand ECM-590	**Drill Bit Type:**	Percussion Drill Bit	**Drill Rod Type:**	N/A
Rig Type:	Hydraulic Rock Drill	**Drill Bit Length:**	6 inches	**Drill Rod Length:**	12 feet
Drill Method:	Top Hammer	**Drill Bit I.D.:**	3 inches	**Drill Rod I.D.:**	N/A

Depth (ft)	Average Drilling Rate (sec/ft)	Drilling & Observation Notes	Additional Notes
	8	Light brown coarse to fine SAND, trace Silt	- 0 to 7 feet BGS
1	8		Drill Time : 1.03 minutes
2	8		
3	8		
4	10		
5	10		
6	10		
7	30	Top of bedrock ~ 7 Ft. BGS.	- 7 to 10 feet BGS
8	30		Drill Time : 1.5 minutes
9	30		
10	30		- 10 to 15 feet BGS
11	30		Drill Time : 2 minutes
12	20		
13	20		
14	20		
15	20		- 15 to 20 feet BGS
16	20		Drill Time : 1.73 minutes
17	20		
18	22		
19	22		
20	28		- 20 to 25 feet BGS
21	28		Drill Time : 2.23 minutes
22	28		
23	28		
24	22		

In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

BGS = Below Grade Surface
No groundwater observed.

Percussion Drilling Log

PP - 02
(continued)

Client:	Concept Engineering Consultants	**Drilling Firm:**	Hayduk Enterprises	**Coordinates:**	40.641723, -74.906078
Project:	Clinton Commons	**Drill Crew:**	Garth Devlia	**Horiz. Datum:**	WGS 84
Location:	Clinton , NJ	**Boring Start:**	2:45 pm 5/10/2022	**Elevation:**	Grade
Inspector:	Michael Garcia	**Boring End:**	3:20 pm 5/10/2022	**Vert. Datum:**	N/A

Depth (ft)	Average Drilling Rate (sec/ft)	Drilling & Observation Notes	Additional Notes
26	22		- 25 to 30 feet BGS Drill Time : 1.83 minutes
27	22		
28	22		
29	22		
30	22		
31	20		- 30 to 35 feet BGS Drill Time : 1.83 minutes
32	20		
33	20		
34	25		
35	25		
36	25		- 35 to 40 feet BGS Drill Time : 2.42 minutes
37	30		
38	30		
39	30		
40	30		
41	25		- 40 to 45 feet BGS Drill Time : 1.97 minutes
42	25		
43	20		
44	24		
45	24		
46	24		- 45 to 49 feet BGS Drill Time : 1.6 minutes
47	24		
48	24		
49	24		Total Drill Time in Rocks : 18.14 minutes
50		End of Percussion Drilling at 49 feet BGS. Backfilled with cuttings and bentonite holeplug	

In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

BGS = Below Grade Surface
No groundwater observed.

Percussion Drilling Log

PP - 03

Client:	Concept Engineering Consultants	**Drilling Firm:**	Hayduk Enterprises	**Coordinates:**	40.641496, -74.905962
Project:	Clinton Commons	**Drill Crew:**	Garth Devlia	**Horiz. Datum:**	WGS 84
Location:	Clinton , NJ	**Boring Start:**	1:30 pm 5/10/2022	**Elevation:**	Grade
Inspector:	Michael Garcia	**Boring End:**	2:40 pm 5/10/2022	**Vert. Datum:**	N/A
Rig Model:	Ingersoll-Rand ECM-590	**Drill Bit Type:**	Percussion Drill Bit	**Drill Rod Type:**	N/A
Rig Type:	Hydraulic Rock Drill	**Drill Bit Length:**	6 inches	**Drill Rod Length:**	12 feet
Drill Method:	Top Hammer	**Drill Bit I.D.:**	3 inches	**Drill Rod I.D.:**	N/A

Depth (ft)	Average Drilling Rate (sec/ft)	Drilling & Observation Notes	Additional Notes
1	8	Light brown coarse to fine SAND, trace Silt	- 0 to 7 feet BGS Drill Time : 0.83 minutes
2	8		
3	8		
4	8		
5	7		
6	7		
7	7		
8	25	Top of bedrock ~ 7 Ft. BGS.	- 7 to 10 feet BGS Drill Time : 1.25 minutes
9	25		
10	25		
11	25		- 10 to 15 feet BGS Drill Time : 1.83 minutes
12	25		
13	20		
14	20		
15	20		
16	20		- 15 to 20 feet BGS Drill Time : 1.83 minutes
17	20		
18	20		
19	25		
20	25		
21	26		- 20 to 25 feet BGS Drill Time : 2.35 minutes
22	30		
23	30		
24	30		
	25		

In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

BGS = Below Grade Surface
No groundwater observed.

Percussion Drilling Log

PP - 03
(continued)

Client:	Concept Engineering Consultants	**Drilling Firm:**	Hayduk Enterprises	**Coordinates:**	40.641496, -74.905962
Project:	Clinton Commons	**Drill Crew:**	Garth Devlia	**Horiz. Datum:**	WGS 84
Location:	Clinton , NJ	**Boring Start:**	1:30 pm 5/10/2022	**Elevation:**	Grade
Inspector:	Michael Garcia	**Boring End:**	2:40 pm 5/10/2022	**Vert. Datum:**	N/A

Depth (ft)	Average Drilling Rate (sec/ft)	Drilling & Observation Notes	Additional Notes
	25		- 25 to 30 feet BGS
26			Drill Time : 2.08 minutes
	25		
27			
	25		
28			
	25		
29			
	25		
30			
	28		- 30 to 35 feet BGS
31			Drill Time : 2.68 minutes
	28		
32			
	35		
33			
	35		
34			
	35		
35			
	35		- 35 to 40 feet BGS
36			Drill Time : 2.85 minutes
	34		
37			
	34		
38			
	34		
39			
	34		
40			
	40		- 40 to 45 feet BGS
41			Drill Time : 3.17 minutes
	40		
42			
	40		
43			
	35		
44			
	35		
45			
	35		- 45 to 49 feet BGS
46			Drill Time : 2.33 minutes
	35		
47			
	35		
48			
	35		Total Drill Time in Rocks : 21.20 minutes
49		End of Percussion Drilling at 49 feet BGS.	
50		Backfilled with cuttings and bentonite holeplug	

In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

BGS = Below Grade Surface
No groundwater observed.

Percussion Drilling Log

PP - 04

Client:	Concept Engineering Consultants	**Drilling Firm:**	Hayduk Enterprises	**Coordinates:**	40.640880, -74.907191
Project:	Clinton Commons	**Drill Crew:**	Garth Devlia	**Horiz. Datum:**	WGS 84
Location:	Clinton , NJ	**Boring Start:**	12:45 pm 5/09/2022	**Elevation:**	Grade
Inspector:	Michael Garcia	**Boring End:**	2:00 pm 5/09/2022	**Vert. Datum:**	N/A
Rig Model:	Ingersoll-Rand ECM-590	**Drill Bit Type:**	Percussion Drill Bit	**Drill Rod Type:**	N/A
Rig Type:	Hydraulic Rock Drill	**Drill Bit Length:**	6 inches	**Drill Rod Length:**	12 feet
Drill Method:	Top Hammer	**Drill Bit I.D.:**	3 inches	**Drill Rod I.D.:**	N/A

Depth (ft)	Average Drilling Rate (sec/ft)	Drilling & Observation Notes	Additional Notes
1	4	Light brown coarse to fine SAND, trace fine Gravel, trace Silt	- 0 to 4 feet BGS Drill Time : 0.27 minutes
	4		
2	4		
3	4		
4	34	Top of bedrock ~ 4 Ft. BGS.	- 4 to 10 feet BGS Drill Time : 2.88 minutes
5	34		
6	30		
7	25		
8	25		
9	25		
10	25		- 10 to 15 feet BGS Drill Time : 1.83 minutes
11	25		
12	20		
13	20		
14	20		
15	20		- 15 to 20 feet BGS Drill Time : 1.83 minutes
16	20		
17	20		
18	25		
19	25		
20	30		- 20 to 25 feet BGS Drill Time : 2.28 minutes
21	30		
22	30		
23	30		
24	17	Possible Groundwater ~ 24 Ft. BGS.	

In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

BGS = Below Grade Surface
No groundwater observed.

Percussion Drilling Log

PP - 04
(continued)

Client:	Concept Engineering Consultants	**Drilling Firm:**	Hayduk Enterprises	**Coordinates:**	40.640880, -74.907191
Project:	Clinton Commons	**Drill Crew:**	Garth Devlia	**Horiz. Datum:**	WGS 84
Location:	Clinton , NJ	**Boring Start:**	12:45 pm 5/09/2022	**Elevation:**	Grade
Inspector:	Michael Garcia	**Boring End:**	2:00 pm 5/09/2022	**Vert. Datum:**	N/A

Depth (ft)	Average Drilling Rate (sec/ft)	Drilling & Observation Notes	Additional Notes
26	17		- 25 to 30 feet BGS Drill Time : 1.42 minutes
27	17		
28	17		
29	17		
30	17		
31	22		- 30 to 35 feet BGS Drill Time : 1.98 minutes
32	22		
33	15		
34	30		
35	30		
36	30		- 35 to 40 feet BGS Drill Time : 2.17 minutes
37	25		
38	25		
39	25		
40	25		
41	22		- 40 to 45 feet BGS Drill Time : 1.67 minutes
42	22		
43	22		
44	17		
45	17		
46	17		- 45 to 49 feet BGS Drill Time : 1.13 minutes
47	17		
48	17		
49	17		Total Drill Time in Rocks : 17.46 minutes
50		End of Percussion Drilling at 49 feet BGS. Backfilled with cuttings and bentonite holeplug	

In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

BGS = Below Grade Surface
No groundwater observed.

Percussion Drilling Log

PP - 05

Client:	Concept Engineering Consultants	**Drilling Firm:**	Hayduk Enterprises	**Coordinates:**	40.642606, -74.906809
Project:	Clinton Commons	**Drill Crew:**	Garth Devlia	**Horiz. Datum:**	WGS 84
Location:	Clinton , NJ	**Boring Start:**	09:00 am 5/04/2022	**Elevation:**	Grade
Inspector:	Michael Garcia	**Boring End:**	11:00 am 5/04/2022	**Vert. Datum:**	N/A
Rig Model:	Ingersoll-Rand ECM-590	**Drill Bit Type:**	Percussion Drill Bit	**Drill Rod Type:**	N/A
Rig Type:	Hydraulic Rock Drill	**Drill Bit Length:**	6 inches	**Drill Rod Length:**	12 feet
Drill Method:	Top Hammer	**Drill Bit I.D.:**	3 inches	**Drill Rod I.D.:**	N/A

Depth (ft)	Average Drilling Rate (sec/ft)	Drilling & Observation Notes	Additional Notes
1	2	Light brown coarse to fine SAND, trace Silt	- 0 to 10 feet BGS Drill Time : 0.42 minutes
2	2		
3	2		
4	2		
5	3		
6	3		
7	2		
8	3		
9	3		
10	3		
11	3		- 10 to 24 feet BGS Drill Time : 0.9 minutes
12	2		
13	2		
14	2		
15	2		
16	4		
17	4		
18	2		
19	6		
20	6		
21	6		
22	6		
23	6		
24	20	Top of bedrock ~ 24 Ft.	

In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

BGS = Below Grade Surface
No groundwater observed.

Percussion Drilling Log

PP - 05
(continued)

Client:	Concept Engineering Consultants	**Drilling Firm:**	Hayduk Enterprises	**Coordinates:**	40.642606, -74.906809
Project:	Clinton Commons	**Drill Crew:**	Garth Devlia	**Horiz. Datum:**	WGS 84
Location:	Clinton , NJ	**Boring Start:**	09:00 am 5/04/2022	**Elevation:**	Grade
Inspector:	Michael Garcia	**Boring End:**	11:00 am 5/04/2022	**Vert. Datum:**	N/A

Depth (ft)	Average Drilling Rate (sec/ft)	Drilling & Observation Notes	Additional Notes
	20		- 24 to 30 feet BGS
26			Drill Time : 2.0 minutes
	20		
27			
	20		
28			
	20		
29			
	20		
30			
	15		- 30 to 35 feet BGS
31			Drill Time : 1.18 minutes
	14		
32			
	14		
33			
	14		
34			
	14		
35			
	14		- 35 to 40 feet BGS
36			Drill Time : 1.63 minutes
	21		
37			
	21		
38			
	21		
39			
	21		
40			
	26		- 40 to 45 feet BGS
41			Drill Time : 2.17 minutes
	26		
42			
	30		
43			
	24		
44			
	24		
45			
	24		- 45 to 49 feet BGS
46			Drill Time : 1.6 minutes
	24		
47			
	24		
48			
	24		Total Drill Time in Rocks : 9.9 minutes
49		End of Percussion Drilling at 49 feet BGS.	
50		Backfilled with cuttings and bentonite holeplug	

In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

BGS = Below Grade Surface
No groundwater observed.

Percussion Drilling Log

PP - 06

Client:	Concept Engineering Consultants	**Drilling Firm:**	Hayduk Enterprises	**Coordinates:**	40.641588, -74.907572
Project:	Clinton Commons	**Drill Crew:**	Garth Devlia	**Horiz. Datum:**	WGS 84
Location:	Clinton , NJ	**Boring Start:**	12:00 pm 5/04/2022	**Elevation:**	Grade
Inspector:	Michael Garcia	**Boring End:**	1:00 pm 5/04/2022	**Vert. Datum:**	N/A
Rig Model:	Ingersoll-Rand ECM-590	**Drill Bit Type:**	Percussion Drill Bit	**Drill Rod Type:**	N/A
Rig Type:	Hydraulic Rock Drill	**Drill Bit Length:**	6 inches	**Drill Rod Length:**	12 feet
Drill Method:	Top Hammer	**Drill Bit I.D.:**	3 inches	**Drill Rod I.D.:**	N/A

Depth (ft)	Average Drilling Rate (sec/ft)	Drilling & Observation Notes	Additional Notes
1	4	Light brown coarse to fine SAND, trace Silt	- 0 to 7 feet BGS Drill Time : 0.7 minutes
	4		
2	4		
3	4		
4	4		
5	10		
6	12		
7	15	Top of bedrock ~ 7 Ft. BGS.	- 7 to 10 feet BGS Drill Time : 0.75 minutes
8	15		
9	15		
10	15		- 10 to 15 feet BGS Drill Time : 0.85 minutes
11	15		
12	18		
13	18		
14	18		
15	18		- 15 to 20 feet BGS Drill Time : 1.43 minutes
16	15		
17	15		
18	20		
19	18		
20	18		- 20 to 25 feet BGS Drill Time : 1.57 minutes
21	18		
22	18		
23	18		
24	22		

In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

BGS = Below Grade Surface
No groundwater observed.

