PROCUREMENT DEPARTMENT

Teria G. Sheffield
Procurement Director

ADDENDUM # 1

Date: 6/6/2024 **PROPOSAL ID #2932**

Bid #2932
Catawba Bend Preserve Phase 1

THE FOLLOWING INFORMATION SHALL BE INCORPORATED AS PART OF THE ABOVE MENTIONED SOLICITATION; ALL OTHER TERMS AND CONDITIONS SHALL REMAIN THE SAME.

Change 1: Add Geotechnical Report attached below

REPORT OF GEOTECHNICAL SUBSURFACE EXPLORATION
CATAWBA BEND PRESERVE LOOP ROAD - PHASE 1
NEELY STORE ROAD
ROCK HILL, SOUTH CAROLINA

NEWTECH PROJECT NO. 192.004

Prepared For:

Mr. William H. Armstrong, PE
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9731 Southern Pine Blvd # L
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Prepared By:

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November 6, 2023

NEWTECH Engineering, PLLC

November 6, 2023

Mr. William H. Armstrong, PE
Armstrong Glen, PC
9731 Southern Pine Blvd # L
Charlotte, NC 28273
Email: Warmstrong@armstrongglen.com

Subject: **Report of Geotechnical Subsurface Exploration**
Catawba Bend Preserve Loop Road - Phase 1
Neely Store Road
Rock Hill, South Carolina
NEWTECH Project No. 192.004

Dear Mr. Armstrong:

NEWTECH Engineering, PLLC (**NEWTECH**) has completed a geotechnical subsurface exploration for the Catawba Bend Preserve Loop Road - Phase 1 project located off Neely Store Road in Rock Hill, South Carolina. This subsurface exploration was performed in general accordance with our Proposal No. P2023-0047-G dated August 23, 2023. This report contains a brief description of the project information provided to us, general site and subsurface conditions revealed during our geotechnical subsurface exploration and our general recommendations regarding foundation design and construction.

NEWTECH appreciates the opportunity to be of service to you on this project. If you have any questions concerning the information presented herein or if we can be of further assistance, please feel free to call us at (704) 400-7826.

Sincerely yours,
NEWTECH Engineering, PLLC

SOUTH CAROLINA NEWTECH Engineering, PLLC No. 6441 CERTIFICATE OF AUTHORIZATION

SOUTH CAROLINA PROFESSIONAL ENGINEER No. 18550 KERRY C. COOPER

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EXECUTIVE SUMMARY

NEWTECH has completed a geotechnical subsurface exploration for the Catawba Bend Preserve Loop Road - Phase 1 project. The purpose of this exploration was to obtain general information regarding the subsurface conditions and to provide geotechnical recommendations regarding foundation support of the proposed construction. This exploration consisted of seven (7) soil test borings (identified as B-1 through B-7). The approximate test locations are shown on Figure 2 provided in Appendix 1. The following geotechnical engineering information was obtained as a result of the soil test borings:

- **Surface Materials –** Surficial organic (topsoil) soils were observed at the existing ground surface of the borings with estimated thicknesses ranging from approximately 1 to 4 inches.

- **Existing Fill Soils -** Existing fill (disturbed) soils were encountered beneath the surface materials in Borings B-1, B-3, and B-4 to approximate depths ranging from 0.5 to 3 feet below the existing ground surface. When sampled, the existing fill soils generally consisted of elastic silts (MH) and sandy silts (ML).

- **Alluvial Soils -** Alluvial (water-deposited) soils were encountered beneath the surface materials and existing fill soils in Boring B-4 from approximate depths from 3 to 5.5 feet below the existing ground surface. When sampled, the alluvial soils generally consisted of lean clays (CL).

- **Residual Soils -** Residual (undisturbed) soils were encountered below the surface materials, existing fill soils, and alluvial soils, and extended to either the maximum boring termination depth or partially weathered rock (PWR). These residual soils generally consisted of fat clays (CH), elastic silts (MH), sandy silts (ML), and silty sands (SM). The Standard Penetration Resistances (SPT N-values) in the residual soils were 8 to 87 bpf.

- **Partially Weathered Rock (PWR) and Auger Refusal Conditions –** Partially weathered rock (PWR) were encountered Boring B-3 at an approximate depth of 8 feet below the existing ground surface. Auger refusal conditions were not encountered in the borings performed for this exploration.

- **Groundwater Levels -** At the time of drilling, a groundwater level was observed Boring B-4 at an approximate depth 8.5 feet below the existing ground surface.

- **Special Construction Considerations:** Special considerations are warranted concerning existing fill soils, alluvial soils, fat clays (CH), and soils with SPT N-values less than 6 bpf. Dependent on final grades, the contractor can anticipate that some undercutting and/or foundation extension may be necessary through unsuitable soils if encountered during grading and construction. Should unsuitable soils be encountered during the grading and construction activities, these soils should be inspected in the field by a Geotechnical Engineer-of-Record and/or their designee prior to remediation. Additional testing such as test pit excavations and/or hand auger borings may be required in order to further explore these soil conditions, depths and locations.

- Existing Fill Soils: At the time of this report, no relevant information (documentations) regarding previous grading activities, prior materials testing, and/or geotechnical engineering services was provided for our review. Borings B-1, B-3, and B-4 encountered undocumented fill soils (fill soils not monitored and tested during placement). Undocumented fill poses risks associated with undetected deleterious materials within the fill soils and/or deleterious material at the interface between the fill soils and residual soils.

- Cultivated Fill Soils: Based on historical aerial photographs and site observations, portions of the site were once utilized as agricultural fields. Typically, agricultural fields will consist of existing fill soils in the upper 0.5 to 1.5 feet that are classified as cultivated fill soils. Therefore, the existing fill soils encountered in Borings B-1 and B-3 were classified as cultivated fill soils. Cultivated fill soil is a layer that was plowed and disturbed for agricultural purposes. Cultivated fill soils are not suitable for building and/or pavement support and are not suitable to be re-used as structural fill material due to the organics mixed in the soil. However, if approved by the Geotechnical Engineer-of-Record, the cultivated fill soils may be suitable as structural fill material if the organic content in the soil is less than 5 percent and/or blended with non-organic soils to reduce the organic content.

- Alluvial Soils: Alluvial (water-deposited) soils were encountered beneath the surface materials in Boring B-3 between the approximate depths of 3 to 5.5 feet below the existing ground surface. Alluvial soils are typically encountered in or near drainage features, pond bottoms, creeks and in low-lying areas. Alluvial soils are generally loose and/or under-compacted and, as such, are typically unsuitable for supporting the proposed construction. Therefore, remediation may be required wherever alluvial soils are encountered during grading activities.

- Fat Clays (CH): High plasticity and moisture sensitive fat clays (CH) soils were encountered beneath the existing fill soils in B-1 to an approximate depth of 2 feet below the existing ground surface. Highly plastic soils can undergo significant changes in volume (shrink/swell behavior) with changes in moisture conditions. These soils typically provide poor subgrade support for pavements and foundations.

- Soils with SPT N-values less than 6 bpf: Soils that exhibited SPT N-values less than 6 bpf are considered not suitable for the direct support of the proposed construction. These soil conditions were encountered in Borings B-4 between the approximate depths of 3 to 5.5 feet below the existing ground surface.

  Typically, the remediation recommendation(s) of these soil conditions are developed at the time of inspection based on the additional testing results. Dependent on the test results and final grades, the remediation recommendation(s) could include, but not limited to, undercut and replacement with structural fills and/or foundation extension.

- Difficult Excavation: The results of the borings indicated that the excavation of residual soils is possible with conventional excavating techniques. However, please note that partially weathered rock (PWR) conditions were encountered in Boring B-3 and auger refusal conditions were not encountered in the borings performed for this exploration.

Dependent on final grades and locations, the contractor should anticipate the excavations of PWR and auger refusal conditions will require specialized equipment and procedures.

Please note that the information provided in this executive summary is intended to be a brief overview of project information and recommendations from the geotechnical report. The information in the executive summary should not be used without first reading the geotechnical report in its entirety and the recommendations described therein.

1.0 INTRODUCTION

1.1. Site and Project Description

The Catawba Bend Preserve Loop Road - Phase 1 site is located off Neely Store Road in Rock Hill, South Carolina. A vicinity map showing the project's general location is provided as Figure 1. The subject site is a portion of York County Tax Parcel ID Numbers 7720000001 (282.58 Ac.) and 7730000001 (467.55 Ac.). At the time of our field exploration, the subject site was wooded land, grassed land, and an existing gravel roadway.

The Client (Armstrong Glen, PC) provided NEWTECH a set of construction drawings prepare by Armstrong Glen, P.C. dated August 3, 2023, that indicated the configurations of the proposed construction planned for this project. Based on the provided information, we understand the project is planned to include the construction of new paved roadways. Based on the provided plans, the maximum cut depths will be on the order of 1 to 2 feet over the existing ground surface and the maximum fill depths will be on the order of 1 to 8 feet over the existing ground surface.

1.2. Purpose of Subsurface Exploration

The purpose of this exploration was to obtain general geotechnical information regarding the subsurface conditions and to provide general preliminary recommendations regarding the geotechnical aspects of site preparation and foundation design. This report contains the following items:

- General subsurface conditions,
- Boring logs and an approximate "Boring Location Plan",
- Suitable foundation types,
- Allowable bearing pressures for design of shallow foundations,
- Anticipated excavation difficulties during site grading and/or utility installation,
- Remedial measures to correct unsatisfactory soil conditions during site development, as needed,

- Drainage requirements around structures and under floor slabs, as needed,
- Construction considerations,
- Pavement subgrade support guidelines,
- Recommend light and heavy asphalt pavement sections.