Percussion Drilling Log

PP - 06
(continued)

Client:	Concept Engineering Consultants	**Drilling Firm:**	Hayduk Enterprises	**Coordinates:**	40.641588, -74.907572
Project:	Clinton Commons	**Drill Crew:**	Garth Devlia	**Horiz. Datum:**	WGS 84
Location:	Clinton , NJ	**Boring Start:**	12:00 pm 5/04/2022	**Elevation:**	Grade
Inspector:	Michael Garcia	**Boring End:**	1:00 pm 5/04/2022	**Vert. Datum:**	N/A

Depth (ft)	Average Drilling Rate (sec/ft)	Drilling & Observation Notes	Additional Notes
26	22		- 25 to 30 feet BGS Drill Time : 1.83 minutes
27	22		
28	22		
29	22		
30	22		
31	22		- 30 to 35 feet BGS Drill Time : 1.77 minutes
32	21		
33	21		
34	21		
35	21		
36	21		- 35 to 40 feet BGS Drill Time : 2.08 minutes
37	26		
38	26		
39	26		
40	26		
41	23		- 40 to 45 feet BGS Drill Time : 1.78 minutes
42	23		
43	18		
44	18		
45	25		
46	25		- 45 to 49 feet BGS Drill Time : 1.67 minutes
47	25		
48	25		
49	25		Total Drill Time in Rocks : 14.43 minutes
50		End of Percussion Drilling at 49 feet BGS. Backfilled with cuttings and bentonite holeplug	

In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

BGS = Below Grade Surface
No groundwater observed.

Percussion Drilling Log

PP - 07

Client:	Concept Engineering Consultants	**Drilling Firm:**	Hayduk Enterprises	**Coordinates:**	40.641271, -74.907599
Project:	Clinton Commons	**Drill Crew:**	Garth Devlia	**Horiz. Datum:**	WGS 84
Location:	Clinton , NJ	**Boring Start:**	09:00 am 5/09/2022	**Elevation:**	Grade
Inspector:	Michael Garcia	**Boring End:**	11:30 am 5/09/2022	**Vert. Datum:**	N/A
Rig Model:	Ingersoll-Rand ECM-590	**Drill Bit Type:**	Percussion Drill Bit	**Drill Rod Type:**	N/A
Rig Type:	Hydraulic Rock Drill	**Drill Bit Length:**	6 inches	**Drill Rod Length:**	12 feet
Drill Method:	Top Hammer	**Drill Bit I.D.:**	3 inches	**Drill Rod I.D.:**	N/A

Depth (ft)	Average Drilling Rate (sec/ft)	Drilling & Observation Notes	Additional Notes
1	3	Light brown coarse to fine SAND, trace fine Gravel, trace Silt	- 0 to 12 feet BGS Drill Time : 1.13 minutes
	3		
2	3		
3	3		
4	2		
5	2		
6	7		
7	9		
8	9		
9	9		
10	9		
11	9		
12	27	Top of bedrock ~ 12 Ft. BGS.	- 12 to 20 feet BGS Drill Time : 3.33 minute
13	27		
14	27		
15	27		
16	23		
17	23		
18	23		
19	23		
20	30		- 20 to 25 feet BGS Drill Time : 2.5 minutes
21	30		
22	30		
23	30		
24	30		

In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

BGS = Below Grade Surface
No groundwater observed.

Percussion Drilling Log

PP - 07
(continued)

Client:	Concept Engineering Consultants	**Drilling Firm:**	Hayduk Enterprises	**Coordinates:**	40.641271, -74.907599
Project:	Clinton Commons	**Drill Crew:**	Garth Devlia	**Horiz. Datum:**	WGS 84
Location:	Clinton , NJ	**Boring Start:**	09:00 am 5/09/2022	**Elevation:**	Grade
Inspector:	Michael Garcia	**Boring End:**	11:30 am 5/09/2022	**Vert. Datum:**	N/A

Depth (ft)	Average Drilling Rate (sec/ft)	Drilling & Observation Notes	Additional Notes
26	30		- 25 to 30 feet BGS Drill Time : 2.5 minutes
27	30		
28	30		
29	30		
30	30		
31	33		- 30 to 35 feet BGS Drill Time : 2.75 minutes
32	33		
33	33		
34	33		
35	33		
36	33		- 35 to 40 feet BGS Drill Time : 3.08 minutes
37	38		
38	38		
39	38		
40	38		
41	30		- 40 to 45 feet BGS Drill Time : 2.87 minutes
42	30		
43	36		
44	38		
45	38		
46	38		- 45 to 49 feet BGS Drill Time : 2.53 minutes
47	38		
48	38		
49	38		Total Drill Time in Rocks : 20.69 minutes
50		End of Percussion Drilling at 49 feet BGS. Backfilled with cuttings and bentonite holeplug	

In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

BGS = Below Grade Surface
No groundwater observed.

Percussion Drilling Log

PP - 08

Client:	Concept Engineering Consultants	**Drilling Firm:**	Hayduk Enterprises	**Coordinates:**	40.642493, -74.907857
Project:	Clinton Commons	**Drill Crew:**	Garth Devlia	**Horiz. Datum:**	WGS 84
Location:	Clinton , NJ	**Boring Start:**	11:00 am 5/04/2022	**Elevation:**	Grade
Inspector:	Michael Garcia	**Boring End:**	12:00 am 5/04/2022	**Vert. Datum:**	N/A
Rig Model:	Ingersoll-Rand ECM-590	**Drill Bit Type:**	Percussion Drill Bit	**Drill Rod Type:**	N/A
Rig Type:	Hydraulic Rock Drill	**Drill Bit Length:**	6 inches	**Drill Rod Length:**	12 feet
Drill Method:	Top Hammer	**Drill Bit I.D.:**	3 inches	**Drill Rod I.D.:**	N/A

Depth (ft)	Average Drilling Rate (sec/ft)	Drilling & Observation Notes	Additional Notes
1	3	Light brown coarse to fine SAND, trace fine Gravel, trace Silt	- 0 to 10 feet BGS Drill Time : 0.67 minutes
	3		
2	3		
3	3		
4	7		
5	7		
6	2		
7	4		
8	4		
9	4		
10	4		- 10 to 18 feet BGS Drill Time : 1.13 minute
11	4		
12	10		
13	10		
14	10		
15	10		
16	10		
17	10		
18	20	Top of bedrock ~ 18Ft. BGS	- 18 to 25 feet BGS Drill Time : 1.83 minutes
19	14		
20	14		
21	14		
22	14		
23	14		
24	20		

In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

BGS = Below Grade Surface
No groundwater observed.

Percussion Drilling Log

PP - 08
(continued)

Client:	Concept Engineering Consultants	**Drilling Firm:**	Hayduk Enterprises	**Coordinates:**	40.642493, -74.907857
Project:	Clinton Commons	**Drill Crew:**	Garth Devlia	**Horiz. Datum:**	WGS 84
Location:	Clinton , NJ	**Boring Start:**	11:00 am 5/04/2022	**Elevation:**	Grade
Inspector:	Michael Garcia	**Boring End:**	12:00 am 5/04/2022	**Vert. Datum:**	N/A

Depth (ft)	Average Drilling Rate (sec/ft)	Drilling & Observation Notes	Additional Notes
26	20		- 25 to 30 feet BGS Drill Time : 1.7 minutes
27	20		
28	20		
29	21		
30	21		
31	24		- 30 to 35 feet BGS Drill Time : 2.27 minutes
32	28		
33	28		
34	28		
35	28		
36	28		- 35 to 40 feet BGS Drill Time : 2.73 minutes
37	34		
38	34		
39	34		
40	34		
41	35		- 40 to 45 feet BGS Drill Time : 2.77 minutes
42	35		
43	36		
44	30		
45	30		
46	30		- 45 to 49 feet BGS Drill Time : 2.0 minutes
47	30		
48	30		
49	30		Total Drill Time in Rocks : 15.1 minutes
50		End of Percussion Drilling at 49 feet BGS. Backfilled with cuttings and bentonite holeplug	

In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

BGS = Below Grade Surface
No groundwater observed.

Percussion Drilling Log

PP - 09

Client:	Concept Engineering Consultants	**Drilling Firm:**	Hayduk Enterprises	**Coordinates:**	40.640651, -74.907153
Project:	Clinton Commons	**Drill Crew:**	Garth Devlia	**Horiz. Datum:**	WGS 84
Location:	Clinton , NJ	**Boring Start:**	11:45 am 5/10/2022	**Elevation:**	Grade
Inspector:	Michael Garcia	**Boring End:**	1:13 pm 5/10/2022	**Vert. Datum:**	N/A
Rig Model:	Ingersoll-Rand ECM-590	**Drill Bit Type:**	Percussion Drill Bit	**Drill Rod Type:**	N/A
Rig Type:	Hydraulic Rock Drill	**Drill Bit Length:**	6 inches	**Drill Rod Length:**	12 feet
Drill Method:	Top Hammer	**Drill Bit I.D.:**	3 inches	**Drill Rod I.D.:**	N/A

Depth (ft)	Average Drilling Rate (sec/ft)	Drilling & Observation Notes	Additional Notes
1	5	Light brown coarse to fine SAND, trace fine Gravel, trace Silt	- 0 to 6 feet BGS Drill Time : 0.67 minutes
	5		
2	5		
3	5		
4	10		
5	10		
6	34	Top of bedrock ~ 6 Ft. BGS.	- 6 to 10 feet BGS Drill Time : 2.06 minute
7	30		
8	30		
9	30		
10	30		- 10 to 15 feet BGS Drill Time : 2.25 minutes
11	30		
12	25		
13	25		
14	25		
15	25		- 12 to 20 feet BGS Drill Time : 2.08 minutes
16	25		
17	25		
18	25		
19	25		
20	27		- 20 to 25 feet BGS Drill Time : 2.37 minutes
21	30		
22	30		
23	30		
24	25		

In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

BGS = Below Grade Surface
No groundwater observed.

Percussion Drilling Log

PP - 09
(continued)

Client:	Concept Engineering Consultants	**Drilling Firm:**	Hayduk Enterprises	**Coordinates:**	40.640651, -74.907153
Project:	Clinton Commons	**Drill Crew:**	Garth Devlia	**Horiz. Datum:**	WGS 84
Location:	Clinton , NJ	**Boring Start:**	11:45 am 5/10/2022	**Elevation:**	Grade
Inspector:	Michael Garcia	**Boring End:**	1:13 pm 5/10/2022	**Vert. Datum:**	N/A

Depth (ft)	Average Drilling Rate (sec/ft)	Drilling & Observation Notes	Additional Notes
	25		- 25 to 30 feet BGS
26			Drill Time : 2.08 minutes
	25		
27			
	25		
28			
	25		
29			
	25		
30			
	30		- 30 to 35 feet BGS
31			Drill Time : 2.5 minutes
	30		
32			
	25		
33			
	30		
34			
	30		
35			
	30		- 35 to 40 feet BGS
36			Drill Time : 2.17 minutes
	25		
37			
	25		
38			
	25		
39			
	25		
40			
	30		- 40 to 45 feet BGS
41			Drill Time : 2.08 minutes
	30		
42			
	25		
43			
	20		
44			
	20		
45			
	20		- 45 to 49 feet BGS
46			Drill Time : 1.33 minutes
	20		
47			
	20		
48			
	20		Total Drill Time in Rocks : 19.59 minutes
49		End of Percussion Drilling at 49 feet BGS.	
50		Backfilled with cuttings and bentonite holeplug	

In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

BGS = Below Grade Surface
No groundwater observed.

Percussion Drilling Log

PP - 10

Client:	Concept Engineering Consultants	**Drilling Firm:**	Hayduk Enterprises	**Coordinates:**	40.641548, -74.907813
Project:	Clinton Commons	**Drill Crew:**	Garth Devlia	**Horiz. Datum:**	WGS 84
Location:	Clinton , NJ	**Boring Start:**	08:00 am 5/09/2022	**Elevation:**	Grade
Inspector:	Michael Garcia	**Boring End:**	09:00 am 5/09/2022	**Vert. Datum:**	N/A
Rig Model:	Ingersoll-Rand ECM-590	**Drill Bit Type:**	Percussion Drill Bit	**Drill Rod Type:**	N/A
Rig Type:	Hydraulic Rock Drill	**Drill Bit Length:**	6 inches	**Drill Rod Length:**	12 feet
Drill Method:	Top Hammer	**Drill Bit I.D.:**	3 inches	**Drill Rod I.D.:**	N/A

Depth (ft)	Average Drilling Rate (sec/ft)	Drilling & Observation Notes	Additional Notes
1	5	Light brown coarse to fine SAND, trace fine Gravel, trace Silt	- 0 to 5 feet BGS Drill Time : 0.42 minutes
2	5		
3	5		
4	5		
5	5		
6	20	Top of bedrock ~ 5 Ft. BGS.	- 5 to 10 feet BGS Drill Time : 1.67 minutes
7	20		
8	20		
9	20		
10	20		
11	20		- 10 to 15 feet BGS Drill Time : 1.42 minutes
12	15		
13	15		
14	15		
15	15		
16	18		- 15 to 20 feet BGS Drill Time : 1.48 minutes
17	18		
18	20		
19	18		
20	18		
21	18		- 20 to 25 feet BGS Drill Time : 1.53 minutes
22	18		
23	18		
24	20		

In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

BGS = Below Grade Surface
No groundwater observed.

Percussion Drilling Log

PP - 10
(continued)

Client:	Concept Engineering Consultants	**Drilling Firm:**	Hayduk Enterprises	**Coordinates:**	40.641548, -74.907813
Project:	Clinton Commons	**Drill Crew:**	Garth Devlia	**Horiz. Datum:**	WGS 84
Location:	Clinton , NJ	**Boring Start:**	08:00 am 5/09/2022	**Elevation:**	Grade
Inspector:	Michael Garcia	**Boring End:**	09:00 am 5/09/2022	**Vert. Datum:**	N/A

Depth (ft)	Average Drilling Rate (sec/ft)	Drilling & Observation Notes	Additional Notes
26	20		- 25 to 30 feet BGS Drill Time : 1.8 minutes
27	20		
28	20		
29	24		
30	24		
31	22		- 30 to 35 feet BGS Drill Time : 1.7 minutes
32	20		
33	20		
34	20		
35	20		
36	20		- 35 to 40 feet BGS Drill Time : 2.0 minutes
37	25		
38	25		
39	25		
40	25		
41	20		- 40 to 45 feet BGS Drill Time : 1.5 minutes
42	20		
43	15		
44	15		
45	20		
46	20		- 45 to 49 feet BGS Drill Time : 1.33 minutes
47	20		
48	20		
49	20		Total Drill Time in Rocks : 14.85 minutes
50		End of Percussion Drilling at 49 feet BGS. Backfilled with cuttings and bentonite holeplug	

In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

BGS = Below Grade Surface
No groundwater observed.