2.0 EXPLORATION PROCEDURES

2.1. Field Exploration

NEWTECH visited the site on September 25, 2023 and performed a subsurface exploration that consisted of seven (7) soil test borings (identified as B-1 through B-7). The approximate locations of the borings are shown on Figure 2 - "Boring Location Plan" provided in Appendix 1. The borings were located by professionals from our office using the provided plan, recreation-grade handheld GPS, existing topography, and aerial maps as reference. Since the boring locations were not surveyed, the location of the borings should be considered approximate.

The soil test borings were performed using an ATV Mounted 7822DT GeoProbe drill rig and extended to approximate depths of 9.4 to 10 feet below the existing ground surface. Hollow-stem, continuous flight auger drilling techniques were used to advance the borings into the ground. Standard Penetration Tests (SPT) were performed within the mechanical borings at designated intervals in general accordance with ASTM D 1586. The SPT "N" value represents the number of blows required to drive a split-barrel sampler 12 inches with a 140-pound hammer falling from a height of 30 inches. When properly evaluated, the SPT results can be used as an index for estimating soil strength and density. In conjunction with the penetration testing, representative soil samples were obtained from each test location and returned to our laboratory for visual classification in general accordance with ASTM D 2488. Water level measurements were attempted at the termination of drilling. The results of these tests are presented on the individual boring logs provided in Appendix 2 at the respective test depth.

2.2. Laboratory Services

NEWTECH collected a soil sample from the adjacent concrete plant property for laboratory testing to determine whether a selected fill material will be suitable to be used as structural fill material. The collected soil sample was transported to the laboratory for laboratory testing that consisted of one (1) Atterberg Limit tests (ASTM D 4318), one (1) percent gradation sieve test (ASTM D 1140), one (1) Standard Proctor test (ASTM D 698), and one (1) California Bearing Ratio test (ASTM D 1883). Laboratory test results are included in Appendix 3 of this report.

3.0 AREA GEOLOGY AND SUBSURFACE CONDITIONS

3.1. Physiography and Area Geology

The subject property is located in Rock Hill, South Carolina, which is located in the south central Piedmont Physiographic Province. The Piedmont Province generally consists of well-rounded hills and ridges which are dissected by a well-developed system of draws and streams. The Piedmont Province is predominantly underlain by metamorphic rock (formed by heat, pressure and/or chemical action) and igneous rock (formed directly from molten material) which were initially formed during the Precambrian and Paleozoic eras. The volcanic and sedimentary rocks deposited in the Piedmont Province during the Precambrian era were the host of the metamorphism and were generally changed to gneiss and schist. The more recent Paleozoic era had periods of igneous emplacement, with episodes of regional metamorphism resulting in the majority of the rock types seen today.

The topographic relief found throughout the Piedmont Province has developed from differential weathering of these igneous and metamorphic rock formations. Ridges developed along the more easily weathered and erodible rock. Because of the continued chemical and physical weathering, the rocks in the Piedmont Province are generally covered with a mantle of soil that has weathered in-place from the parent bedrock below. These soils have variable thicknesses and are referred to as residual soils, as they are the result of in-place weathering. Residual soils are typically fine-grained and have a higher clay content near the ground surface because of the advanced weathering. Similarly, residual soils typically become more coarse-grained with increasing depth because of decreased weathering. As weathering decreases with depth, residual soils generally retain the overall appearance, texture, gradation and foliations of their parent rock.

3.2. Generalized Subsurface Stratigraphy

General subsurface conditions observed during our geotechnical exploration are described herein. For more detailed soil descriptions and stratifications at a particular field test location, the respective “Boring Logs”, provided in Appendix 2 should be reviewed. The horizontal stratification lines designating the interface between various strata represents approximate boundaries. Transitions between different strata in the field may be gradual in both the horizontal and vertical directions. Therefore, subsurface stratigraphy between test locations may vary.

3.2.1. Surface Materials

Surficial organic (topsoil) soils were observed at the existing ground surface of the borings with estimated thicknesses ranging from approximately 1 to 4 inches. The surficial organic soil depths provided in this report and on the individual "Boring Logs" are based on observations of field personnel and should be considered approximate. Please note that the thickness of surface materials at the site should be expected to vary, and measurements necessary for detailed quantity estimation were not performed for this report. For planning purposes, we suggest considering a topsoil thickness of about 12 inches to account for existing vegetation and shallow roots.

Surficial Organic Soil is typically a dark-colored soil material containing roots, fibrous matter, and/or other organic components, and is generally unsuitable for engineering purposes. **NEWTECH** has not performed any laboratory testing to determine the organic content or other horticultural properties of the observed surficial organic soils. Therefore, the phrase "surficial organic soil" is not intended to indicate suitability for landscaping and/or other purposes.

3.2.2. Existing Fill Soils

Existing fill (disturbed) soils were encountered beneath the surface materials in Borings B-1, B-3, and B-4 to approximate depths ranging from 0.5 to 3 feet below the existing ground surface. When sampled, the existing fill soils generally consisted of firm elastic silts (MH) and sandy silts (ML). The Standard Penetration Resistances (SPT N-values) in the existing fill soils was 6 blows per foot (bpf).

Based on historical aerial photographs and site observations, portions of the site were once utilized as agricultural fields. Typically, agricultural fields will consist of existing fill soils in the upper 0.5 to 1.5 feet that are classified as cultivated fill soils. Therefore, the existing fill soils encountered in Borings B-1 and B-3 were classified as cultivated fill soils. Cultivated fill soil is a layer that was plowed and disturbed for agricultural purposes. Cultivated fill soils are not suitable for pavement support and are not suitable to be re-used as structural fill material due to the organics mixed in the soil. However, if approved by the Geotechnical Engineer-of-Record, the cultivated fill soils may be suitable as structural fill material if the organic content in the soil is less than 5 percent and/or blended with non-organic soils to reduce the organic content.

Based on historical aerial photographs and our site observations, previous grading activities and/or development have occurred on the property. As such, the contractor should anticipate the presence of fill soils, active or abandoned utility lines, and/or construction debris that were not encountered in the borings performed for this exploration.

If fill soils are encountered at other locations in the field during construction, the fill soils should be inspected by the Geotechnical Engineer-of-Record and/or their designee, with respect to the criteria outlined in Section 5.0 of this report.

3.2.3. Alluvial Soils

Alluvial (water-deposited) soils were encountered beneath the surface materials and existing fill soils in Boring B-4 from approximate depths of 3 to 5.5 feet below the existing ground surface. When sampled, the alluvial soils generally consisted of very soft lean clays (CL). The Standard Penetration Resistances (SPT N-values) in the alluvial soils was 0 (“weight-of-hammer) bpf.

Alluvial soils are typically encountered in or near drainage features, pond bottoms, creeks and in low-lying areas. Alluvial soils are generally loose and/or under-compacted and, as such, are typically unsuitable for supporting the proposed construction. Therefore, remediation may be required wherever alluvial soils are encountered during grading activities. The design team may want to consider evaluating the extent of the alluvial soils prior to or during grading activities. The extent of the alluvial soils should be inspected in the field by the Geotechnical Engineer-of-Record or and/or their designee. Additional testing such as test pit excavations and/or hand auger borings may be required in order to further explore these soil conditions.

3.2.4. Residual Soils

Residual (undisturbed) soils were encountered below the surface materials, existing fill soils, and alluvial soils, and extended to either the maximum boring termination depth or partially weathered rock (PWR). These residual soils generally consisted of very stiff fat clays (CH), stiff to very stiff elastic silts (MH), firm to hard sandy silts (ML), and loose to very dense silty sands (SM). The Standard Penetration Resistances (SPT N-values) in the residual soils were 8 to 87 bpf.

3.2.5. Partially Weathered Rock and Auger Refusal

Partially weathered rock (PWR) conditions were encountered in Boring B-3 at an approximate depth 8 feet below the existing ground surface. PWR is defined as soil-like material exhibiting SPT N-values in excess of 100 bpf. When sampled, the PWR generally breaks down into silty sands (SM) with rock fragments.

Auger refusal conditions were not encountered in the borings performed during this exploration. Auger refusal is defined as material that could not be penetrated by the drilling equipment used during our field exploration. Materials that might result in auger refusal include large boulders, rock ledges, lenses, seams or the top of parent bedrock. Core drilling techniques would be required to evaluate the character and continuity of the refusal material. However, rock coring was beyond the scope of this exploration and not performed.

3.2.6. Groundwater Level Measurements

At the time of drilling, a groundwater level was observed Boring B-4 at an approximate depth 8.5 feet below the existing ground surface. Please note moisture conditions of the soil samples were noted within some of the borings and moisture conditions within the soils may be an indication of the presence of groundwater. Also, moist to wet soil conditions can be an indication that some manipulation (scarifying and drying) of the soil may be required in order to obtain the specified compaction during grading operations.

It should also be noted that groundwater levels tend to fluctuate with seasonal and climatic variations, as well as with some types of construction operations. Therefore, water may be encountered during construction at depths not indicated in the borings performed for this exploration.

4.0 EVALUATIONS AND RECOMMENDATIONS

4.1. General

Our preliminary evaluation and recommendations are based on the project information outlined previously and on the data obtained from the field and laboratory testing program. If the structural loading, geometry, or proposed roadway locations are changed or significantly differ from those outlined, or if conditions are encountered during construction that differ from those encountered by the borings, **NEWTECH** requests the opportunity to review our recommendations based on the new information and make the necessary changes.

4.2. Retaining Wall Recommendations (if used)

Design Parameters for backfill properties (i.e., friction angle, earth pressure coefficients) should use the values in the table below. These parameters are based on suitable soils with a minimum moist unit weight of 115 to 120 pcf. **NEWTECH** should be retained to test the actual soils used for construction to verify these design assumptions. To reduce long term creep or deflections to the wall system, desirable wall backfill soils should be used. These include non-plastic, granular soils (sands and gravels). However, these soils may not be available on site.

Soil Parameters for Wall Backfill

Backfill Type	Allowable Bearing Capacity (psf)	Friction Angle (deg)	Modulus of Subgrade Reaction (pci)	Active Earth Pressure Coefficient K_a	Passive Earth Pressure Coefficient Kp	Coefficient of Earth Pressure at Rest Ko	Slide Friction
Residuum	2,500	28°	200	0.361	2.77	0.531	0.4
Fill	2,500	24 °	150	0.421	2.37	0.593	0.4

Additional Testing is Required to verify these estimated designed parameters.

Soils classified as lean clays (CL), elastic silts (MH) and/or fat clays (CH) shall not be used for wall backfill or in the retained zone as shown in Table 1610.1 of the 2018 IBC. If on-site soils are used as backfill within the reinforced zone, the wall designer should address the need for wall drainage and the possibility of long-term, time-dependent movement or creep in their design.

At the time of report preparation, we were not provided retaining wall plans or specifications. Therefore, we request the opportunity to review the wall plans and specifications once they are finalized and make any necessary changes to our recommendations. Also, we recommend an external stability analysis (including global stability) of the proposed wall(s) be conducted once the site layout and wall geometry are complete.

4.3. Low to Moderate Plasticity Moisture Sensitive Soils (CL and MH)

Low to moderate plasticity and moisture sensitive lean clay (CL) and elastic silt (MH) soils were encountered in the borings performed during this exploration. These fine-grained soils are susceptible to moisture intrusion and can become soft when exposed to weather and/or water infiltration. Consequently, some undercutting and/or reworking (drying) of the near-surface soils may be required depending upon the site management practices and weather conditions present during construction.

Should these materials be left in-place, special consideration should be given to providing positive drainage away from the structure and discharging roof drains a minimum of 5 feet from the foundations to reduce infiltration of surface water to the subgrade materials.

Note: Since Low to Moderate Plasticity and Moisture Sensitive Soils can become remolded (i.e., softened) under the weight of repeated construction traffic and changes in moisture conditions, these soils should be evaluated and closely monitored by the Geotechnical Engineer-of-Record or and/or their designee prior to and during fill placement. Additional testing and inspections of moisture sensitive soils may be warranted such as laboratory testing, field density (compaction) testing, hand auger borings with dynamic cone penetrometer (DCP) testing and/or test pit excavations.

4.4. High Plasticity Moisture Sensitive Soils (CH)

High plasticity and moisture sensitive fat clays (CH) soils were encountered beneath the existing fill soils in B-1 to an approximate depth of 2 feet below the existing ground surface. Highly plastic soils can undergo significant changes in volume (shrink/swell behavior) with changes in moisture conditions. The highly plastic materials encountered in the borings performed for this exploration are typically not considered suitable for pavement subgrade support. Depending on final subgrade elevations, we recommend the highly plastic soils be undercut from beneath foundations and pavements so that the foundation elements bear on 3 feet or more of engineered fill and pavements are supported on 1½ feet or more of engineered fill, creating a separation between the foundation elements/pavements and the underlying highly plastic soils.

The presence of high plasticity materials can adversely affect the performance of the foundation and pavement systems. Due to the presence of highly plastic soils at the project site, we recommend the following be implemented by the design team:

1. The high plasticity materials should be undercut from all structural and pavement areas. The undercut subgrades should be observed by a **NEWTECH** staff professional upon completion of undercut operations. Once completed and the subgrade appears suitable, structural fill should be placed to proposed subgrade elevation.

2. Three (3) feet of separation should be provided between the high plasticity materials and bottom of foundations and one and one-half (1½) feet of separation on pavement areas provided the area is stable. The separation material should consist of approved structural fill materials.

3. Lime stabilization techniques could be utilized in order to lower the plasticity of the referenced soils in-place and minimize any undercut. These techniques should extend to a depth of at least 3 feet below the finished floor elevation of the building and at least 1.5 feet on pavement areas. It should be noted that the success of lime stabilization techniques is highly dependent upon the means and methods utilized by the contractor.

4. If the expansive soils are not undercut from beneath the structures or adequate separation is not provided, the building foundations should be designed to either penetrate the expansive soils or designed to resist the differential volume change and prevent structural damage. Slab-on-grades should be designed as structural slabs for the expansive soils in accordance with WRI/CRSI Design of Slab-on-Ground Foundations or PTI Design and Construction of Post-Tensioned Slabs-on-Ground.

4.5. Wet Weather Conditions

Contractors should be made aware of the moisture sensitivity of the near soils and potential compaction difficulties. If construction is undertaken during wet weather conditions, the surficial soils may become saturated, soft, and unworkable. The contractor can anticipate reworking and/or recompacting soils may be needed when excessive moisture conditions occur. Additionally, subgrade stabilization techniques, such as chemical (lime or lime-fly ash) treatment, may be needed to provide a more weather-resistant working surface during construction. Therefore, we recommend that consideration be given to construction during the dryer months.

Surface runoff should be drained away from excavations and not allowed to pond. Concrete for foundations should be placed as soon as practical after the excavation is made. That is, the exposed foundation soils should not be allowed to become excessively dry or wet before placement of concrete. Bearing soils exposed to moisture variations may become highly disturbed resulting in the need for undercutting prior to placement of concrete. If excavations must remain open overnight, or if rainfall becomes imminent while the bearing soils are exposed, we recommend that a 2- to 4-inch-thick “mud-mat” of lean (2000 psi) concrete be placed on the bearing soils before work stops for the night.

NEWTECH recommends that special care be given to providing adequate drainage away from the pavement areas to reduce infiltration of surface water to the base course and subgrade materials. If these materials are allowed to become saturated during the life of the slab section, a strength reduction of the materials may result causing a reduced life of the section.

4.6. Pavements Subgrade Preparation

The pavement sections can be adequately supported on approved non-high plasticity residual soils, or newly compacted fill, provided the site preparation and fill placement procedures outlined in this report are implemented. Immediately prior to constructing the pavement section, we recommend that the areas be proofrolled to detect any softened, loosened or disturbed areas that may have been exposed to wet weather or construction traffic. Areas that are found to be disturbed or indicate instability during the proofrolling should be undercut and replaced with adequately compacted structural fill or repaired as recommended by the Geotechnical Engineer-of-Record. This proofrolling should be observed by a **NEWTECH** professional or a senior soils technician under his/her direction. Proofrolling procedures are outlined in the "Site Preparation" section of this report.

Due to prevalence of near surface low to high plasticity lean clays (CL), elastic silts (MH) and fat clays (CH), remediation of pavement subgrade soils may be recommended (as determined by the Geotechnical Engineer-of-Record during construction) including undercutting and replacement with additional SCDOT MACADAM stone. Alternatively, lime stabilization of pavement subgrade may be a more economical option and **NEWTECH** can provide lime stabilization mix design services if requested. This may be more pronounced depending on the time of the year and seasonal conditions at the time of pavement construction. We recommend contingency for some remediation efforts for the subgrade soils be considered during the planning stage.

4.7. Pavement Section Recommendations

NEWTECH utilized the 1993 AASHTO Interim Guide for Design of Pavement Structures and the SCDOT Pavement Design Guide, the estimated traffic flow, and our previous project experiences to perform our analysis.

Pavement strength is normally calculated and designed based on SCDOT Design Methodology using what is called a Structural Number (SN). A pavements' SN is calculated based on the thickness of an individual pavement component multiplied by the component's Strength

Coefficient. The Strength Coefficient is assigned based on empirical information gathered by various highway agencies to include the SCDOT. In general, Strength Coefficient is the highest for hot laid compacted asphalt (0.44 per inch) and lower for graded aggregate base course (0.18 per inch).

The following data was used during our pavement analysis:

- California bearing ratio (CBR) value of 4 (Laboratory Test Results)
- Traffic – 5 Trucks Trips/Day servings mostly passenger cars and light trucks (estimated)
- 5 Trucks/Day (estimated)18-kip semi-EASL; School Buses, Trash Trucks are fractional.
- 20-year Design Life.

CBR AND RECOMMENDED SSV

Item	Recommended Value
California Bearing Ratio (CBR) (AASHTO T 193)	4
Soil Support Value	1.8

Should the anticipated vehicular loading conditions change, **NEWTECH** should be given the opportunity to review our pavement recommendation and to make any necessary changes or revision. Please note that this analysis assumes that the subgrade soils are stable and have been properly compacted and that fill soils have been properly placed.

DESIGN ASPHALT PAVEMENT SECTION

Material	Parking Spaces (Inches)	Roadway Thickness (Inches)	Roadway Thickness (Inches)
Asphaltic Concrete Surface Course	2	2.5	2
Asphaltic Concrete Intermediate Course	---	3.5	2.5
Crushed Aggregate Base Course (ABC)	6	8	10
TOTAL DESIGN PAVEMENT THICKNESS	**8**	**14**	**14.5**
Structural Number (SN) for the Anticipated Traffic	1.08	4.08	3.78

All new pavement components should meet the latest SCDOT requirements (Standard Specifications for Highway Construction, Latest Edition).