APPENDIX E

As-Completed Test Boring Logs

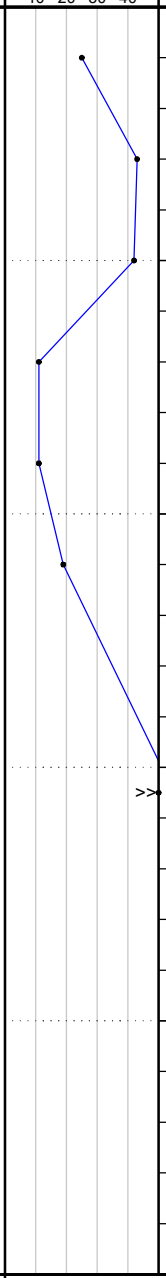
Soil Boring Log

B-01

Client:	Concept Engineering Consultants, PA	**Drilling Firm:**	Boring Brothers, Inc	**Coordinates:**	40.6424972 N,-74.907852 E
Project:	Clinton Commons	**Drill Crew:**	M. Daniel / D. Osuch	**Horiz. Datum:**	WGS 84
Location:	Clinton, NJ	**Boring Start:**	9/12/2022 1:30:00 PM	**Elevation:**	Grade
Inspector:	Sidharth Nambiar	**Boring End:**	9/14/2022 9:30:00 AM	**Vert. Datum:**	N/A

Rig Model:	CME-55LC	**Sampler Type:**	Split Spoon	**Casing Type:**	Steel Casing
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	5 feet
Drill Method:	Mud Rotary	**Sampler I.D.:**	1.375 inches	**Casing I.D.:**	4 inches
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	140 pounds
Drilling Fluid:	Water	**Hammer Fall:**	30 inches	**Hammer Fall:**	30 inches

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)
	S-1	18	3 5 20 44	25	ML	Dark brown Clayey SILT, some coarse to fine Sand, dry (ML)	L	L	0.5	1.5
					GP	Brown to dark gray Sandy coarse to fine GRAVEL, some Silt, dry (GP)				
	S-2	10	17 19 24 49	43	ML	Hard, dark brown SILT, some Clay, trace coarse to fine Gravel, dry (ML)	M	M	3.75	4.0
5	S-3	11	12 17 25 22	42	GM	Dense, dark brown to dark gray Silty coarse to fine GRAVEL, little coarse to fine Sand, moist (GM)				
	S-4	11	8 5 6 7	11		Medium dense, dark brown Silty coarse to fine GRAVEL, some coarse to fine Sand, moist (GM)				
	S-5	4	13 5 6 12	11		Medium dense, dark brown Silty coarse to fine GRAVEL, trace fine Sand, moist (GM)				
10	S-6	5	8 13 6 4	19	ML	Very stiff, dark brown Clayey SILT, trace coarse to fine Sand, moist (ML)	M	M		
15	S-7	6	2 50/0"	> 50	GM	Very dense, dark brown Silty coarse to fine GRAVEL, some Clay, moist (GM)				
						Coring Rock at 17 feet BGS. See Rock Coring Log.				
20										



Drilling & Strata Notes

- Casing Installed at 4 feet BGS.
- Casing Installed at 8 feet BGS.
- Not enough sample for P.P/T.V tests.
- Rock fragments at spoon tip.
- Roller bit refusal at 17 feet BGS.

In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

▼ = Water Level (if observed)
BGS = Below Ground Surface
Groundwater was not encountered within this borehole.

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

Rock Coring Log

B-01

Client:	Concept Engineering Consultants, PA	**Drilling Firm:**	Boring Brothers, Inc	**Coordinates:**	40.6424972 N,-74.907852 E
Project:	Clinton Commons	**Drill Crew:**	M. Daniel / D. Osuch	**Horiz. Datum:**	WGS 84
Location:	Clinton, NJ	**Boring Start:**	9/12/2022 1:30:00 PM	**Elevation:**	Grade
Inspector:	Sidharth Nambiar	**Boring End:**	9/14/2022 9:30:00 AM	**Vert. Datum:**	N/A

Rig Model:	CME-55LC	**Casing Type:**	Steel Casing	**Core Barrel Type:**	NQ	**Core Bit Type:**	NQ - 01
Rig Type:	Track	**Casing Length:**	5 feet	**Core Barrel Length:**	5 feet	**Core Bit Length:**	3 inches
Drill Method:	Mud Rotary	**Casing I.D.:**	4 inches	**Core Barrel I.D.:**	3 inches	**Core Bit I.D.:**	1.875 inches

Depth (ft)	Avg Core Rate (min/ft)	Run No.	Recovery (in. / %)	RQD (in. / %)	Hardness	Weathering	Graphic Log	Visual Classification	Depth (ft.)	Discontinuities: Type	Dip Angle	Roughness	Weathering	Aperture	Infilling	Drilling & Strata Notes
	4.97							LIMESTONE, light gray fine grained, slightly weathered, very close to close discontinuity spacing.								Casing Installed at 17 feet BGS.
	5.08								18.2	J	50	P,R	FR	VT	N	Water loss at 18 feet BGS.
								18.6' to 18.9' Highly Fractured Zone.								Calcite veins throughout the cores. Light gray return. Vertical fracture at 6.1 feet BGS.
	5.17	R-1	58 97%	25 42%	R4	SL			19.8	J	20	P,Sm	DS	VT	N	
20																
	4.83								20.9	J	20	P,Sm	FR	O	N	
	4.92							20.9' to 21.8' Fractured Zone.								
	5.22							LIMESTONE, light gray fine grained, slightly weathered, close discontinuity spacing.	22.7	J	25	P,R	DS	VT	N	
	5.13															Water loss at 23 feet BGS.
	3.72	R-2	60 100%	48 80%				24.2 to 24.6 Fractured Zone.	24.2	J	10	P,R	FR	VT	N	
									24.7	J	20	P,R	DS	VT	N	
25																
	10.7								26	J	20	P,R	FR	VT	N	
	9.97							End of Boring at 27 feet BGS. Backfilled with soil and bentonite holeplug.								
30																
35																

In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

▼ = Water Level (if observed) **BGS =** Below Ground Surface

Groundwater was not encountered within this borehole.

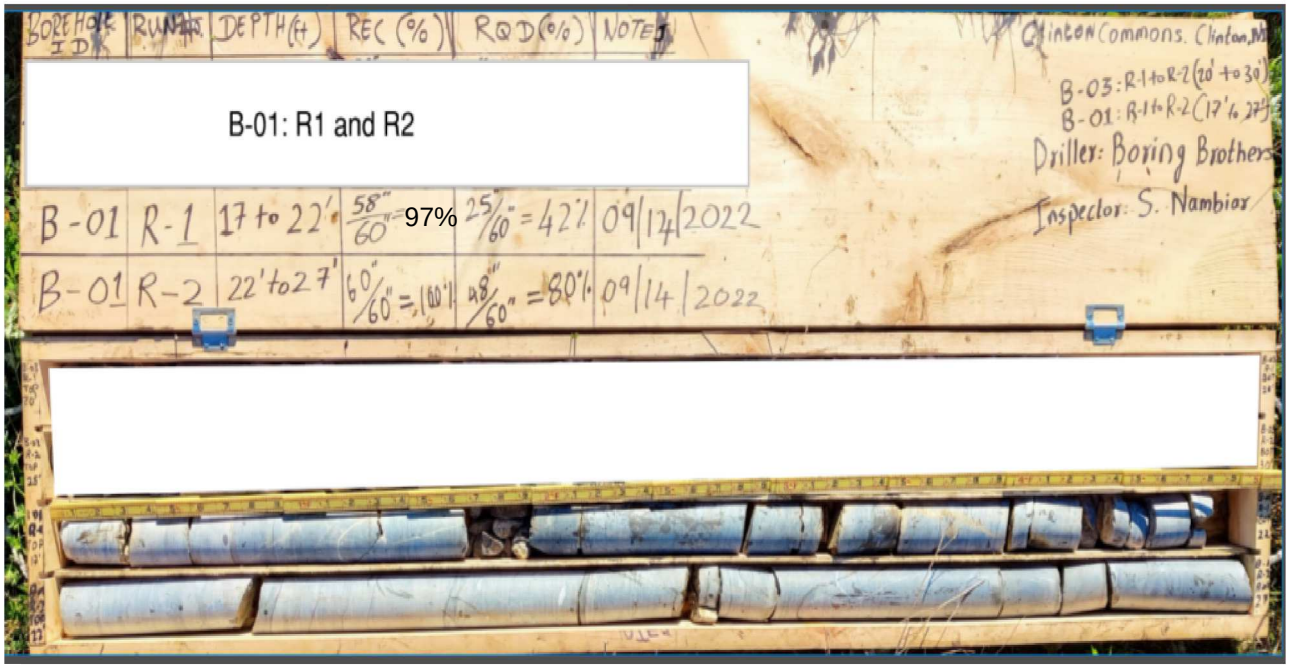


Figure B-01.1
B-01; R-1 and R-2 (dry)

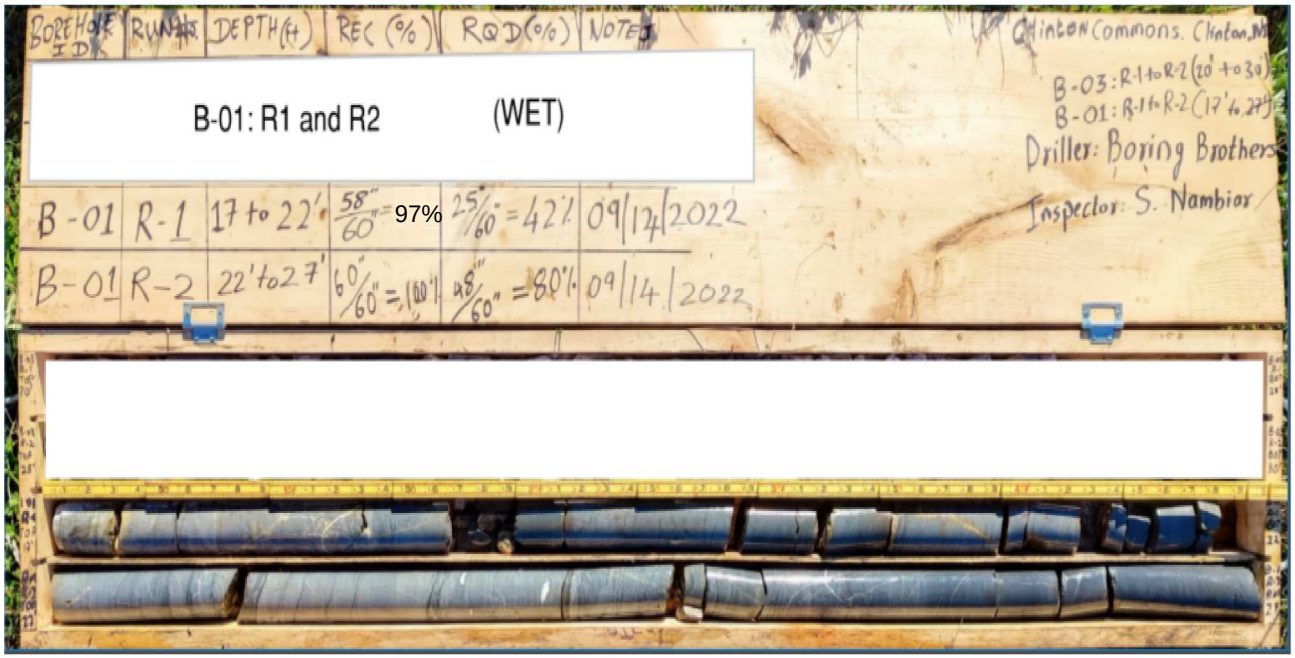


Figure B-01.2
B-01; R-1 and R-2 (wet)

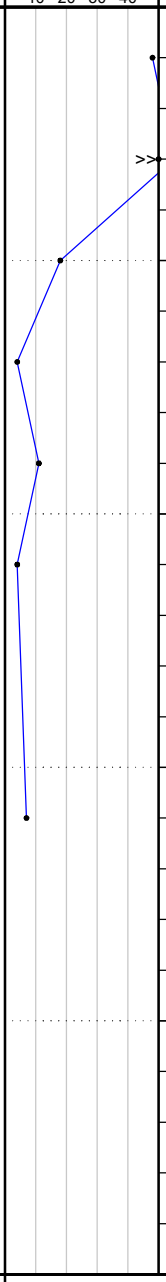
Soil Boring Log

B-03

Client:	Concept Engineering Consultants, PA	**Drilling Firm:**	Boring Brothers, Inc	**Coordinates:**	40.6424 N,-74.9066 E
Project:	Clinton Commons	**Drill Crew:**	M. Daniel / D. Osuch	**Horiz. Datum:**	WGS 84
Location:	Clinton, NJ	**Boring Start:**	9/12/2022 8:30:00 AM	**Elevation:**	Grade
Inspector:	Sidharth Nambiar	**Boring End:**	9/12/2022 12:30:00 PM	**Vert. Datum:**	N/A

Rig Model:	CME-55LC	**Sampler Type:**	Split Spoon	**Casing Type:**	Steel Casing
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	5 feet
Drill Method:	Mud Rotary	**Sampler I.D.:**	1.375 inches	**Casing I.D.:**	4 inches
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	140 pounds
Drilling Fluid:	Water	**Hammer Fall:**	30 inches	**Hammer Fall:**	30 inches

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)	Drilling & Strata Notes
	S-1	17	5 24 24 22	48	ML	Brown Clayey SILT, trace fine Sand, moist (ML)					Not enough sample for P.P/T.V tests
					GP	Gray Sandy coarse to fine GRAVEL, trace Silt, dry (GP)	L	L			
	S-2	13	27 28 45 26	> 50		Very dense, light brown to dark gray Sandy coarse to fine GRAVEL, trace Silt, dry (GP)					
5	S-3	8	9 10 8 8	18	SP	Medium dense, light brown to dark gray coarse to fine SAND, some coarse to fine Gravel, trace Silt, dry (SP)					
	S-4	1	1 2 2 3	4	GM	Very loose, light brown coarse to fine GRAVEL, some Silt, trace coarse to fine Sand, moist (GM)					Casing installed at 6 feet BGS.
	S-5	8	4 5 6 5	11		Medium dense, brown to dark brown coarse to fine GRAVEL, some coarse to fine Sand, some Silt, moist (GM)					
10	S-6	4	3 2 2 3	4		Very loose, dark brown Silty coarse to fine GRAVEL, some coarse to fine Sand, moist (GM)					Casing installed at 10 feet BGS.
15	S-7	7	5 2 5 6	7		Loose, light brown Silty coarse to fine GRAVEL, some Clay, trace coarse to fine Sand, moist (GM)					Casing installed at 15 feet BGS. Water loss encountered at 15 feet BGS.
20						Coring Rock at 20 feet BGS. See Rock Coring Log.					



In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

▼ = Water Level (if observed)
BGS = Below Ground Surface
Groundwater was not encountered within this borehole.