4.8. Cut and Fill Slopes

Permanent project slopes should be designed with geometry of 3 horizontal to 1 vertical (3H:1V) or flatter. The tops and bases of all slopes should be located 10 feet or more from structural limits and 5 feet or more from parking limits. Fill slopes should be constructed utilizing properly compacted, structural fill according to the recommendations provided in this report. In addition, fill slopes should be overbuilt and cut to finished grade during construction to achieve proper compaction on the slope face. All slopes should be seeded, stabilized and maintained after construction and adhere to local, state and federal municipal standards, if applicable.

Immediately prior to constructing the project slopes, the areas should be proof-rolled to detect any softened, loosened or disturbed areas that may have been exposed to wet weather or construction traffic. Areas that are found to be disturbed or indicate pumping action during the proof-rolling should be undercut and replaced with adequately compacted structural fill. This proof-rolling should be observed by a **NEWTECH** staff professional or a senior soils technician under his/her direction. Proof-rolling procedures are outlined in the "Site Preparation" section of this report.

Structural fill should not be placed on a subgrade with a slope steeper than 5 horizontal to 1 vertical (5H:1V), unless the fill is confined by an opposing slope, such as in a ravine. Otherwise, where steeper slopes exist, the subgrade should be benched to allow for fill placement on a horizontal surface.

5.0 CONSTRUCTION CONSIDERATIONS

5.1. Abandoned Utilities/Structures

NEWTECH recommends that any existing utility lines and foundations be removed from within the proposed pavement areas. The utility backfill and foundation material should be removed and the subgrade in the excavations should be inspected by a geotechnical professional prior to fill placement. The subgrade inspection should consist of visual observations, probing with a steel rod and/or performing hand auger borings with Dynamic Cone Penetrometer tests to explore their suitability of receiving structural fill. Once the excavations are inspected and approved, they should be backfilled with adequately compacted structural fill. Excavation backfill under proposed new foundations should consist of properly compacted structural fill, crushed stone, flowable fill or lean concrete as approved by the Geotechnical Engineer-of-Record.

5.2. Site Preparation

Based on the results of our borings, and dependent on final grades, the contractor can anticipate that some undercutting and/or foundation extension through existing fill soils, cultivated fill soils, alluvial soils, fat clays (CH), and soils with N-values less than 6 bpf may be required prior to construction and/or fill placement. If these soils are encountered during the grading activities, the extent of the undercut required should be determined in the field by the Geotechnical Engineer-of-Record and/or their designee. Additional testing such as test pit excavations and/or hand auger borings may be required to further explore these soil conditions, depths and locations.

Topsoil, organic laden/stained soils, and other unsuitable materials should be stripped/removed from the proposed construction limits. Stripping and clearing should extend 10 feet or more beyond the planned construction limits. Upon completion of the stripping operations, we recommend areas planned for support of foundations, floor slabs, parking areas, slope areas and structural fill be proof-rolled with a loaded dump truck or similar pneumatic tired vehicle (minimum loaded weight of 20 tons) under the observations of a staff professional. After excavation of the site has been completed, the exposed subgrade in cut areas should also be proof-rolled. The proof-rolling procedures should consist of four complete passes of the exposed areas, with two of the passes being in a direction perpendicular to the proceeding ones. Any areas which deflect, rut or pump excessively during proof-rolling or fail to "tighten up" after successive passes should be undercut to suitable soils and replaced with compacted fill.

The extent of any undercut required should be determined in the field by a **NEWTECH** staff professional or engineer while monitoring construction activity. After the proof-rolling operation has been completed and approved, final site grading should proceed immediately. If construction progresses during wet weather, the proof-rolling operation should be repeated after any inclement weather event with at least one pass in each direction immediately prior to placing fill material or aggregate base course stone. If unstable conditions are experienced during this operation, then undercutting or reworking of the unstable soils may be required.

5.3. Difficult Excavation

Based on the results of our soil test borings and dependent on final grades, it appears that the majority of general excavation for footings and utilities will be possible with conventional excavating techniques. We anticipate that the residual soils can be excavated using pans, scrapers, backhoes, and front end loaders. Depending on the location, excavations deeper than approximately 8 feet may require specialized equipment and procedures.

Partially weathered rock (PWR) conditions were encountered in one (1) of the borings and auger refusal conditions were not encountered in the borings performed for this exploration. The depth and thickness of partially weathered rock, boulders, and rock lenses or seams can vary dramatically in short distances and between the boring locations; therefore, soft/hard weathered rock, boulders or bedrock may be encountered during construction at locations or depths, between the boring locations, not encountered during this exploration.

The actual rippability of these in-place materials is however, dependent on many factors such as the operator's skill level, equipment, and the techniques used during excavation, degree of weathering within the formation, rock hardness, rock structure (i.e., foliations or bedding), jointing and fracture spacing and necessary size or width of excavation. Rippability of weathered rock is typically more difficult in confined excavations.

The table below may be used as a quick reference for rip ability of in-place materials.

Summary of Rippability Based on SPT N-Values

N-Values as Shown on Boring Logs	Description of N-Values	Anticipated Rippability
60 > N-Value	N-values less than 60 bpf	These materials may generally be excavated with heavy-duty equipment such as a Caterpillar D-8 with a single-shank ripper
60 < N-Value < 50/3"	N-values more than 60 bpf, but less than 50 blows per 3 inches of penetration	These materials are considered marginally excavatable, even with heavy-duty equipment.
50/3" < N-Value	N-values more than 50 blows per 3 inches of penetration	Blasting and/or removal with impact hammers is typically required to excavate these materials.
*This table is for general information only. Actual rippability is dependent upon many other factors as stated above.		

Care should be exercised during excavations for footings on rock to reduce disturbance to the foundation elevation. The bottom of each footing should be approximately level. When blasting is utilized for foundation excavation in rock, charges should be held above design grades. Actual grades for setting charges should be selected by the contractor and he should be responsible for any damage caused by the blasting. All loose rock should be carefully cleaned from the bottom of the excavation prior to pouring concrete. Footing excavations in which the rock subgrade has been loosened due to blasting should be deepened to an acceptable bearing elevation.

In our professional opinion, a clear and appropriate definition of rock should be included in the project specifications to reduce the potential for misunderstandings. A sample definition of rock for excavation specifications is provided below:

Rock is defined as any material that cannot be dislodged during mass grading by a Caterpillar D-8 tractor, or equivalent, equipped with a hydraulically operated power ripper without the use of drilling and blasting. For rock removal in confined excavations (e.g., utility excavations) marginally excavatable materials (softer PWR 50/3"-50/6") may be *accomplished using a large trackhoe Caterpillar 325, or equivalent with rock teeth without the use of drilling and blasting. However harder materials (PWR 50/0"-50/3") in confined excavations will not likely be possible with conventional equipment and typically requires blasting. Boulders or masses of rock exceeding ½ cubic yard in volume shall also be considered rock excavation. This classification does not include materials such as loose rock, concrete, or other materials that can be removed by means other than drilling and blasting, but which for any reason, such as economic reasons, the Contractor chooses to remove by drilling and blasting.*

5.4. Temporary Excavation Stability

Localized areas of soft or unsuitable soils not detected by our borings, or in unexplored areas, may be encountered once grading operations begin. Vertical cuts in these soils may be unstable and may present a significant hazard because they can fail without warning. Therefore, temporary construction slopes greater than 5 feet in height should not be steeper than two horizontal to one vertical (2H:1V), and excavated material should not be placed within 10 feet of the crest of any excavated slope. In addition, runoff water should be diverted away from the crest of the excavated slopes to prevent erosion and sloughing.

Should excavations extend below final grades, shoring and bracing or flattening (laying back) of the slopes may be required to obtain a safe working environment. Excavation should be sloped or shored in accordance with local, state and federal regulations, including OSHA (29 CFR Part 1926) excavation trench safety standards.

5.5. Structural Fill

Soil to be used as structural fill should be free of organic matter, roots or other deleterious materials. Structural fill should have a plasticity index (PI) less than 25 and a liquid limit (LL) less than 50 or as approved by the Geotechnical Engineer-of-Record. The structural fill should exhibit a maximum dry density of at least 90 pounds per cubic foot, as determined by a Standard Proctor compaction test (ASTM-D 698). Compacted structural fill should consist of materials classified as either CL, ML, SC, SM, SP, SW, GC, GM, GP, or GW per ASTM D-2487 or as approved by the Geotechnical Engineer-of-Record. Off-site borrow soil should also meet these same classification requirements. Non-organic, low-plasticity on-site soils are expected to meet this criterion. However, successful reuse of the excavated, on-site soils as compacted structural fill will depend on the moisture content of the soils encountered during excavation. We anticipate that scarifying and drying of portions of the on-site soils will be required before the recommended compaction can be achieved. Drying of these soils will likely result in some delay.

All structural fill soils should be placed within the proposed pavement area extending at least 3 feet beyond the perimeter of the pad and foundation limits. All structural fill soils should be placed in thin (not greater than 8 inches) loose lifts and compacted to a minimum of 95 percent of the soil's Standard Proctor maximum dry density (ASTM D 698) at/or near optimum moisture content (±2 percent). The upper 2 feet of structural fill should be compacted to a minimum of 100 percent of the soil's Standard Proctor maximum dry density (ASTM D 698) at/or near optimum moisture content (±2 percent). Some manipulation of the moisture content (such as wetting, drying) may be required during the filling operation to obtain the required degree of compaction. The manipulation of the moisture content is highly dependent on weather conditions and site drainage conditions. Therefore, the grading contractor should be prepared to both dry and wet the fill materials to obtain the specified compaction during grading. Sufficient density tests should be performed to confirm the required compaction of the fill material.

5.6. Engineering Services During Construction

As previously stated, the engineering recommendations provided in this report are based on the project information outlined above and the data obtained from field and laboratory tests. However, unlike other engineering materials like steel and concrete, the extent and properties of geologic materials (soil) vary significantly. Regardless of the thoroughness of a geotechnical engineering exploration, there is always a possibility that conditions between borings will be different from those at the boring locations, that conditions are not as anticipated by the designers, or that the construction process has altered the subsurface conditions. This report does not reflect variations that may occur between the boring locations. Therefore, conditions on the site may vary between the discrete locations observed at the time of our subsurface exploration.

The nature and extent of variations between the borings may not become evident until construction is underway. To account for this variability, professional observation, testing and monitoring of subsurface conditions during construction should be provided as an extension of our engineering services. These services will help in evaluating the Contractor's conformance with the plans and specifications. Because of our unique position to understand the intent of the geotechnical engineering recommendations, retaining us for these services will also allow us to provide consistent service through the project construction. Geotechnical engineering construction observations should be performed under the supervision of the Geotechnical Engineer-of-Record from our office who is familiar with the intent of the recommendations presented herein. This observation is recommended to evaluate whether the conditions anticipated in the design actually exist or whether the recommendations presented herein should be modified where necessary. Observation and testing of compacted structural fill and backfill should also be provided by our firm.

6.0 RELIANCE AND QUALIFICATIONS OF REPORT

This geotechnical subsurface exploration has been provided for the sole use of Armstrong Glen, PC. This geotechnical subsurface exploration should not be relied upon by other parties without the express written consent of **NEWTECH** and Armstrong Glen, PC.

The analyses and recommendations submitted in this report were based, in part, on data obtained from this exploration. If the above-described project conditions are incorrect or changed after the issuing of this report, or subsurface conditions encountered during construction are different from those reported, **NEWTECH** should be notified and these recommendations should be re-evaluated based on the changed conditions to make appropriate revisions. We have prepared this report according to generally accepted geotechnical engineering practices. No warranty, express or implied, is made as to the professional advice included in this report.

APPENDIX 1 – Figures

Figure 1

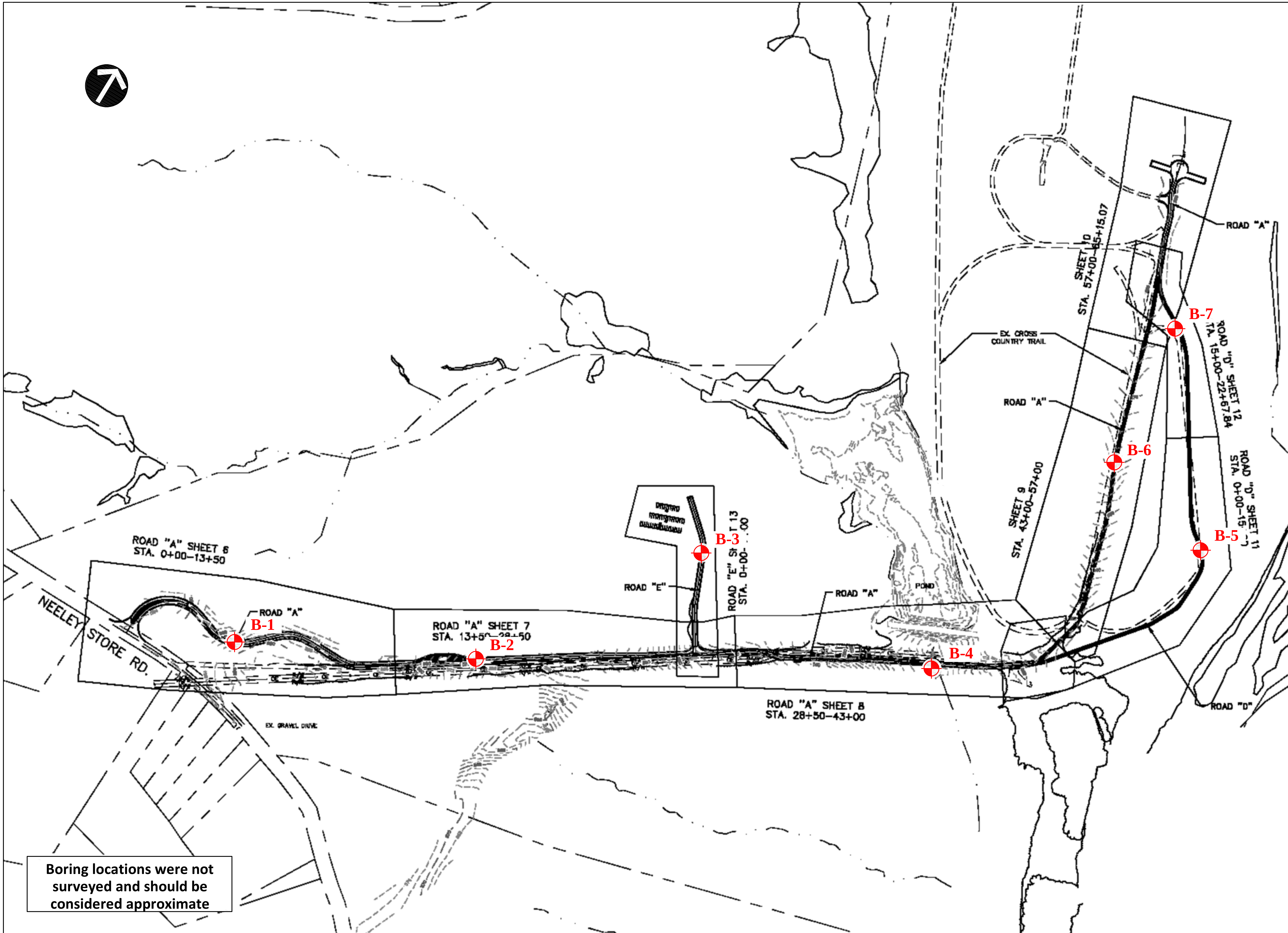
Site Vicinity Map

SCALE: NTS

Catawba Bend Preserve Loop Road
Phase 1
Neely Store Road
Rock Hill, South Carolina

Project No.: 192.004

NewTech Engineering, PLLC
2360 South Tryon Street - Suite F
Charlotte, North Carolina 28203



NewTech Engineering PLLC
2360 South Tryon Street - Suite F
Charlotte, North Carolina 28203

Catawba Bend Preserve Loop Road
Phase 1
Neely Store Road
Rock Hill, South Carolina

Project No.: 192.004

Figure 2
Boring Location Plan

Approx. Soil Test Boring Location

SCALE: NTS

APPENDIX 2 – Boring Logs

Project: **Catawba Bend Preserve Loop Road - Phase 1** Project Location: **Rock Hill, SC** Project Number: **192.004**	Key to Log of Boring **Sheet 1 of 1**

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
1	2	3	4	5	6	7	8	9

COLUMN DESCRIPTIONS

1 Elevation (feet): Elevation (MSL, feet).
2 Depth (feet): Depth in feet below the ground surface.
3 Sample Type: Type of soil sample collected at the depth interval shown.
4 Sample Number: Sample identification number.
5 Sampling Resistance, blows/ft: Number of blows to advance driven sampler one foot (or distance shown) beyond seating interval using the hammer identified on the boring log.
6 Material Type: Type of material encountered.
7 Graphic Log: Graphic depiction of the subsurface material encountered.
8 MATERIAL DESCRIPTION: Description of material encountered. May include consistency, moisture, color, and other descriptive text.
9 REMARKS AND OTHER TESTS: Comments and observations regarding drilling or sampling made by driller or field personnel.

FIELD AND LABORATORY TEST ABBREVIATIONS

CHEM: Chemical tests to assess corrosivity
COMP: Compaction test
CONS: One-dimensional consolidation test
LL: Liquid Limit, percent
PI: Plasticity Index, percent
SA: Sieve analysis (percent passing No. 200 Sieve)
UC: Unconfined compressive strength test, Qu, in ksf
WA: Wash sieve (percent passing No. 200 Sieve)

MATERIAL GRAPHIC SYMBOLS

Alluvial Soils
Fat CLAY (CH)
FILL: ELASTIC SILT (MH)
FILL: SANDY SILT (ML)
ELASTIC SILT (MH)
SANDY SILT (ML)
Partially Weathered Rock
Silty SAND (SM)
Topsoil