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

Rock Coring Log

B-03

Client:	Concept Engineering Consultants, PA	**Drilling Firm:**	Boring Brothers, Inc	**Coordinates:**	40.6424 N,-74.9066 E
Project:	Clinton Commons	**Drill Crew:**	M. Daniel / D. Osuch	**Horiz. Datum:**	WGS 84
Location:	Clinton, NJ	**Boring Start:**	9/12/2022 8:30:00 AM	**Elevation:**	Grade
Inspector:	Sidharth Nambiar	**Boring End:**	9/12/2022 12:30:00 PM	**Vert. Datum:**	N/A

Rig Model:	CME-55LC	**Casing Type:**	Steel Casing	**Core Barrel Type:**	NQ	**Core Bit Type:**	NQ - 01
Rig Type:	Track	**Casing Length:**	5 feet	**Core Barrel Length:**	5 feet	**Core Bit Length:**	3 inches
Drill Method:	Mud Rotary	**Casing I.D.:**	4 inches	**Core Barrel I.D.:**	3 inches	**Core Bit I.D.:**	1.875 inches

Depth (ft)	Avg Core Rate (min/ft)	Run No.	Recovery (in. / %)	RQD (in. / %)	Hardness	Weathering	Graphic Log	Visual Classification	Depth (ft.)	Discontinuities: Type	Dip Angle	Roughness	Weathering	Aperture	Infilling	Drilling & Strata Notes
	3.25							LIMESTONE, light gray very fine grained, slightly weathered, very close to close discontinuity spacing.								
	3.22															
	3.25	R-1	52 87%	0 0%	R3	SL		20' to 25' Highly Fractured Zone.								Water loss encountered at 22 feet BGS.
	3.28															
	3.37															
25	4.75							LIMESTONE, dark gray very fine grained, slightly weathered, very close to close discontinuity spacing.								
	5.88															
	5.77	R-2	29 48%	0 0%	R3	SL		25' to 30' Highly Fractured Zone.								
	2.383															
	7.15															
30								End of Boring at 30 feet BGS. Backfilled with soil and bentonite holeplug.								
35																

In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

▼ = Water Level (if observed) **BGS =** Below Ground Surface

Groundwater was not encountered within this borehole.

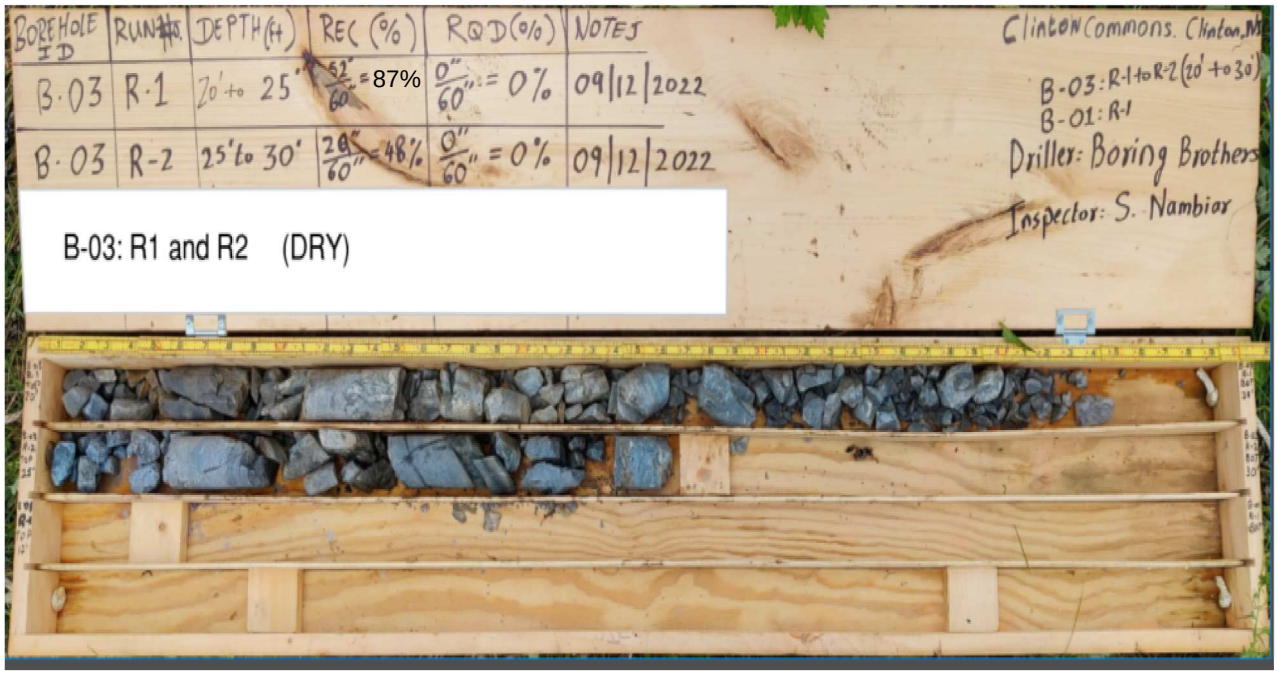


Figure B-03.1
B-03; R-1 and R-2 (dry)

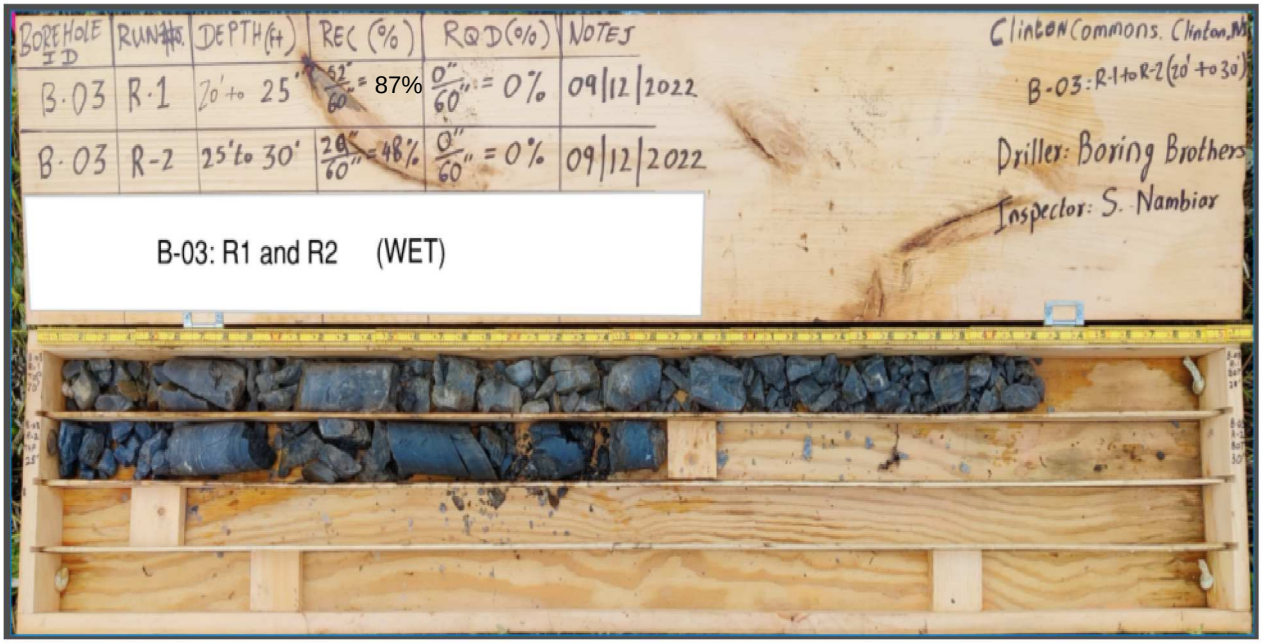


Figure B-03.2
B-03; R-1 and R-2 (wet)

Soil Boring Log

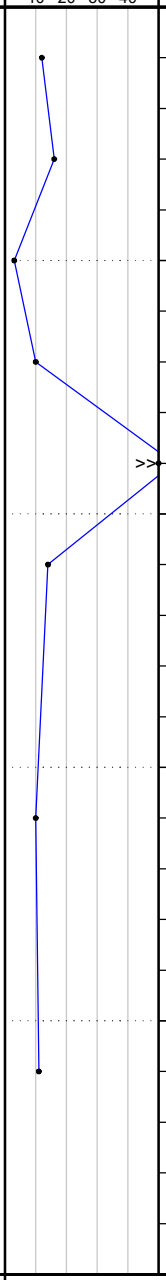
B-04

Client:	Concept Engineering Consultants, PA	**Drilling Firm:**	Boring Brothers, Inc	**Coordinates:**	40.64157 N,-74.907675 E
Project:	Clinton Commons	**Drill Crew:**	M. Daniel / D. Osuch	**Horiz. Datum:**	WGS 84
Location:	Clinton, NJ	**Boring Start:**	9/14/2022 9:45:00 AM	**Elevation:**	Grade
Inspector:	Sidharth Nambiar	**Boring End:**	9/14/2022 12:15:00 PM	**Vert. Datum:**	N/A

Rig Model:	CME-55LC	**Sampler Type:**	Split Spoon	**Casing Type:**	Steel Casing
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	5 feet
Drill Method:	Mud Rotary	**Sampler I.D.:**	1.375 inches	**Casing I.D.:**	4 inches
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	140 pounds
Drilling Fluid:	Water	**Hammer Fall:**	30 inches	**Hammer Fall:**	30 inches

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)	Drilling & Strata Notes
	S-1	10	9 3 9 10	12	ML	Dark brown SILT, some Clay, trace coarse to fine Sand, dry (ML)	L	L	0.75	1.0	
					GP	Brown to dark gray coarse to fine GRAVEL, some coarse to fine Sand, trace Silt, dry (GP)					
	S-2	10	6 10 6 3	16	ML	Very stiff, gray to brown SILT, some coarse to fine Gravel, trace Clay, dry (ML)	L	M			Not enough sample for P.P/T.V tests
5	S-3	2	2 2 1 2	3	GM	Very loose, brown to gray coarse to fine GRAVEL, some Silt, trace Clay, moist (GM)					Casing installed at 4 feet BGS.
	S-4	9	1 4 6 5	10		Loose, brown to dark brown Silty coarse to fine GRAVEL, trace coarse to fine Sand, moist (GM)					
	S-5	9	9 34 50/5"	> 50		Very dense, gray to brown coarse to fine GRAVEL, some coarse to fine Sand, some Silt, moist (GM)					Casing installed at 8 feet BGS. Weathered Rock.
10	S-6	6	10 7 7 3	14		Medium dense, gray to dark brown Silty coarse to fine GRAVEL, some coarse to fine Sand, moist (GM)					Weathered Rock.
											Roller bit drilled down to 15 feet BGS.
15	S-7	12	3 5 5 6	10	ML	Stiff, dark brown SILT, some coarse to fine Sand, trace Clay, moist (ML)	L	L	2.25	0.5	
20	S-8	18	2 4 7 13	11		Stiff, brown to dark gray Sandy coarse to fine SILT, little coarse to fine Gravel, trace Clay, moist (ML)					
						Coring Rock at 23 feet BGS. See Rock Coring Log.					

N-Value (10 20 30 40)



In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

▼ = Water Level (if observed)
BGS = Below Ground Surface
Groundwater was not encountered within this borehole.

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

Rock Coring Log

B-04

Client:	Concept Engineering Consultants, PA	**Drilling Firm:**	Boring Brothers, Inc	**Coordinates:**	40.64157 N,-74.907675 E
Project:	Clinton Commons	**Drill Crew:**	M. Daniel / D. Osuch	**Horiz. Datum:**	WGS 84
Location:	Clinton, NJ	**Boring Start:**	9/14/2022 9:45:00 AM	**Elevation:**	Grade
Inspector:	Sidharth Nambiar	**Boring End:**	9/14/2022 12:15:00 PM	**Vert. Datum:**	N/A

Rig Model:	CME-55LC	**Casing Type:**	Steel Casing	**Core Barrel Type:**	NQ	**Core Bit Type:**	NQ - 01
Rig Type:	Track	**Casing Length:**	5 feet	**Core Barrel Length:**	5 feet	**Core Bit Length:**	3 inches
Drill Method:	Mud Rotary	**Casing I.D.:**	4 inches	**Core Barrel I.D.:**	3 inches	**Core Bit I.D.:**	1.875 inches

Depth (ft)	Avg Core Rate (min/ft)	Run No.	Recovery (in. / %)	RQD (in. / %)	Hardness	Weathering	Graphic Log	Visual Classification	Depth (ft.)	Discontinuities: Type	Dip Angle	Roughness	Weathering	Aperture	Infilling	Drilling & Strata Notes
25	6.83	R-1	46 77%	17 28%	R3	SL		LIMESTONE, light gray fine grained, slightly weathered, very close to close discontinuity spacing.								Casing installed at 23 feet BGS.
	5.95								24.9	J	40	P,R	FR	VT	N	
	4.37							23' to 24.6' Fractured Zone.	25.3	J	45	P,R	FR	VT	N	
	5.85							26.1' to 26.8' Fractured Zone.	25.8	J	30	P,R	FR	T	N	
	8.52															
30	4.92	R-2	54 90%	33 55%	R4			LIMESTONE, light gray fine grained, slightly weathered, very close to close discontnuity spacing.								Casing installed at 28 feet BGS.
	2.53								28.8	J	30	P,R	FR	T	N	
	3.5								29.3	J	40	P,R	DS	T	N	
	3.37								29.9	J	20	P,R	FR	VT	N	
	3.87								30.3	J	10	P,R	FR	VT	N	
									30.8	J	20	P,R	DS	VT	N	
									32	J	50	P,R	DS	VT	N	
35								End of Boring at 33 feet BGS. Backfilled with soil and bentonite holeplug.								
40																

In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

▼ = Water Level (if observed) **BGS =** Below Ground Surface

Groundwater was not encountered within this borehole.

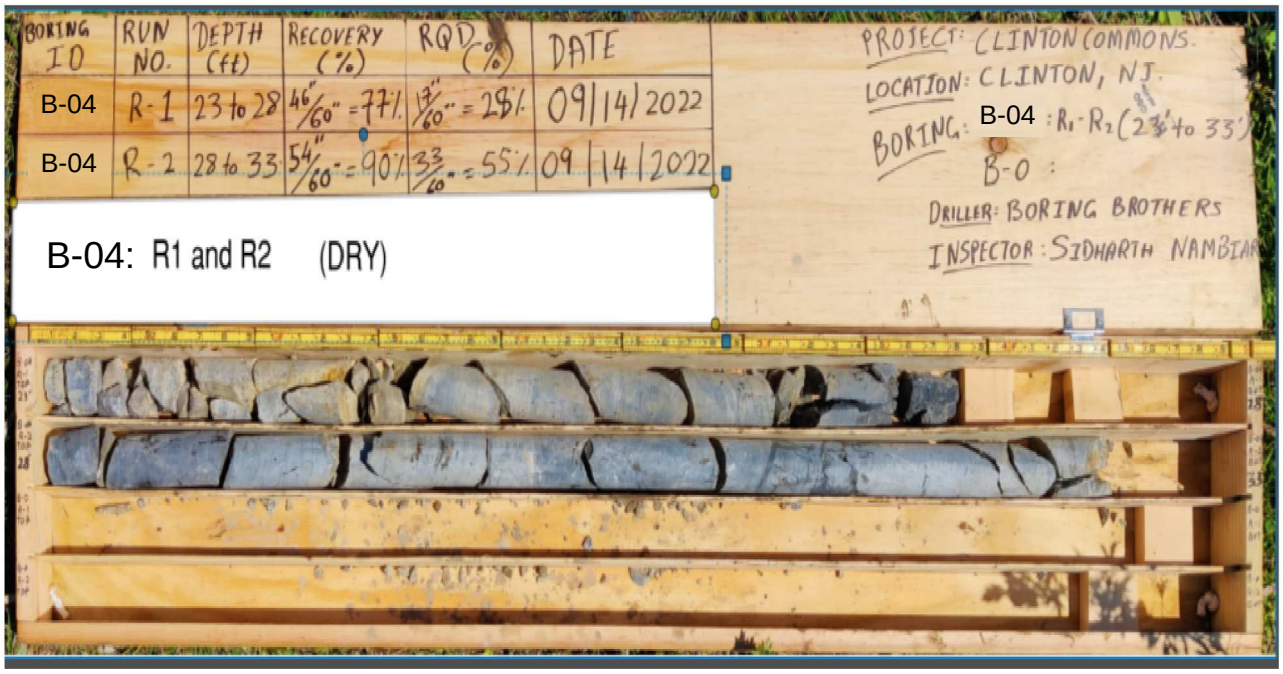


Figure B-04.1
B-04; R-1 and R-2 (dry)

Figure B-04.2
B-04; R-1 and R-2 (wet)

Soil Boring Log

B-05

Client:	Concept Engineering Consultants, PA	**Drilling Firm:**	Boring Brothers, Inc	**Coordinates:**	40.640769 N, -74.907358 E
Project:	Clinton Commons	**Drill Crew:**	Rob Dollar / Lyle Delmeir	**Horiz. Datum:**	NAD83
Location:	Clinton, NJ	**Boring Start:**	5/13/2022 12:00:00 PM	**Elevation:**	Grade
Inspector:	Michael Garcia	**Boring End:**	5/13/2022 1:45:00 PM	**Vert. Datum:**	N/A

Rig Model:	CME-55LC	**Sampler Type:**	Split Spoon	**Casing Type:**	Steel Casing
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	5 feet
Drill Method:	Mud Rotary	**Sampler I.D.:**	1.375 inches	**Casing I.D.:**	4 inches
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	140 pounds
Drilling Fluid:	Water	**Hammer Fall:**	30 inches	**Hammer Fall:**	30 inches

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Graphic Log	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)	N-Value (10 20 30 40)	Drilling & Strata Notes
	S-1	19	4 5 10 12	15	SP		Medium dense, light gray to brown medium to fine SAND, some coarse to fine Gravel, trace Silt, moist (SP)						
	S-2	20	22 30 50/4"	> 50			Medium dense, light gray medium to fine SAND, some coarse to fine Gravel, trace Silt, dry (SP)					>>	Split spoon refusal at 3.3 feet BGS. Roller bit down to 4 feet BGS. Water return was light gray. Roller bit refusal at 4 feet BGS.
							Coring Rock at 4 feet BGS See Rock Coring Log						
5													5
10													10
15													15
20													20

In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

▼ = Water Level (if observed)
BGS = Below Ground Surface
Groundwater was not encountered within this borehole.

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

Rock Coring Log

B-05

Client:	Concept Engineering Consultants, PA	**Drilling Firm:**	Boring Brothers, Inc	**Coordinates:**	40.640769 N, -74.907358 E
Project:	Clinton Commons	**Drill Crew:**	Rob Dollar / Lyle Delmeir	**Horiz. Datum:**	NAD83
Location:	Clinton, NJ	**Boring Start:**	5/13/2022 12:00:00 PM	**Elevation:**	Grade
Inspector:	Michael Garcia	**Boring End:**	5/13/2022 1:45:00 PM	**Vert. Datum:**	N/A

Rig Model:	CME-55LC	**Casing Type:**	Steel Casing	**Core Barrel Type:**	NQ	**Core Bit Type:**	NQ - 01
Rig Type:	Track	**Casing Length:**	5 feet	**Core Barrel Length:**	5 feet	**Core Bit Length:**	3 inches
Drill Method:	Mud Rotary	**Casing I.D.:**	4 inches	**Core Barrel I.D.:**	3 inches	**Core Bit I.D.:**	1.875 inches

Depth (ft)	Avg Core Rate (min/ft)	Run No.	Recovery (in. / %)	RQD (in. / %)	Hardness	Weathering	Graphic Log	Visual Classification	Depth (ft.)	Discontinuities: Type	Dip Angle	Roughness	Weathering	Aperture	Infilling	Drilling & Strata Notes
5	5.78							LIMESTONE, light gray coarse to fine grained, moderately weathered, medium strong, very close to close discontinuity spacing.								Calcite veins throughout the cores. Light gray return.
	3.75															Vertical fracture at 5.2 feet BGS.
	3.83	R-1	55 92%	24 40%	R3	M			6.35	J	44	S,R	DS	T	N	
									6.85	S	35	S,R	DS	T	N	
	3.90								7.33	J	80	S,R	DS	T	N	Vertical fracture at 7.21 feet BGS.
	5.92								8.12	J	43	S,R	DS	T	N	
10	4.72							LIMESTONE, light gray coarse to fine grained, moderately weathered, medium strong, very close to close discontinuity spacing.								Calcite veins throughout the cores. Light gray return. Vertical fracture at 9.29 feet BGS.
	4.37															
	4.43	R-2	43 72%	10 17%	R3	M			11	J	43	S,R	DS	T	N	
									11.4	J	32	S,R	DS	T	N	
	4.08															
	4.23															
15								End of Boring at 14 feet BGS. Backfilled with soil and bentonite holeplug.								
20																

In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

▼ = Water Level (if observed) **BGS =** Below Ground Surface

Groundwater was not encountered within this borehole.

Figure B-05.1

B-05; R-1 and R-2 (dry)

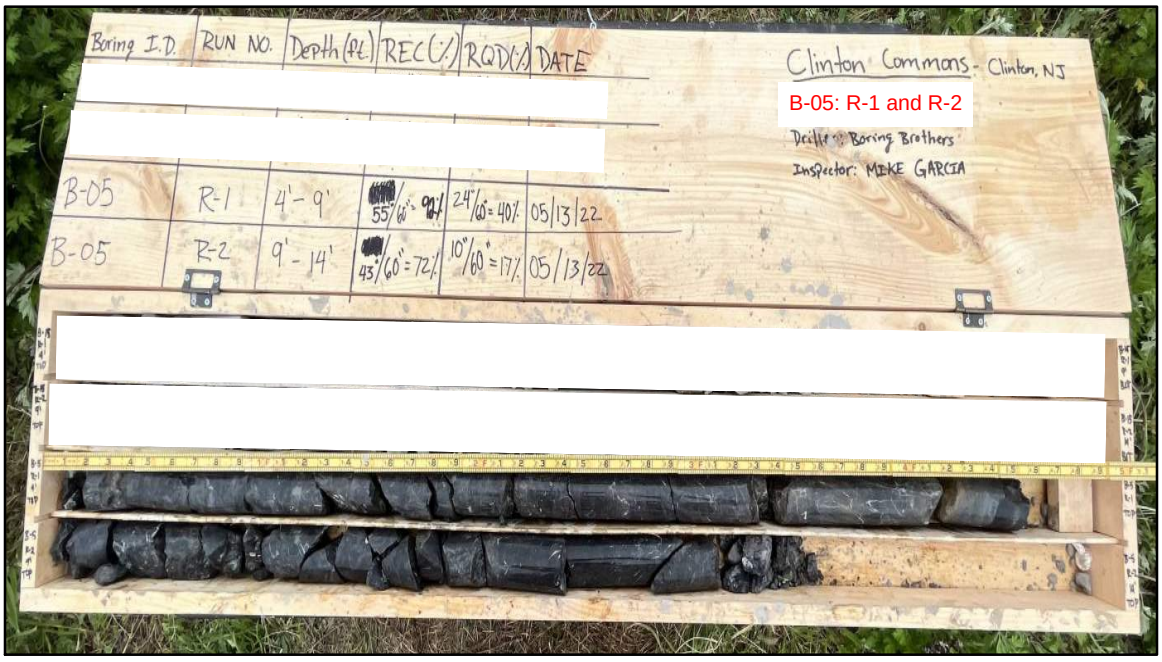


Figure B-05.2

B-05; R-1 and R-2 (wet)

Soil Boring Log

B-06

Client:	Concept Engineering Consultants, PA	**Drilling Firm:**	Boring Brothers, Inc	**Coordinates:**	40.6415 N, -74.905967 E
Project:	Clinton Commons	**Drill Crew:**	Rob Dollar / Lyle Delmeir	**Horiz. Datum:**	NAD83
Location:	Clinton, NJ	**Boring Start:**	5/12/2022 8:30:00 AM	**Elevation:**	Grade
Inspector:	Michael Garcia	**Boring End:**	5/12/2022 11:05:00 AM	**Vert. Datum:**	N/A

Rig Model:	CME-55LC	**Sampler Type:**	Split Spoon	**Casing Type:**	Steel Casing
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	5 feet
Drill Method:	Mud Rotary	**Sampler I.D.:**	1.375 inches	**Casing I.D.:**	4 inches
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	140 pounds
Drilling Fluid:	Water	**Hammer Fall:**	30 inches	**Hammer Fall:**	30 inches

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Graphic Log	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)	N-Value (10 20 30 40)	Drilling & Strata Notes
	S-1	12	2 4 2 2	6	SP		Loose, dark brown medium to fine SAND, trace Silt, dry (SP)						
	S-2	15	2 3 3 4	6	CL		Medium stiff light brown CLAY, some fine Sand, some Silt, dry (CL)						
5	S-3	13	4 4 3 3	7			Medium stiff light brown CLAY, some fine Sand, some Silt, dry (CL)						
	S-4	12	4 6 50/5"	> 50			Stiff light brown CLAY, some Silt, trace fine Sand, moist (CL)					>>	Casing installed to 7 feet BGS.
	S-5	3	50/3"	> 50	GP		Very dense light to dark gray coarse GRAVEL, moist (GP)					>>	Split spoon refusal at 8.25 feet BGS.
10							Coring Rock at 10 feet BGS See Rock Coring Log						Roller bit down to 10 feet BGS. Water return was light gray. Roller bit refusal at 10 feet BGS.
15													
20													

In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

▼ = Water Level (if observed)
BGS = Below Ground Surface
Groundwater was not encountered within this borehole.

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

Rock Coring Log

B-06

Client:	Concept Engineering Consultants, PA	**Drilling Firm:**	Boring Brothers, Inc	**Coordinates:**	40.6415 N, -74.905967 E
Project:	Clinton Commons	**Drill Crew:**	Rob Dollar / Lyle Delmeir	**Horiz. Datum:**	NAD83
Location:	Clinton, NJ	**Boring Start:**	5/12/2022 8:30:00 AM	**Elevation:**	Grade
Inspector:	Michael Garcia	**Boring End:**	5/12/2022 11:05:00 AM	**Vert. Datum:**	N/A

Rig Model:	CME-55LC	**Casing Type:**	Steel Casing	**Core Barrel Type:**	NQ	**Core Bit Type:**	NQ - 01
Rig Type:	Track	**Casing Length:**	5 feet	**Core Barrel Length:**	5 feet	**Core Bit Length:**	3 inches
Drill Method:	Mud Rotary	**Casing I.D.:**	4 inches	**Core Barrel I.D.:**	3 inches	**Core Bit I.D.:**	1.875 inches

Depth (ft)	Avg Core Rate (min/ft)	Run No.	Recovery (in. / %)	RQD (in. / %)	Hardness	Weathering	Graphic Log	Visual Classification
	3.10							LIMESTONE, light to dark gray, coarse to fine grained, moderately weathered, weak, very close discontinuity spacing.
	3.23							
	4.00	R-1	60 100%	27 45%	R3	M		
	3.73							
	3.92							
15								
	3.00							LIMESTONE, light gray, coarse to medium grained, moderately weathered, medium strong, very close discontinuity spacing.
	3.25							
	2.80	R-2	60 100%	58 97%	R3	M		
	3.67							
	5.92							
20								
	2.88							LIMESTONE, light gray, coarse to medium grained, moderately weathered, medium strong, very close discontinuity spacing.
	4.08							
	5.25	R-3	60 100%	52 87%	R3	M		
	5							
	5.93							
25								
	3.77							LIMESTONE, light gray, coarse to medium grained, moderately weathered, medium strong, very close discontinuity spacing.
	3.67							
	5.87	R-4	60 100%	56 93%	R3	M		
	6.72							
	7							

Depth (ft.)	Discontinuities: Type	Dip Angle	Roughness	Weathering	Aperture	Infilling	Drilling & Strata Notes
							Calcite veins throughout the cores. Light gray return.
							Vertical fracture at 10.7 feet BGS.
11.75	J	68	S,R	DS	T	N	
12	J	64	S,R	DS	T	N	
12.8	S	78	S,R	DS	T	N	
13.4	S	55	S,R	DS	T	N	
14.3	J	60	S,R	DS	T	N	Vertical fracture at 14.25 feet BGS.
15	J	55	S,R	DS	T	N	
							Calcite veins throughout the cores. Light gray return.
15.81	S	71	S,R	DS	T	N	
17.08	J	40	S,R	DS	T	N	Vertical fracture at 17.05 feet BGS.
17.75	J	44	S,R	DS	T	N	
18.25	J	58	S,R	DS	T	N	
18.65	J	60	S,R	DS	T	N	
							Iron stains throughout the cores. Calcite veins throughout the cores. Light gray return.
20.8	S	40	S,R	DS	T	N	Vertical fracture at 20.08 feet BGS.
21.19	J	65	S,R	DS	T	N	
22.65	J	40	S,R	DS	T	N	
23.3	J	45	S,R	DS	T	N	
24.01	J	35	S,R	DS	T	N	Vertical fracture at 24.1 feet BGS.
25	J	33	S,R	DS	T	N	
							Calcite veins throughout the cores. Light gray return.
26.01	J	52	S,R	DS	T	N	
26.22	J	61	S,R	DS	T	N	
28.2	J	33	S,R	DS	T	N	

In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

▼ = Water Level (if observed) **BGS =** Below Ground Surface

Groundwater was not encountered within this borehole.

Borehole camera was attempted, but unable to see due to color of water in the borehole.

Rock Coring Log

B-06
(Continued)

Client:	Concept Engineering Consultants, PA	**Drilling Firm:**	Boring Brothers, Inc	**Coordinates:**	40.6415 N, -74.905967 E
Project:	Clinton Commons	**Drill Crew:**	Rob Dollar / Lyle Delmeir	**Horiz. Datum:**	NAD83
Location:	Clinton, NJ	**Boring Start:**	5/12/2022 8:30:00 AM	**Elevation:**	Grade
Inspector:	Michael Garcia	**Boring End:**	5/12/2022 11:05:00 AM	**Vert. Datum:**	N/A

Depth (ft)	Avg Core Rate (min/ft)	Run No.	Recovery (in. / %)	RQD (in. / %)	Hardness	Weathering	Graphic Log	Visual Classification	Depth (ft.)	Discontinuities: Type	Dip Angle	Roughness	Weathering	Aperture	Infilling	Drilling & Strata Notes
	3.27							LIMESTONE, light gray, coarse to medium grained, moderately weathered, medium strong, very close discontinuity spacing.	30	J	60	P,R	DS	VT	N	Calcite veins throughout the cores. Light gray return.
									30.5	J	40	P,R	DS	VT	N	
	3.42															
	3.52	R-5	60 100%	34 57%	R3	M										
	3.32							31.3' to 34.4' Fractured Rock.								
									33.75	J	60	S,R	DS	T	N	
									34.1	J	50	S,R	DS	T	N	
	3.5								34.45	J	30	S,R	DS	T	N	
35									35	J	40	S,R	DS	T	N	
	3.15							LIMESTONE, light gray, coarse to medium grained, moderately weathered, medium strong, very close discontinuity spacing.	35.5	S	50	S,R	DS	T	N	Calcite veins throughout the cores. Light gray return.
	2.63															
	3.50	R-6	59 98%	49 82%	R3	M			37.75	J	50	S,R	DS	T	N	
	4.17								38.4	J	30	S,R	DS	T	N	
	4.07															
40								End of Boring at 40 feet BGS. Backfilled with soil and bentonite holeplug.								
45																
50																

In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

▼ = Water Level (if observed) **BGS =** Below Ground Surface

Groundwater was not encountered within this borehole.