TYPICAL SAMPLER GRAPHIC SYMBOLS

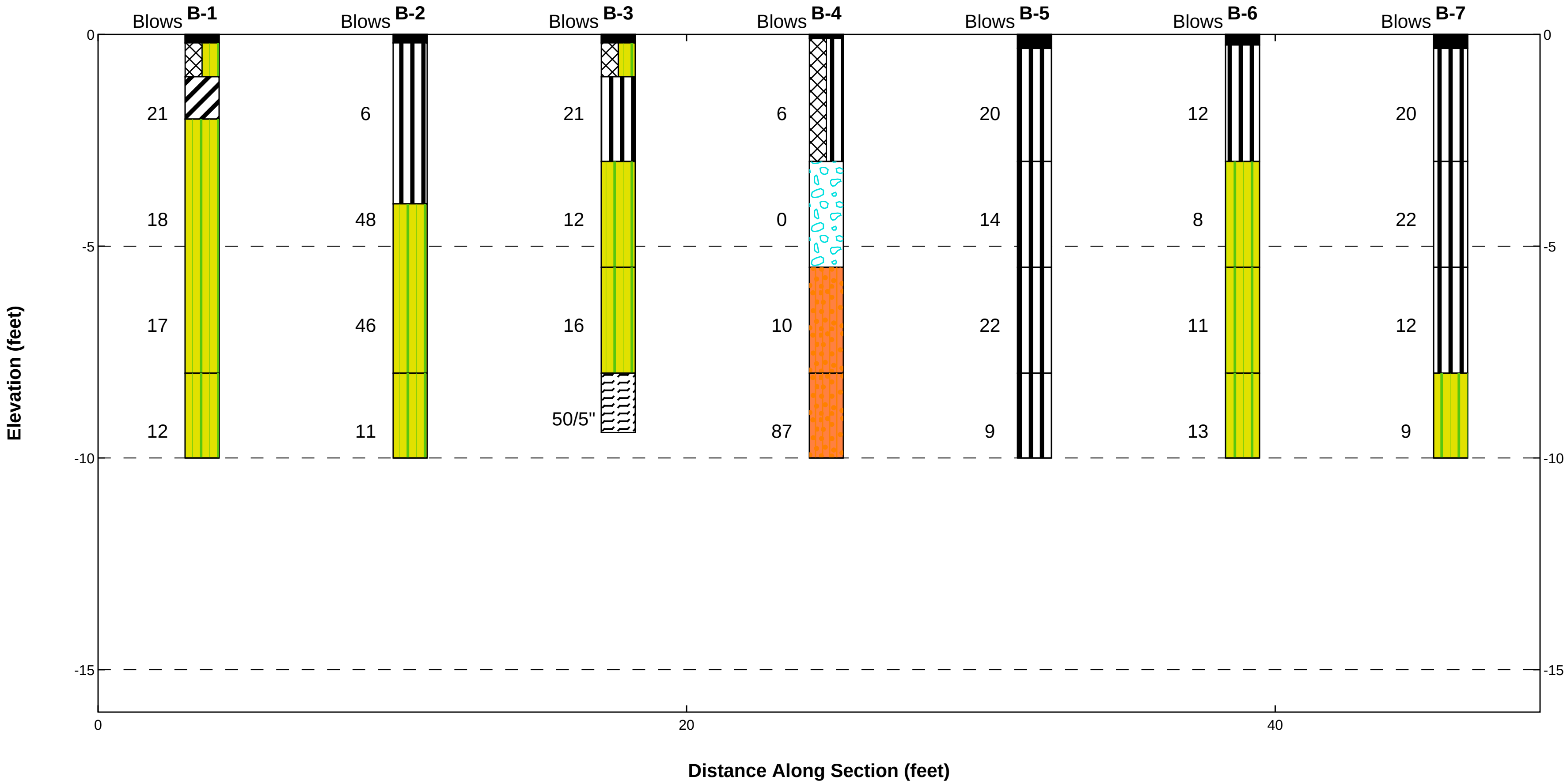
Auger sampler
Bulk Sample
3-inch-OD California w/ brass rings
CME Sampler
Grab Sample
2.5-inch-OD Modified California w/ brass liners
Pitcher Sample
2-inch-OD unlined split spoon (SPT)
Shelby Tube (Thin-walled, fixed head)

OTHER GRAPHIC SYMBOLS

Water level (at time of drilling, ATD)
Water level (after waiting, AW)
Minor change in material properties within a stratum
Inferred/gradational contact between strata
? Queried contact between strata

GENERAL NOTES

1: Soil classifications are based on the Unified Soil Classification System. Descriptions and stratum lines are interpretive, and actual lithologic changes may be gradual. Field descriptions may have been modified to reflect results of lab tests.
2: Descriptions on these logs apply only at the specific boring locations and at the time the borings were advanced. They are not warranted to be representative of subsurface conditions at other locations or times.



MATERIAL GRAPHIC SYMBOLS

- No material type.
- Alluvial Soils
- Fat CLAY (CH)
- FILL: ELASTIC SILT (MH)
- FILL: SANDY SILT (ML)
- ELASTIC SILT (MH)
- SANDY SILT (ML)
- Partially Weathered Rock
- Silty SAND (SM)
- Topsoil

Catawba Bend Preserve Loop Road Phase 1 Neely Store Road Rock Hill, South Carolina
NEWTECH Engineering, PLLC 2630 South Tryon Street Suite F Charlotte, North Carolina 29203
192.004
Project No.

Project: **Catawba Bend Preserve Loop Road - Phase 1**	# Log of Boring B-1
Project Location: **Rock Hill, SC**	**Sheet 1 of 1**
Project Number: **192.004**	

Date(s) Drilled **9/25/23**	Logged By **CVET**	Checked By **TC**
Drilling Method **Hollow Stem Auger**	Drill Bit Size/Type **2-1/4" ID / 6-inch Bore Hole**	Total Depth of Borehole **10**
Drill Rig Type **7822DT GeoProbe**	Drilling Contractor **CVET**	Approximate Surface Elevation **0**
Groundwater Level and Date Measured **GW ATD NE**	Sampling Method(s) **SPT**	Hammer Data **Auto Hammer**
Borehole Backfill **Cuttings**	Location **Please refer to Figure 2 for Approx. Boring Location**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
0	0				Topsoil		Approx. 2" of Topsoil	
					Fill -ML		FILL: (Cultivated Fill Soil) Light Brown Slightly Clayey Sandy SILT	
			1	21	CH		RESIDUUM: Very Stiff Reddish Brown Fat CLAY	LL=60 PL=29 PI=31 %<#200=60.5
					ML		Very Stiff Yellow, Red and White Slightly Clayey Sandy SILT	
			2	18				
-5	5							
			3	17				
					ML		Stiff Yellow, Red and White Slightly Clayey Sandy SILT	
			4	12				
-10	10						Boring Terminated at an Approx. Depth of 10 feet bgs	
-15	15							
-20	20							
-25	25							
-30	30							

Project: **Catawba Bend Preserve Loop Road - Phase 1**	Log of Boring B-2
Project Location: **Rock Hill, SC**	**Sheet 1 of 1**
Project Number: **192.004**	

Date(s) Drilled **9/25/23**	Logged By **CVET**	Checked By **TC**
Drilling Method **Hollow Stem Auger**	Drill Bit Size/Type **2-1/4" ID / 6-inch Bore Hole**	Total Depth of Borehole **10**
Drill Rig Type **7822DT GeoProbe**	Drilling Contractor **CVET**	Approximate Surface Elevation **0**
Groundwater Level and Date Measured **GW ATD NE**	Sampling Method(s) **SPT**	Hammer Data **Auto Hammer**
Borehole Backfill **Cuttings**	Location **Please refer to Figure 2 for Approx. Boring Location**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
0	0				Topsoil		Approx. 2" of Topsoil	
					MH		RESIDUUM: Firm Red Elastic SILT	
			1	6				
			2	48	ML		Hard Yellow and White Sandy SILT with Rock Fragments	
-5	5							
			3	46				
					ML		Stiff Moist Brown, Yellow, White and Black Sandy SILT	
			4	11				
-10	10						Boring Terminated at an Approx. Depth of 10 feet bgs	
-15	15							
-20	20							
-25	25							
-30	30							

Project: **Catawba Bend Preserve Loop Road - Phase 1**	Log of Boring B-3
Project Location: **Rock Hill, SC**	**Sheet 1 of 1**
Project Number: **192.004**	

Date(s) Drilled **9/25/23**	Logged By **CVET**	Checked By **TC**
Drilling Method **Hollow Stem Auger**	Drill Bit Size/Type **2-1/4" ID / 6-inch Bore Hole**	Total Depth of Borehole **9.4**
Drill Rig Type **7822DT GeoProbe**	Drilling Contractor **CVET**	Approximate Surface Elevation **0**
Groundwater Level and Date Measured **GW ATD NE**	Sampling Method(s) **SPT**	Hammer Data **Auto Hammer**
Borehole Backfill **Cuttings**	Location **Please refer to Figure 2 for Approx. Boring Location**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
0	0				Topsoil		Approx. 3" of Topsoil	
					Fill -ML		FILL: (Cultivated Fill Soil) Light Brown Slightly Clayey Sandy SILT	
		SPT	1	21	MH		RESIDUUM Very Stiff Red Elastic SILT with Sand	
		SPT	2	12	ML		Stiff Yellow and White Slightly Clayey Sandy SILT	
-5	5							
		SPT	3	16	ML		Very Stiff Red and Yellow Slightly Clayey Sandy SILT	
		SPT	4	50/5"	PWR		Partially Weathered Rock (PWR) when sampled becomes Red and Yellow Silty SAND with Rock Fragments	
							Boring Terminated at an Approx. Depth of 9.4 feet bgs	
-10	10							
-15	15							
-20	20							
-25	25							
-30	30							

Project: **Catawba Bend Preserve Loop Road - Phase 1** Project Location: **Rock Hill, SC** Project Number: **192.004**	# Log of Boring B-4 **Sheet 1 of 1**