Figure B-06.1
B-06; R-1, R-2, R-3 and R-4 (dry)

Figure B-06.2
B-06; R-1, R-2, R-3 and R-4 (wet)

Figure B-06.3
B-06; R-5 and R-6 (dry)

Figure B-06.4
B-06; R-5 and R-6 (wet)

Soil Boring Log

B-07

Client:	Concept Engineering Consultants, PA	**Drilling Firm:**	Boring Brothers, Inc	**Coordinates:**	40.64176389 N,-74.9069028 E
Project:	Clinton Commons	**Drill Crew:**	M. Daniel / D. Osuch	**Horiz. Datum:**	WGS 84
Location:	Clinton, NJ	**Boring Start:**	9/14/2022 1:00:00 PM	**Elevation:**	Grade
Inspector:	Sidharth Nambiar	**Boring End:**	9/14/2022 3:30:00 PM	**Vert. Datum:**	N/A

Rig Model:	CME-55LC	**Sampler Type:**	Split Spoon	**Casing Type:**	Steel Casing
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	5 feet
Drill Method:	Mud Rotary	**Sampler I.D.:**	1.375 inches	**Casing I.D.:**	4 inches
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	140 pounds
Drilling Fluid:	Water	**Hammer Fall:**	30 inches	**Hammer Fall:**	30 inches

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Graphic Log	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)	N-Value (10 20 30 40)	Drilling & Strata Notes
					ML		Brown SILT, trace coarse to fine Sand, dry (ML)						6" Topsoil.
	S-1	10	4 24 38 40	> 50	SP		Gray Gravelly coarse to fine SAND, some Silt, dry (SP)					>>	
	S-2	10	23 16 22 50/5"	> 50			Very dense, gray coarse to fine SAND, some coarse to fine Gravel, some Silt, dry (SP)					>>	
	S-3	0	50/2"	> 50			No recovery.					>>	Casing installed at 4 feet BGS.
5							Coring Rock at 5 feet BGS. See Rock Coring Log.						
10													
15													
20													

In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

▼ = Water Level (if observed)
BGS = Below Ground Surface
Groundwater was not encountered within this borehole.

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

Rock Coring Log

B-07

Client:	Concept Engineering Consultants, PA	**Drilling Firm:**	Boring Brothers, Inc	**Coordinates:**	40.64176389 N,-74.9069028 E
Project:	Clinton Commons	**Drill Crew:**	M. Daniel / D. Osuch	**Horiz. Datum:**	WGS 84
Location:	Clinton, NJ	**Boring Start:**	9/14/2022 1:00:00 PM	**Elevation:**	Grade
Inspector:	Sidharth Nambiar	**Boring End:**	9/14/2022 3:30:00 PM	**Vert. Datum:**	N/A

Rig Model:	CME-55LC	**Casing Type:**	Steel Casing	**Core Barrel Type:**	NQ	**Core Bit Type:**	NQ - 01
Rig Type:	Track	**Casing Length:**	5 feet	**Core Barrel Length:**	5 feet	**Core Bit Length:**	3 inches
Drill Method:	Mud Rotary	**Casing I.D.:**	4 inches	**Core Barrel I.D.:**	3 inches	**Core Bit I.D.:**	1.875 inches

Depth (ft)	Avg Core Rate (min/ft)	Run No.	Recovery (in. / %)	RQD (in. / %)	Hardness	Weathering	Graphic Log	Visual Classification	Depth (ft.)	Discontinuities: Type	Dip Angle	Roughness	Weathering	Aperture	Infilling	Drilling & Strata Notes
	2.48							LIMESTONE, light gray fine grained, slightly weathered, very close to close discontinuity spacing.								Casing installed at 5 feet BGS.
	2.63															
	4.2	R-1	24 40%	0 0%	R3	SL										
	4.13							5' to 10' Fractured Zone.								
	4.97															
10	3.93							LIMESTONE, light gray fine grained, slightly weathered, very close to close discontinuity spacing.								
	5.18															
	6.87	R-2	8 13%	0 0%												
	5.7							10' to 15' Fractured Zone.								
	6.03															
15								End of Boring at 15 feet BGS. Backfilled with soil and bentonite holeplug.								
20																

In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

▼ = Water Level (if observed) **BGS =** Below Ground Surface

Groundwater was not encountered within this borehole.

Figure B-07.1
B-07; R-1 and R-2 (dry)

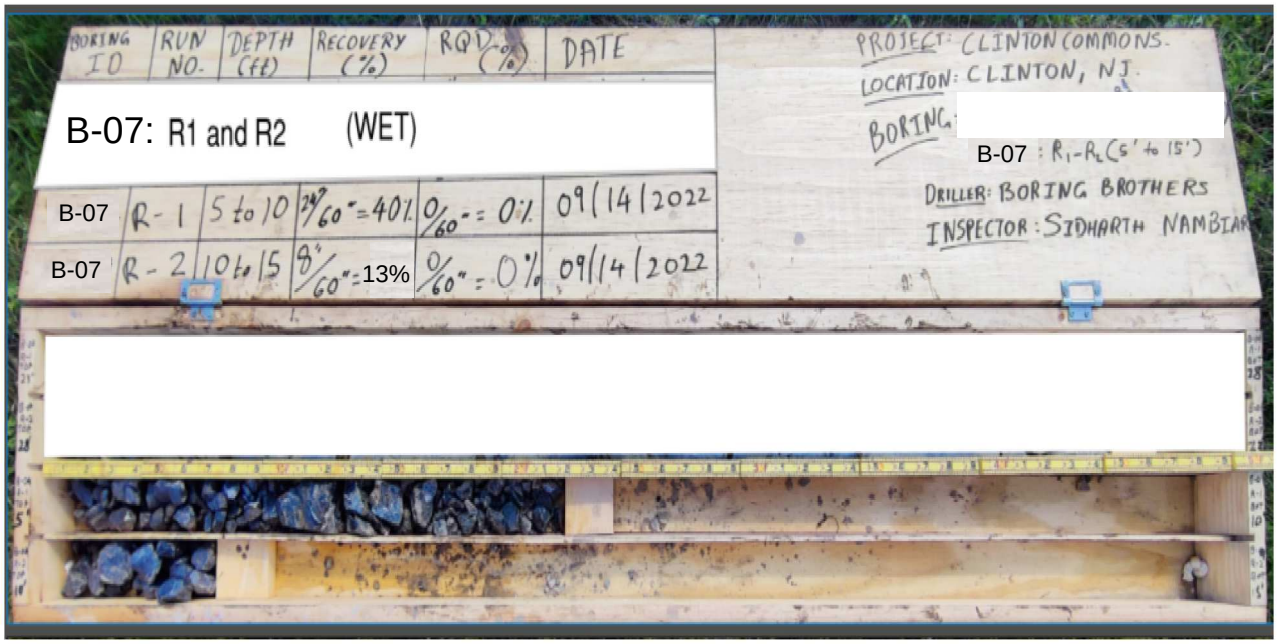


Figure B-07.2
B-07; R-1 and R-2 (wet)

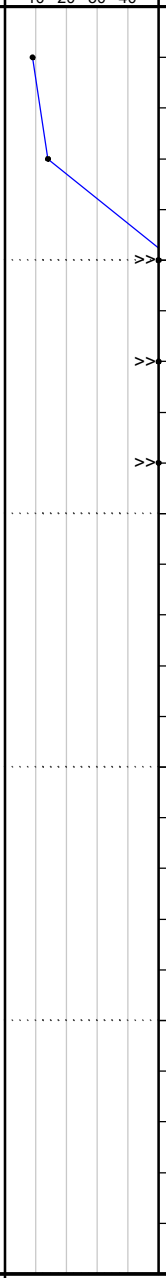
Soil Boring Log

B-08

Client:	Concept Engineering Consultants, PA	**Drilling Firm:**	Boring Brothers, Inc	**Coordinates:**	40.642431 N, -74.905622 E
Project:	Clinton Commons	**Drill Crew:**	Rob Dollar / Lyle Delmeir	**Horiz. Datum:**	NAD83
Location:	Clinton, NJ	**Boring Start:**	5/11/2022 8:30:00 AM	**Elevation:**	Grade
Inspector:	Michael Garcia	**Boring End:**	5/11/2022 11:00:00 AM	**Vert. Datum:**	N/A

Rig Model:	CME-55LC	**Sampler Type:**	Split Spoon	**Casing Type:**	Steel Casing
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	5 feet
Drill Method:	Mud Rotary	**Sampler I.D.:**	1.375 inches	**Casing I.D.:**	4 inches
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	140 pounds
Drilling Fluid:	Water	**Hammer Fall:**	30 inches	**Hammer Fall:**	30 inches

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Graphic Log	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)
	S-1	16	4 4 5 2	9	SP		Loose, light to darkish brown coarse to medium SAND, trace Silt, dry (SP)				
	S-2	18	5 6 8 5	14			Medium dense, light brown coarse to medium SAND, trace Silt, dry (SP)				
5	S-3	16	10 15 52 38	> 50	GP		Very dense, light gray coarse to fine GRAVEL, some medium to fine Sand, trace Silt, dry (GP)				
	S-4	15	20 31 54 58	> 50			Very dense, light gray coarse to fine GRAVEL, some medium to fine Sand, trace Silt, dry (GP)				
	S-5	2.5	50/5"	> 50			Very dense, light gray coarse to fine GRAVEL, some medium to fine Sand, trace Silt, wet (GP)				
10							Coring Rock at 10 feet BGS See Rock Coring Log				
15											
20											



Drilling & Strata Notes

Casing installed to 7 feet BGS.

Split spoon refusal at 8 feet BGS. Gravel at the tip of the split-spoon

Roller bit refusal at 10 feet BGS.

In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

▼ = Water Level (if observed)
BGS = Below Ground Surface
Groundwater was not encountered within this borehole.

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

Rock Coring Log

B-08

Client:	Concept Engineering Consultants, PA	**Drilling Firm:**	Boring Brothers, Inc	**Coordinates:**	40.642431 N, -74.905622 E
Project:	Clinton Commons	**Drill Crew:**	Rob Dollar / Lyle Delmeir	**Horiz. Datum:**	NAD83
Location:	Clinton, NJ	**Boring Start:**	5/11/2022 8:30:00 AM	**Elevation:**	Grade
Inspector:	Michael Garcia	**Boring End:**	5/11/2022 11:00:00 AM	**Vert. Datum:**	N/A

Rig Model:	CME-55LC	**Casing Type:**	Steel Casing	**Core Barrel Type:**	NQ	**Core Bit Type:**	NQ - 01
Rig Type:	Track	**Casing Length:**	5 feet	**Core Barrel Length:**	5 feet	**Core Bit Length:**	3 inches
Drill Method:	Mud Rotary	**Casing I.D.:**	4 inches	**Core Barrel I.D.:**	3 inches	**Core Bit I.D.:**	1.875 inches

Depth (ft)	Avg Core Rate (min/ft)	Run No.	Recovery (in. / %)	RQD (in. / %)	Hardness	Weathering	Graphic Log	Visual Classification	Depth (ft.)	Discontinuities: Type	Dip Angle	Roughness	Weathering	Aperture	Infilling	Drilling & Strata Notes
	1.5							LIMESTONE, light to dark gray medium to fine grained, moderately weathered, medium strong, very close to close discontinuity spacing.								Calcite veins throughout the cores. Water at 10 feet BGS and returned back at 18 feet BGS. Light gray return.
	2.63															
	3.67	R-1	60 100%	4.5 7.5%	R3	M										
	3.72							10' to 14.3' Fractured Rock.								
	11.5								14.17	J	20	S,R	DS	T	N	
15																
	1.42							LIMESTONE, light to dark gray medium to fine grained, moderately weathered, medium strong, very close to close discontinuity spacing.	15.65	J	10	P,R	DS	T	N	Calcite veins throughout the cores. Gray water return.
	3.45								16.25	J	25	S,R	DS	T	N	
	3.03	R-2	58 97%	21 35%	R3	M			17.35	J	44	S,R	DS	T	N	
	3.58							18' to 20' Fractured Rock.								
	7.58															
20								End of Boring at 20 feet BGS. Backfilled with soil and bentonite holeplug.								
25																

In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

▼ = Water Level (if observed) **BGS =** Below Ground Surface

Groundwater was not encountered within this borehole.