Date(s) Drilled **9/25/23**	Logged By **CVET**	Checked By **TC**
Drilling Method **Hollow Stem Auger**	Drill Bit Size/Type **2-1/4" ID / 6-inch Bore Hole**	Total Depth of Borehole **10**
Drill Rig Type **7822DT GeoProbe**	Drilling Contractor **CVET**	Approximate Surface Elevation **0**
Groundwater Level and Date Measured **GW ATD @ 8.5 feet bgs**	Sampling Method(s) **SPT**	Hammer Data **Auto Hammer**
Borehole Backfill **Cuttings**	Location **Please refer to Figure 2 for Approx. Boring Location**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
0	0				Topsoil		Approx. 1" of Topsoil	
			1	6	Fill - MH		FILL: Firm Moist Red and Yellow Elastic SILT	
			2	0	ALLUVIUM		ALLUVIUM: Firm Moist Brownish Gray Lean CLAY with Sand	
-5	5		3	10	SM		RESIDUUM: Loose Wet Light Gray Silty SAND	
			4	87	SM		Very Dense Light Olive Yellow and Light Gray Silty SAND ∇	GW ATD @ 8.5 feet bgs
-10	10						Boring Terminated at an Approx. Depth of 10 feet bgs	
-15	15							
-20	20							
-25	25							
-30	30							

Project: **Catawba Bend Preserve Loop Road - Phase 1**	**Log of Boring B-5**
Project Location: **Rock Hill, SC**	**Sheet 1 of 1**
Project Number: **192.004**	

Date(s) Drilled **9/25/23**	Logged By **CVET**	Checked By **TC**
Drilling Method **Hollow Stem Auger**	Drill Bit Size/Type **2-1/4" ID / 6-inch Bore Hole**	Total Depth of Borehole **10**
Drill Rig Type **7822DT GeoProbe**	Drilling Contractor **CVET**	Approximate Surface Elevation **0**
Groundwater Level and Date Measured **GW ATD NE**	Sampling Method(s) **SPT**	Hammer Data **Auto Hammer**
Borehole Backfill **Cuttings**	Location **Please refer to Figure 2 for Approx. Boring Location**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
0	0				Topsoil		Approx. 4" of Topsoil	
			1	20	MH		RESIDUUM: Very Stiff Dark Red Elastic SILT	
			2	14	MH		Stiff Dark Red Elastic SILT	
-5	5		3	22	MH		Very Stiff Dark Red Elastic SILT	
			4	9	MH		Stiff Dark Red and Yellow Elastic SILT	
-10	10						Boring Terminated at an Approx. Depth of 10 feet bgs	
-15	15							
-20	20							
-25	25							
-30	30							

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Project: **Catawba Bend Preserve Loop Road - Phase 1**	# Log of Boring B-6
Project Location: **Rock Hill, SC**	**Sheet 1 of 1**
Project Number: **192.004**	

Date(s) Drilled **9/25/23**	Logged By **CVET**	Checked By **TC**
Drilling Method **Hollow Stem Auger**	Drill Bit Size/Type **2-1/4" ID / 6-inch Bore Hole**	Total Depth of Borehole **10**
Drill Rig Type **7822DT GeoProbe**	Drilling Contractor **CVET**	Approximate Surface Elevation **0**
Groundwater Level and Date Measured **GW ATD NE**	Sampling Method(s) **SPT**	Hammer Data **Auto Hammer**
Borehole Backfill **Cuttings**	Location **Please refer to Figure 2 for Approx. Boring Location**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
0	0				Topsoil		Approx. 3" of Topsoil	
			1	12	MH		RESIDUUM: Stiff Red Elastic SILT	
			2	8	ML		Firm Light Brown and Yellow Slightly Clayey Sandy SILT	
-5	5							
			3	11	ML		Stiff Light Brownish Gray and Light Red Sandy SILT	
			4	13	ML		Stiff Yellow and White Sandy SILT	
-10	10						Boring Terminated at an Approx. Depth of 10 feet bgs	
-15	15							
-20	20							
-25	25							
-30	30							

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Project: **Catawba Bend Preserve Loop Road - Phase 1**	Log of Boring B-7
Project Location: **Rock Hill, SC**	**Sheet 1 of 1**
Project Number: **192.004**	

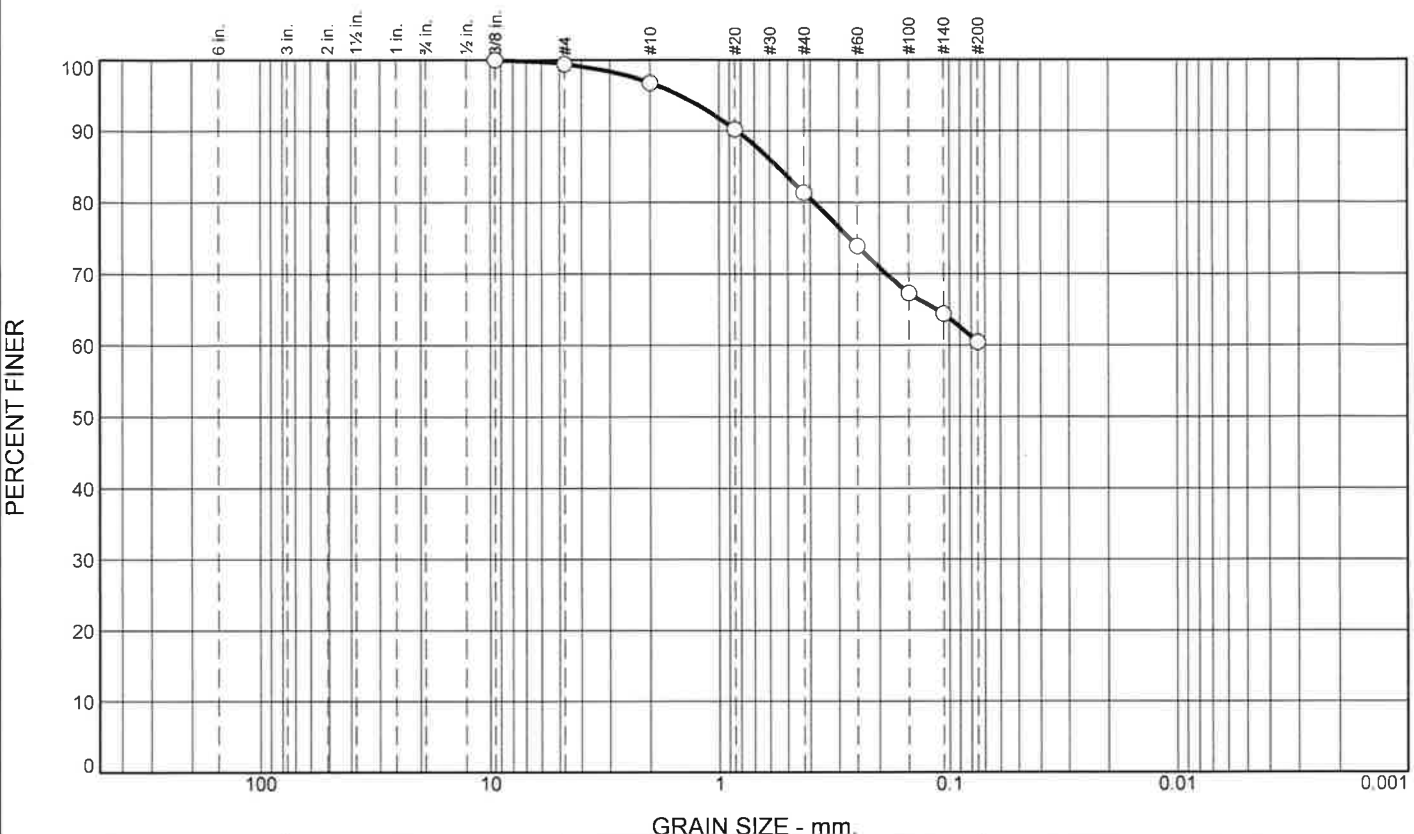
Date(s) Drilled **9/25/23**	Logged By **CVET**	Checked By **TC**
Drilling Method **Hollow Stem Auger**	Drill Bit Size/Type **2-1/4" ID / 6-inch Bore Hole**	Total Depth of Borehole **10**
Drill Rig Type **7822DT GeoProbe**	Drilling Contractor **CVET**	Approximate Surface Elevation **0**
Groundwater Level and Date Measured **GW ATD NE**	Sampling Method(s) **SPT**	Hammer Data **Auto Hammer**
Borehole Backfill **Cuttings**	Location **Please refer to Figure 2 for Approx. Boring Location**	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
0	0				Topsoil		Approx. 4" of Topsoil	
		SPT	1	20	MH		RESIDUUM: Very Stiff Dark Elastic SILT	
		SPT	2	22	MH		Very Stiff Dark Red Elastic SILT	
-5	5							
		SPT	3	12	MH		Stiff Dark Red Elastic SILT with Sand	
		SPT	4	9	ML		Stiff Yellow and White Sandy SILT	
-10	10						Boring Terminated at an Approx. Depth of 10 feet bgs	
-15	15							
-20	20							
-25	25							
-30	30							

APPENDIX 3 – Laboratory Test Results

Particle Size Distribution Report

ASTM D6913



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.6	2.6	15.4	20.9	60.5	

Test Results (ASTM D6913)				
Sieve Size or Diam. (mm.)	Finer (%)	Spec.* (%)	Out of Spec. (%)	Pct. of Fines
0.375	100.0			
#4	99.4			
#10	96.8			
#20	90.2			
#40	81.4			
#60	73.9			
#100	67.2			
#140	64.3			
#200	60.5			

* (no specification provided)

Material Description

Red-Brown Sandy Fat Clay

Atterberg Limits

PL= 29 LL= 60 PI= 31

Coefficients

D_{90}= 0.8300 D_{85}= 0.5549 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CH AASHTO= A-7-6(17)

Test Remarks

Location: B-1 Bulk Sample

Sample Date: 10-10-23

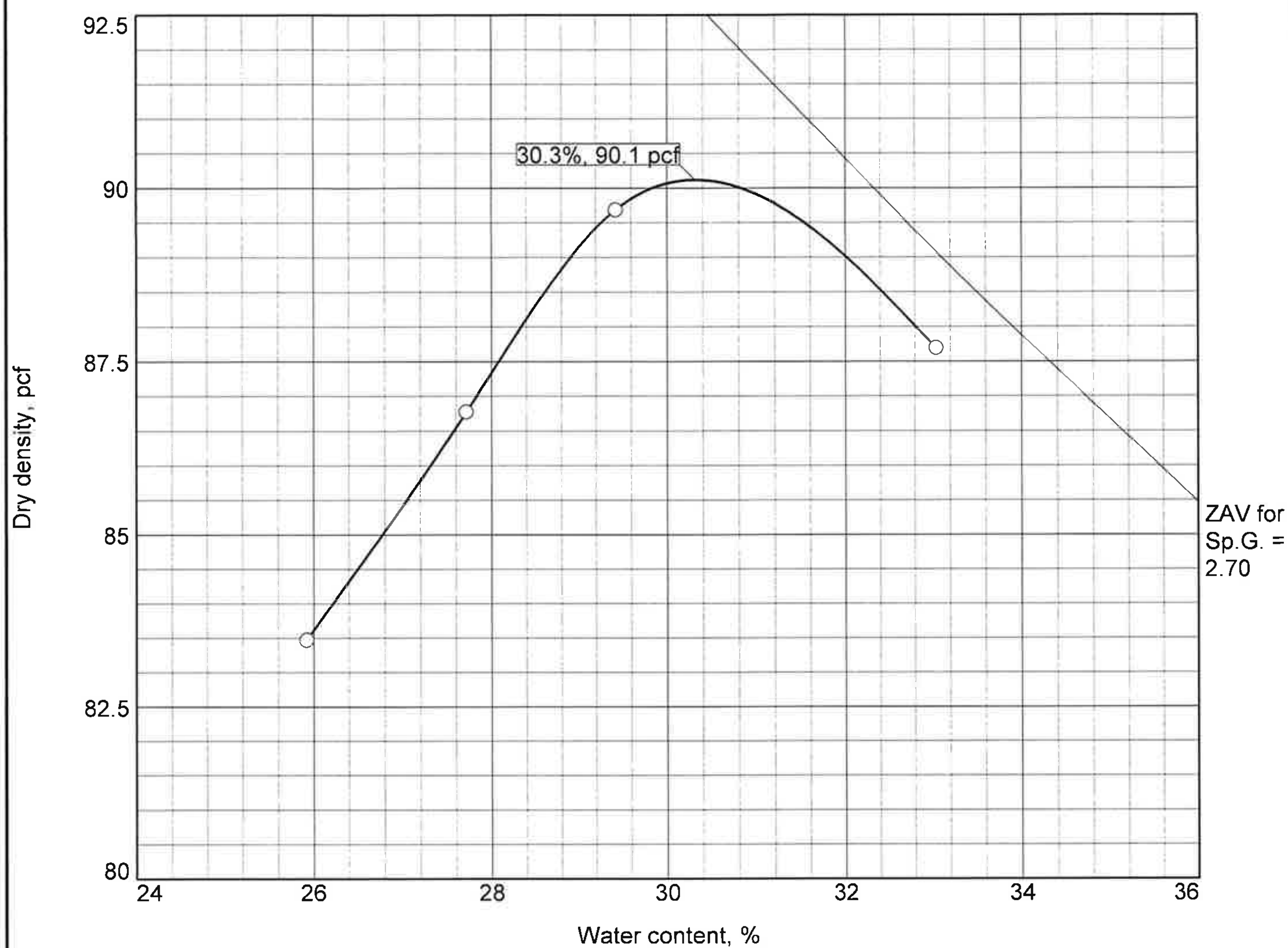
NEWTECH Engineering, PLLC
2630 South Tryon Street – Suite F
Charlotte, North Carolina 29203

Client: NewTech Engineering
Project: Catawba Bend Preserve Loop Phase I

Project No: 7936.L0045 **Figure**

Tested By: FG **Checked By:** MH

COMPACTION TEST REPORT



Test specification: ASTM D 698-12 Method A Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > #4	% < No.200
	USCS	AASHTO						
	CH	A-7-6(17)			60	31	0.6	60.5

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 90.1 pcf Optimum moisture = 30.3 %	Red-Brown Sandy Fat Clay

Project No. 7936.L0045 **Client:** NewTech Engineering

Project: Catawba Bend Preserve Loop Phase I

Date: 10-06-23

○ **Location:** B-1 Bulk Sample

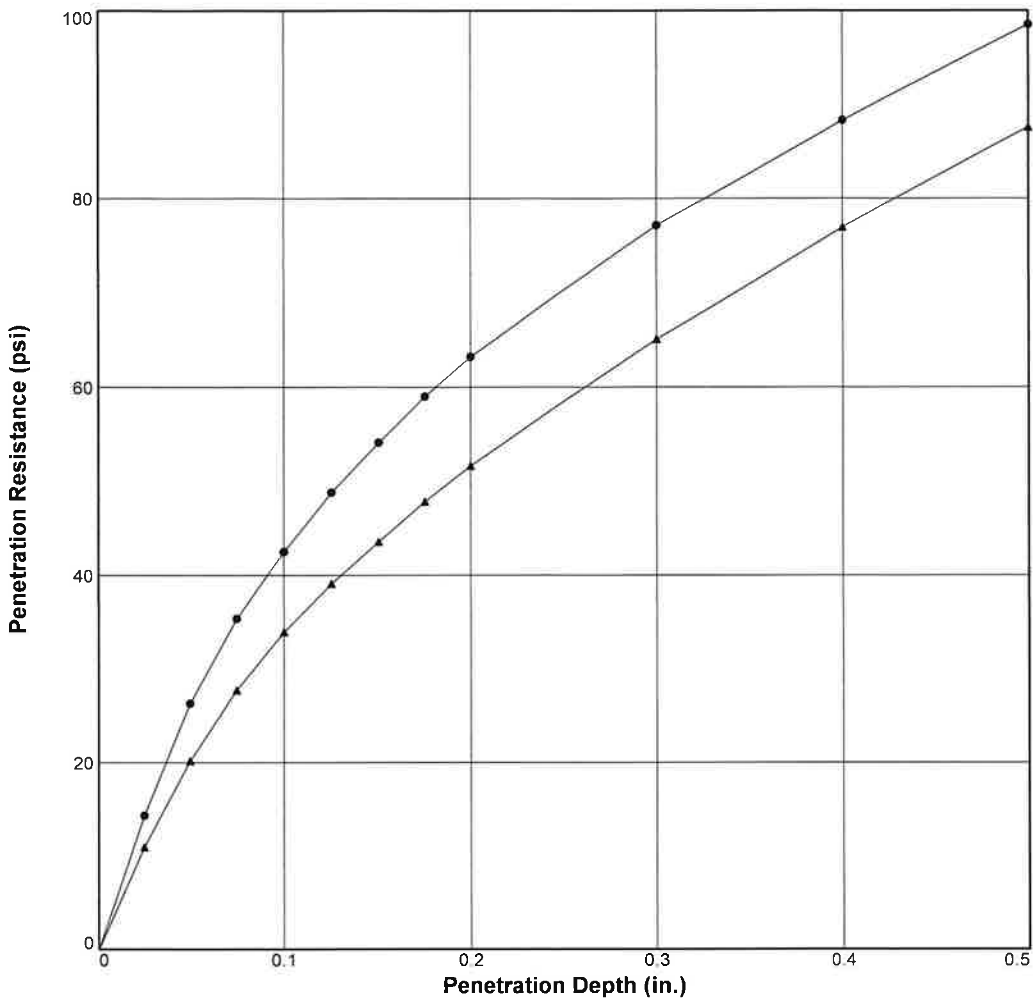
Remarks:

NEWTECH Engineering, PLLC
2630 South Tryon Street – Suite F
Charlotte, North Carolina 29203

Figure

Tested By: FG **Checked By:** MH

BEARING RATIO TEST REPORT
ASTM D1883-16



	Molded Density (pcf)	Molded Percent of Max. Dens.	Molded Moisture (%)	Soaked Density (pcf)	Soaked Percent of Max. Dens.	Soaked Moisture (%)	CBR (%) 0.10 in.	CBR (%) 0.20 in.	Linearity Correction (in.)	Surcharge (lbs.)	Max. Swell (%)
1 ●	86.7	96.2	28.8	84.3	93.6	35.0	4.3	4.2	0.000	10	2.9
2 ▲	86.3	95.8	28.8	84.0	93.3	37.6	3.4	3.4	0.000	10	2.7
3 ■											

Material Description	AASHTO	Max. Dens. (pcf)	Optimum Moisture (%)	LL	PI
Red-Brown Sandy Fat Clay (CH)	A-7-6(17)	90.1	30.3	60	31

Project No: 7936.L0045

Project: Catawba Bend Preserve Loop Phase I

Location: B-1 Bulk Sample

Date: 10-10-23

NEWTECH Engineering, PLLC
2630 South Tryon Street – Suite F
Charlotte, North Carolina 29203

Test Remarks:

Figure ______

Tested By: FG/JC **Checked By:** MH