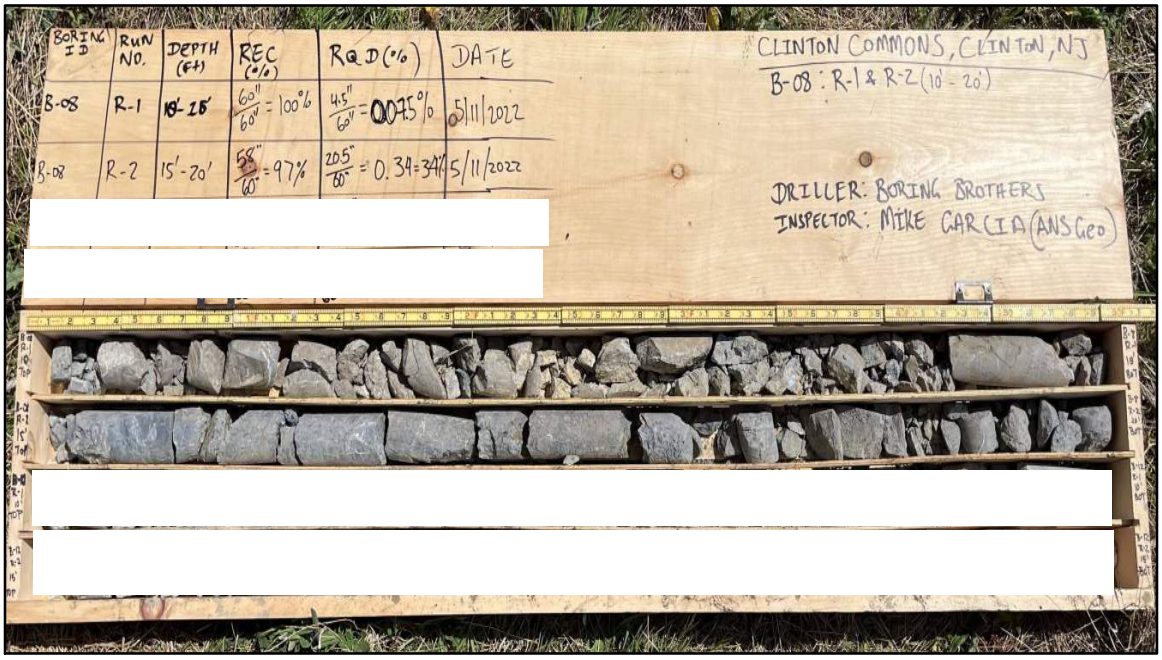


Figure B-08.1
B-08; R-1 and R-2 (dry)

Figure B-08.2
B-08; R-1 and R-2 (wet)

Soil Boring Log

B-09

Client:	Concept Engineering Consultants, PA	**Drilling Firm:**	Boring Brothers, Inc	**Coordinates:**	40.641261 N,-74.9068861 E
Project:	Clinton Commons	**Drill Crew:**	R. Dollar / L. Delmeir	**Horiz. Datum:**	WGS 84
Location:	Clinton, NJ	**Boring Start:**	9/20/2022 12:45:00 PM	**Elevation:**	Grade
Inspector:	Sidharth Nambiar	**Boring End:**	9/20/2022 2:10:00 PM	**Vert. Datum:**	N/A

Rig Model:	CME-55LC	**Sampler Type:**	Split Spoon	**Casing Type:**	Steel Casing
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	5 feet
Drill Method:	Mud Rotary	**Sampler I.D.:**	1.375 inches	**Casing I.D.:**	4 inches
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	140 pounds
Drilling Fluid:	Water	**Hammer Fall:**	30 inches	**Hammer Fall:**	30 inches

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Graphic Log	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)	N-Value (10 20 30 40)	Drilling & Strata Notes
	S-1		7 35 45 50/3"	> 50	SM		Very dense, light brown to brown coarse to fine SAND, some Silt, little coarse to fine Gravel, dry, (SM)					>>	
	S-2		50/0"	> 50			No recovery.					>>	Casing installed at 2 feet BGS.
							Coring Rock at 3 feet BGS. See Rock Coring Log.						
5												5	
10												10	
15												15	
20												20	

In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

▼ = Water Level (if observed)
BGS = Below Ground Surface
Groundwater was not encountered within this borehole.

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

Rock Coring Log

B-09

Client:	Concept Engineering Consultants, PA	**Drilling Firm:**	Boring Brothers, Inc	**Coordinates:**	40.641261 N,-74.9068861 E
Project:	Clinton Commons	**Drill Crew:**	R. Dollar / L. Delmeir	**Horiz. Datum:**	WGS 84
Location:	Clinton, NJ	**Boring Start:**	9/20/2022 12:45:00 PM	**Elevation:**	Grade
Inspector:	Sidharth Nambiar	**Boring End:**	9/20/2022 2:10:00 PM	**Vert. Datum:**	N/A

Rig Model:	CME-55LC	**Casing Type:**	Steel Casing	**Core Barrel Type:**	NQ	**Core Bit Type:**	NQ - 01
Rig Type:	Track	**Casing Length:**	5 feet	**Core Barrel Length:**	5 feet	**Core Bit Length:**	3 inches
Drill Method:	Mud Rotary	**Casing I.D.:**	4 inches	**Core Barrel I.D.:**	3 inches	**Core Bit I.D.:**	1.875 inches

Depth (ft)	Avg Core Rate (min/ft)	Run No.	Recovery (in. / %)	RQD (in. / %)	Hardness	Weathering	Graphic Log	Visual Classification	Depth (ft.)	Discontinuities: Type	Dip Angle	Roughness	Weathering	Aperture	Infilling	Drilling & Strata Notes
	3.1							LIMESTONE, light gray fine grained, slightly weathered, very close discontinuity spacing.	3.7	J	40	P,R	FR	VT	N	
	1.68								4.5	J	55	P,R	FR	VT	N	
5	1.383	R-1	35 58%	12 20%	R3	SL		5.1' to 5.9' Fractured Zone.								
	2.25															
	4.97															
	5.07							LIMESTONE, light gray fine grained, slightly weathered, very close to close discontinuity spacing.	8.6	J	30	P,R	DS	VT	N	
	2.17															
10	3.07	R-2	48 80%	6 10%	R3	SL		8.6' to 13' Fractured Zone.								
	3.75															
	4.35															
								End of Boring at 13 feet BGS. Backfilled with soil and bentonite holeplug.								
15																
20																

In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

▼ = Water Level (if observed) **BGS =** Below Ground Surface

Groundwater was not encountered within this borehole.

Figure B-09.1
B-09; R-1 and R-2 (dry)

Figure B-09.2
B-09; R-1 and R-2 (wet)

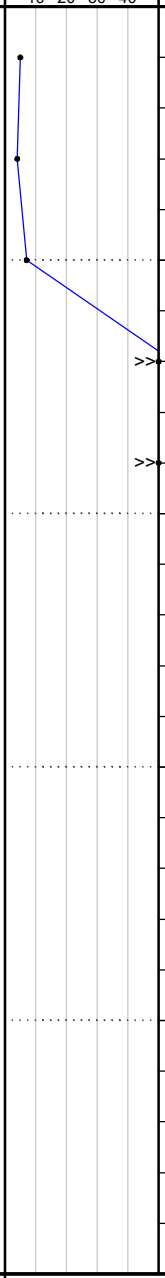
Soil Boring Log

B-10

Client:	Concept Engineering Consultants, PA	**Drilling Firm:**	Boring Brothers, Inc	**Coordinates:**	40.641403 N, -74.906431 E
Project:	Clinton Commons	**Drill Crew:**	Rob Dollar / Lyle Delmeir	**Horiz. Datum:**	NAD83
Location:	Clinton, NJ	**Boring Start:**	5/11/2022 1:00:00 PM	**Elevation:**	Grade
Inspector:	Michael Garcia	**Boring End:**	5/11/2022 2:30:00 PM	**Vert. Datum:**	N/A

Rig Model:	CME-55LC	**Sampler Type:**	Split Spoon	**Casing Type:**	Steel Casing
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	5 feet
Drill Method:	Mud Rotary	**Sampler I.D.:**	1.375 inches	**Casing I.D.:**	4 inches
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	140 pounds
Drilling Fluid:	Water	**Hammer Fall:**	30 inches	**Hammer Fall:**	30 inches

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)	Drilling & Strata Notes
	S-1	19	2 4 1 2	5	SC	Loose, light brown SAND, some Clay, trace Silt, moist (SC)					
	S-2	16	2 1 3 2	4	CL	Soft, light brown CLAY, some medium to fine Sand, trace Silt, moist (CL)					
5	S-3	10	4 4 3 1	7	SP	Loose, light gray to brown, [grain size] SAND, some [grain size] Gravel, trace Clay, trace Silt, moist (SP)					
	S-4	5	50/4"	> 50	GP	Very dense light gray coarse to fine GRAVEL, trace medium to fine Sand, trace Silt, trace Clay, moist (GP)					Casing installed to 7 feet BGS.
	S-5	3	50/1"	> 50	GP	Very dense light gray coarse to fine GRAVEL, trace Silt, wet (GP)					Roller bit down to 8 feet BGS. Rig chatter from 8 to 9 feet BGS.
10						Coring Rock at 10 feet BGS See Rock Coring Log					Roller bit down to 10 feet BGS. Split spoon refusal at 10 feet BGS. Light gray water return. Roller bit refusal at 10 feet BGS.
15											
20											



In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

▼ = Water Level (if observed)
BGS = Below Ground Surface
Groundwater was not encountered within this borehole.

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

Rock Coring Log

B-10

Client:	Concept Engineering Consultants, PA	**Drilling Firm:**	Boring Brothers, Inc	**Coordinates:**	40.641403 N, -74.906431 E
Project:	Clinton Commons	**Drill Crew:**	Rob Dollar / Lyle Delmeir	**Horiz. Datum:**	NAD83
Location:	Clinton, NJ	**Boring Start:**	5/11/2022 1:00:00 PM	**Elevation:**	Grade
Inspector:	Michael Garcia	**Boring End:**	5/11/2022 2:30:00 PM	**Vert. Datum:**	N/A

Rig Model:	CME-55LC	**Casing Type:**	Steel Casing	**Core Barrel Type:**	NQ	**Core Bit Type:**	NQ - 01
Rig Type:	Track	**Casing Length:**	5 feet	**Core Barrel Length:**	5 feet	**Core Bit Length:**	3 inches
Drill Method:	Mud Rotary	**Casing I.D.:**	4 inches	**Core Barrel I.D.:**	3 inches	**Core Bit I.D.:**	1.875 inches

Depth (ft)	Avg Core Rate (min/ft)	Run No.	Recovery (in. / %)	RQD (in. / %)	Hardness	Weathering	Graphic Log	Visual Classification	Depth (ft.)	Discontinuities: Type	Dip Angle	Roughness	Weathering	Aperture	Infilling	Drilling & Strata Notes
	3.07							LIMESTONE, light gray, coarse to fine grained, moderately weathered, medium strong, very close to close discontinuity spacing.	10.55	S	47	S,R	DS	T	N	Calcite veins throughout the cores. Return was light gray.
	3.50								11.1	S	40	S,R	DS	T	N	
	3.77	R-1	42 70%	16 27%	R3	M		11.8' Fractured Rock.								
	4.85															
	5.17															
15									15	S	35	S,R	DS	T	N	
	3.40							LIMESTONE, light gray, coarse to fine grained, moderately weathered, medium strong, very close to close discontinuity spacing.								Calcite veins throughout the cores. Return was light gray.
	3.48								16.5	J	40	S,R	DS	T	N	
	3.58	R-2	58 97%	42 70%	R3	M			17.5	S	74	S,R	DS	T	N	Vertical fracture at 17.1 feet BGS.
	5.36								18.25	S	34	S,R	DS	T	N	
	5.73															
20								End of Boring at 20 feet BGS. Backfilled with soil and bentonite holeplug.								
25																

In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

▼ = Water Level (if observed) **BGS =** Below Ground Surface

Groundwater was not encountered within this borehole.

Figure B-10.1

B-10; R-1 and R-2 (dry)

Figure B-10.2

B-10; R-1 and R-2 (wet)

Soil Boring Log

B-12

Client:	Concept Engineering Consultants, PA	**Drilling Firm:**	Boring Brothers, Inc	**Coordinates:**	40.641903 N, -74.905997 E
Project:	Clinton Commons	**Drill Crew:**	Rob Dollar / Lyle Delmeir	**Horiz. Datum:**	NAD83
Location:	Clinton, NJ	**Boring Start:**	5/12/2022 11:15:00 AM	**Elevation:**	Grade
Inspector:	Michael Garcia	**Boring End:**	5/12/2022 2:30:00 PM	**Vert. Datum:**	N/A

Rig Model:	CME-55LC	**Sampler Type:**	Split Spoon	**Casing Type:**	Steel Casing
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	5 feet
Drill Method:	Mud Rotary	**Sampler I.D.:**	1.375 inches	**Casing I.D.:**	4 inches
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	140 pounds
Drilling Fluid:	Water	**Hammer Fall:**	30 inches	**Hammer Fall:**	30 inches

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Graphic Log	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)	Drilling & Strata Notes
	S-1	16	8 9 7 10	16			Medium dense, light gray to brown coarse to fine GRAVEL, some fine Sand, trace Silt, dry (GP)					
	S-2	19	11 10 12 18	22			Medium dense, light gray to brown coarse to fine GRAVEL, some fine Sand, trace Silt, dry (GP)					
5	S-3	20	11 14 21 34	35	GP		Dense, light gray to brown coarse to fine GRAVEL, some fine Sand, trace Silt, dry (GP)					
	S-4	11	50/5"	> 50			Very dense, light gray coarse to fine GRAVEL, some fine Sand, trace Silt, dry (GP)					Casing installed to 7 feet BGS.
	S-5	0	50/0"	> 50			Split Spoon refusal at 8 feet BGS.					SPT refusal at 8 feet BGS. Light gray water return.
10							Coring Rock at 10 feet BGS See Rock Coring Log					Roller bit refusal at 10 feet BGS.
15												
20												

N-Value: 10 20 30 40

In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

▼ = Water Level (if observed)
BGS = Below Ground Surface
Groundwater was not encountered within this borehole.

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

Rock Coring Log

B-12

Client:	Concept Engineering Consultants, PA	**Drilling Firm:**	Boring Brothers, Inc	**Coordinates:**	40.641903 N, -74.905997 E
Project:	Clinton Commons	**Drill Crew:**	Rob Dollar / Lyle Delmeir	**Horiz. Datum:**	NAD83
Location:	Clinton, NJ	**Boring Start:**	5/12/2022 11:15:00 AM	**Elevation:**	Grade
Inspector:	Michael Garcia	**Boring End:**	5/12/2022 2:30:00 PM	**Vert. Datum:**	N/A

Rig Model:	CME-55LC	**Casing Type:**	Steel Casing	**Core Barrel Type:**	NQ	**Core Bit Type:**	NQ - 01
Rig Type:	Track	**Casing Length:**	5 feet	**Core Barrel Length:**	5 feet	**Core Bit Length:**	3 inches
Drill Method:	Mud Rotary	**Casing I.D.:**	4 inches	**Core Barrel I.D.:**	3 inches	**Core Bit I.D.:**	1.875 inches

Depth (ft)	Avg Core Rate (min/ft)	Run No.	Recovery (in. / %)	RQD (in. / %)	Hardness	Weathering	Graphic Log	Visual Classification	Depth (ft.)	Discontinuities: Type	Dip Angle	Roughness	Weathering	Aperture	Infilling	Drilling & Strata Notes
	6.17							LIMESTONE, light gray, coarse to fine grained, moderately weathered, medium strong, very close to close discontinuity spacing.	10.8	J	41	S,R	DS	T	N	
	10.50															Calcite veins throughout the cores. Vertical fracture at 11.5 feet BGS. Light gray return.
	5.83	R-1	43 72%	17 28%	R3	M			12.2	J	35	S,R	DS	T	N	
	9.50							10' to 12.3' Fractured Rock.	13	J	44	S,R	DS	T	N	
	9.00															
15	5.43							LIMESTONE, light gray, coarse to fine grained, moderately weathered, medium strong, very close to close discontinuity spacing.								Calcite veins throughout the cores. Light gray return.
	11.15															
	6.28	R-2	40 67%	5 8%	R3	M		Fractured Rock.	17.7	J	10	S,R	DS	T	N	
	7.77															
	6.33															
20								End of Boring at 20 feet BGS. Backfilled with soil and bentonite holeplug.								
25																

In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

▼ = Water Level (if observed) **BGS =** Below Ground Surface

Groundwater was not encountered within this borehole.

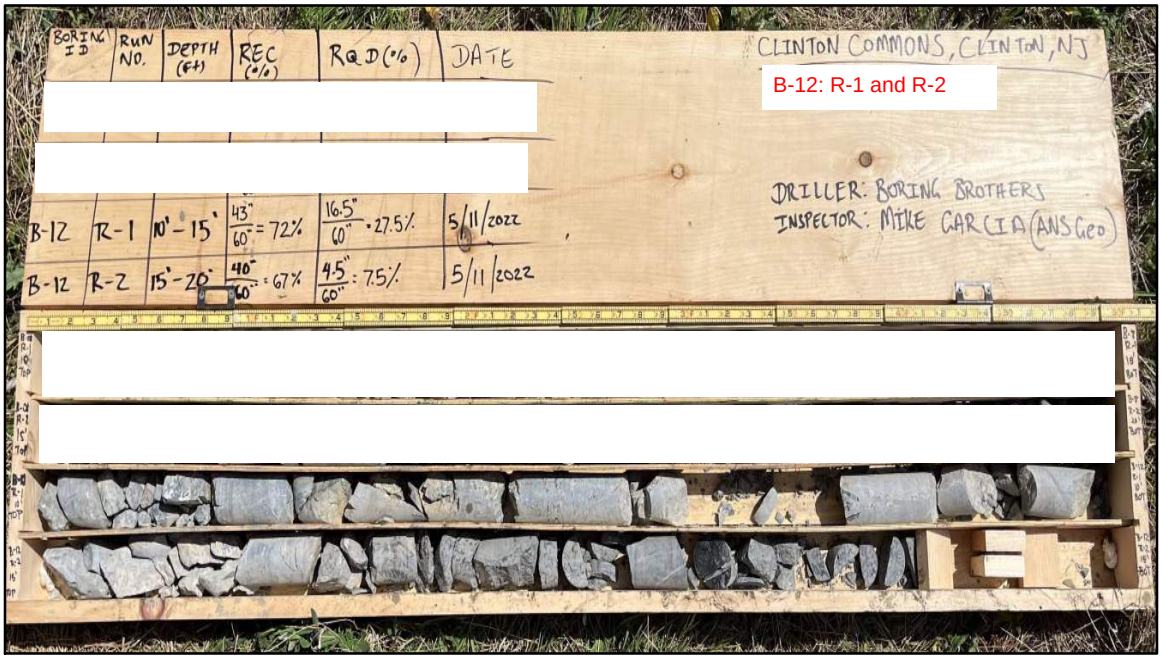


Figure B-12.1

B-12; R-1 and R-2 (dry)

Figure B-12.2

B-12; R-1 and R-2 (wet)

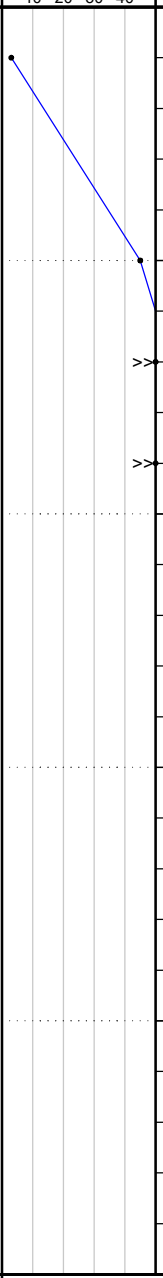
Soil Boring Log

B-13

Client:	Concept Engineering Consultants, PA	**Drilling Firm:**	Boring Brothers, Inc	**Coordinates:**	40.64118056 N,-74.9077639 E
Project:	Clinton Commons	**Drill Crew:**	R. Dollar / L. Delmeir	**Horiz. Datum:**	WGS 84
Location:	Clinton, NJ	**Boring Start:**	9/20/2022 9:00:00 AM	**Elevation:**	Grade
Inspector:	Sidharth Nambiar	**Boring End:**	9/20/2022 12:30:00 PM	**Vert. Datum:**	N/A

Rig Model:	CME-55LC	**Sampler Type:**	Split Spoon	**Casing Type:**	Steel Casing
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	5 feet
Drill Method:	Mud Rotary	**Sampler I.D.:**	1.375 inches	**Casing I.D.:**	4 inches
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	140 pounds
Drilling Fluid:	Water	**Hammer Fall:**	30 inches	**Hammer Fall:**	30 inches

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)	Drilling & Strata Notes
	S-1	10	2 2 1 1	3	ML	Soft, dark brown to light gray SILT, little coarse to fine Sand, little Clay, trace coarse to fine Gravel, dry (ML)	L	L	1.5	1.0	
	S-2	12	0 0 1 11			Very soft, dark brown SILT, some coarse to fine Sand, little Clay, trace coarse to fine Gravel, dry (ML)	L	M	1.5	1.5	Weight of hammer penetrated first 12 inches. Very soft Soil.
5	S-3	9	42 25 20 8	45	GM	Dense, light gray to dark brown Silty coarse to fine GRAVEL, some coarse to fine Sand, dry (GM)					
	S-4	12	14 46 50 50/3"	> 50	GP	Very dense, light gray Sandy coarse to fine GRAVEL, little Silt, dry (GP)					Drilled down to 8 feet BGS.
	S-5	0	50/0"	> 50		No recovery.					Casing installed at 8 feet BGS. Water loss encountered at 8 feet BGS.
10						Coring Rock at 10 feet BGS. See Rock Coring Log.					
15											
20											



In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

▼ = Water Level (if observed)
BGS = Below Ground Surface
Groundwater was not encountered within this borehole.

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

Rock Coring Log

B-13

Client:	Concept Engineering Consultants, PA	**Drilling Firm:**	Boring Brothers, Inc	**Coordinates:**	40.64118056 N,-74.9077639 E
Project:	Clinton Commons	**Drill Crew:**	R. Dollar / L. Delmeir	**Horiz. Datum:**	WGS 84
Location:	Clinton, NJ	**Boring Start:**	9/20/2022 9:00:00 AM	**Elevation:**	Grade
Inspector:	Sidharth Nambiar	**Boring End:**	9/20/2022 12:30:00 PM	**Vert. Datum:**	N/A

Rig Model:	CME-55LC	**Casing Type:**	Steel Casing	**Core Barrel Type:**	NQ	**Core Bit Type:**	NQ - 01
Rig Type:	Track	**Casing Length:**	5 feet	**Core Barrel Length:**	5 feet	**Core Bit Length:**	3 inches
Drill Method:	Mud Rotary	**Casing I.D.:**	4 inches	**Core Barrel I.D.:**	3 inches	**Core Bit I.D.:**	1.875 inches

Depth (ft)	Avg Core Rate (min/ft)	Run No.	Recovery (in. / %)	RQD (in. / %)	Hardness	Weathering	Graphic Log	Visual Classification	Depth (ft.)	Discontinuities: Type	Dip Angle	Roughness	Weathering	Aperture	Infilling	Drilling & Strata Notes
	1.93							LIMESTONE, light gray fine grained, slightly weathered, very close discontinuity spacing.	10.8	J	50	P,R	FR	VT	N	Water loss encountered.
	1.6															
	4.95	R-1	28 47%	5 8%	R4	SL		10' to 15' Fractured Zone.								
	7.12															
	2.37															
15	2.07							LIMESTONE, light gray fine grained, moderately weathered, very close discontinuity spacing.	16.2	J	30	P,R	FR	VT	N	
	2.23															
	1.95	R-2	57 95%	43 72%		M			17.6	J	40	P,R	DS	VT	N	
	1.87								19	J	30	P,R	DS	T	N	
	1.38								19.8	J	30	P,R	DS	T	N	
20								End of Boring at 20 feet BGS. Backfilled with soil and bentonite holeplug.								
25																

In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

▼ = Water Level (if observed) **BGS =** Below Ground Surface

Groundwater was not encountered within this borehole.

Figure B-13.1
B-13; R-1 and R-2 (dry)

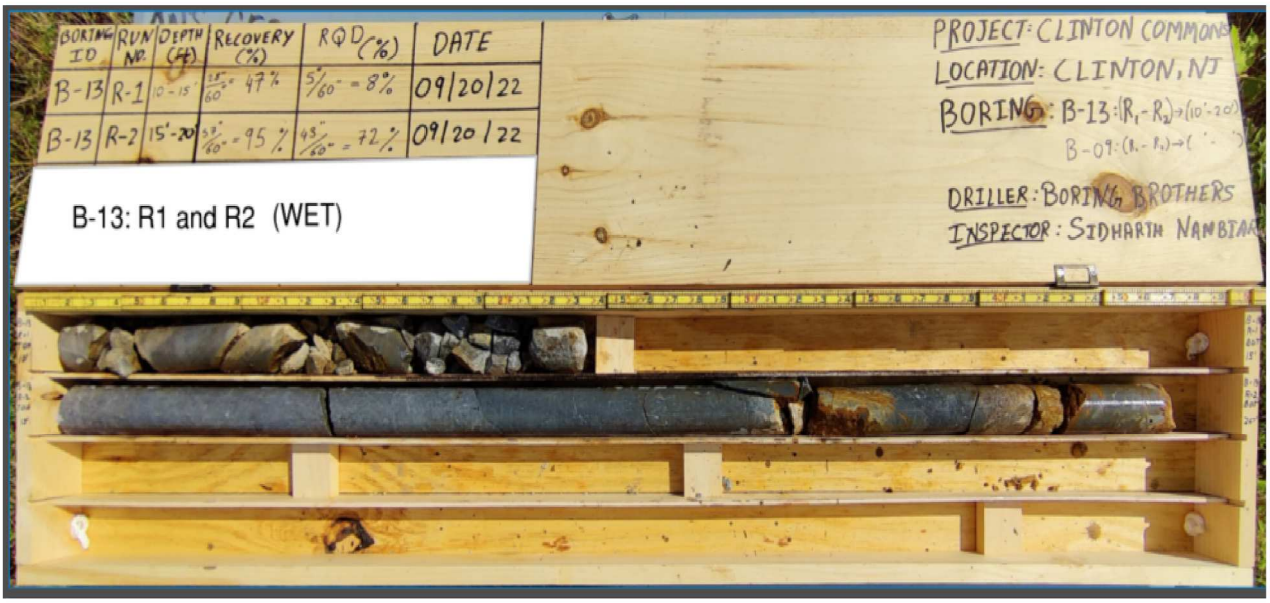


Figure B-13.2
B-13; R-1 and R-2 (wet)

Soil Boring Log

B-15

Client:	Concept Engineering Consultants, PA	**Drilling Firm:**	Boring Brothers, Inc	**Coordinates:**	40.640653 N, -74.906947 E
Project:	Clinton Commons	**Drill Crew:**	Rob Dollar / Lyle Delmeir	**Horiz. Datum:**	NAD83
Location:	Clinton, NJ	**Boring Start:**	5/13/2022 8:15:00 AM	**Elevation:**	Grade
Inspector:	Michael Garcia	**Boring End:**	5/13/2022 11:45:00 AM	**Vert. Datum:**	N/A

Rig Model:	CME-55LC	**Sampler Type:**	Split Spoon	**Casing Type:**	Steel Casing
Rig Type:	Track	**Sampler Length:**	24 inches	**Casing Length:**	5 feet
Drill Method:	Mud Rotary	**Sampler I.D.:**	1.375 inches	**Casing I.D.:**	4 inches
Hammer Type:	Automatic	**Hammer Wt.:**	140 pounds	**Hammer Wt.:**	140 pounds
Drilling Fluid:	Water	**Hammer Fall:**	30 inches	**Hammer Fall:**	30 inches

Depth (ft)	Sample No.	Rec. (in)	Blows per 6"	N-Value	USCS Symbol	Graphic Log	Visual Classification	Toughness	Plasticity	PP (tsf)	TV (tsf)	N-Value (10 20 30 40)	Drilling & Strata Notes
	S-1	16	6 7 8 4	15	SP		Medium dense, light brown coarse to fine SAND, some coarse to fine Gravel, trace Silt, dry (SP)						
	S-2	15	11 20 50/3"	> 50			Dense, light gray to brown medium to fine SAND, some coarse to fine Gravel, trace Silt, dry (SP)					>>	Split spoon refusal at 3.25 feet BGS. Light gray water return. Roller bit refusal at 4 feet BGS.
							Coring Rock at 4 feet BGS See Rock Coring Log						
5												5	
10												10	
15												15	
20												20	

In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

▼ = Water Level (if observed)
BGS = Below Ground Surface
Groundwater was not encountered within this borehole.

Toughness: Low (L), Medium (M), High (H)
Plasticity: Non-Plastic (NP), Low (L), Medium (M), High (H)
PP = Pocket Penetrometer, measured in tons per square ft.
TV = Torvane (Shear Vane), measured in tons per square ft.

Rock Coring Log

B-15

Client:	Concept Engineering Consultants, PA	**Drilling Firm:**	Boring Brothers, Inc	**Coordinates:**	40.640653 N, -74.906947 E
Project:	Clinton Commons	**Drill Crew:**	Rob Dollar / Lyle Delmeir	**Horiz. Datum:**	NAD83
Location:	Clinton, NJ	**Boring Start:**	5/13/2022 8:15:00 AM	**Elevation:**	Grade
Inspector:	Michael Garcia	**Boring End:**	5/13/2022 11:45:00 AM	**Vert. Datum:**	N/A

Rig Model:	CME-55LC	**Casing Type:**	Steel Casing	**Core Barrel Type:**	NQ	**Core Bit Type:**	NQ - 01
Rig Type:	Track	**Casing Length:**	5 feet	**Core Barrel Length:**	5 feet	**Core Bit Length:**	3 inches
Drill Method:	Mud Rotary	**Casing I.D.:**	4 inches	**Core Barrel I.D.:**	3 inches	**Core Bit I.D.:**	1.875 inches

Depth (ft)	Avg Core Rate (min/ft)	Run No.	Recovery (in. / %)	RQD (in. / %)	Hardness	Weathering	Graphic Log	Visual Classification	Depth (ft.)	Discontinuities: Type	Dip Angle	Roughness	Weathering	Aperture	Infilling	Drilling & Strata Notes
5	5.25							LIMESTONE, light gray coarse to fine grained, moderately weathered, medium strong, very close discontinuity spacing.	4.51	J	85	S,R	DS	T	N	
	4.08								5.7	J	30	S,R	DS	T	N	
	5.33	R-1	43 72%	19 32%	R3	M			6.1	J	60	S,R	DS	T	N	Calcite veins throughout the cores. Light gray return. Vertical fracture at 6.1 feet BGS.
	5.25															
	4.90															
10	4.72							LIMESTONE, light gray coarse to fine grained, moderately weathered, medium strong, very close discontinuity spacing.								
	5.03								10.25	J	64	P,R	DS	T	N	
	4.85	R-2	44 73%	5 8%	R3	M		9' to 11.4' Fractured Rock.								Calcite veins throughout the cores. Light gray return. Vertical fracture at 11.7 feet BGS.
	5.70															
	5.52															
15								End of Boring at 14 feet BGS. Backfilled with soil and bentonite holeplug.								
20																

In-Borehole Water Levels

Date / Time	Casing Tip (ft)	Bot. of Hole (ft)	Water Lvl (ft)

General Notes

▼ = Water Level (if observed) **BGS =** Below Ground Surface

Groundwater was not encountered within this borehole.

Figure B-15.1
B-15; R-1 and R-2 (dry)

Figure B-15.2
B-15; R-1 and R-2 (wet)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