**Addendum No. 1, dated April 29, 2019**
To the documents for
Renovations to the Catawba County Board of Elections
Newton, North Carolina
Comm. No. 19002.00

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**CHANGES TO PROJECT MANUAL / SPECIFICATIONS**

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**BID AND CONTRACT DOCUMENTS**

SECTION 00 21 13 – INSTRUCTIONS TO BIDDERS

1. Revise Paragraph 19 to read:

The following forms must be returned with your **original** Bid:

**a.** **Bid Form (Addendum must be acknowledged on the Bid Form)**

**b.** **Bid Deposit (Bid Bond, cash, cashier's check or certified check. Power of Attorney must be included when submitting a Bid Bond)**

**c.** **Non-Collusive Affidavit**

**d.** **Affidavit of Compliance (E-Verify)**

**e.** **Authority to Execute Contract**

**f.** **M/WBE Forms**

**Failure to submit these M/WBE documents may be grounds for rejection of the bid.**

SECTION 00 31 32 – GEOTECHNICAL INVESTIGATIONS

2. Add the attached Geotechnical Engineering Report dated April 23, 2019.

SECTION 00 72 00 32 – STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

3. Delete this Section in its entirety. The Standard General Conditions of the Construction Contract are included within Section 00 52 00 – CONSTRUCTION AGREEMENT FOR BOE. This information contained within this Section is a duplicate of Section 00 52 00.

SECTION 01 22 00 – UNIT PRICES

4. Under Part 3 - Execution, under paragraph B, replace subparagraphs 2 and 3 as follows:

    2. Disposal of unsuitable material shall be **off site**.
    3. Supply of new "satisfactory" material acceptable to the Engineer from **off site**. Refer to Geotechnical Report and Civil Drawings for description of satisfactory backfill material.

5. Replace UNIT PRICE SCHEDULE with the following:

    Unit Price No. 1:

    Removal and Replacement of Unsuitable Soil - The unit price **per cubic yard** shall include removal of unsuitable soil from the project site to an area **off site** and replacement with structural fill from **off site**, compacted in place as indicated by the Civil Drawings and the Geotechnical Report. Removal of soil shall include excavation, loading and transportation of soil away from the project site. Replacement of soil shall include excavation, transportation and compacted placement of structural fill soil from an **off site** source.

END OF ADDENDUM NO. 1

Attachments:

1. Geotechnical Engineering Report dated April 23, 2019.

# GEOTECHNICAL ENGINEERING REPORT

**Renovations for Catawba County Board of Elections**
**145 Government Drive**
**Newton, Catawba County, North Carolina**

**CVET Project No. 19-517**

**April 23, 2019**

**PREPARED FOR:**

**Catawba County**
**25 Government Drive, P.O. Box 389**
**Newton, North Carolina 28658**

**PREPARED BY:**

**CATAWBA VALLEY ENGINEERING AND TESTING, P.C.**
**HICKORY, NORTH CAROLINA**

CATAWBA VALLEY
ENGINEERING & TESTING

PO Box 747
Hickory, NC 28603

308 15th St. SE
Suite 2
Hickory, NC 28602

828 578 9972 O
828 322 1801 F

NC Firm No. C-3833
SC Firm No. 5201

April 23, 2019

Mr. John Cameron
Catawba County
25 Government Drive, P.O. Box 389
Newton, North Carolina 28658
jcameron@catawbacountync.gov

Re: Geotechnical Engineering Report
Renovations for Catawba County Board of Elections
145 Government Drive
Newton, Catawba County, North Carolina
CVET Project No.: 19-517

Dear Mr. Cameron:

Catawba Valley Engineering and Testing (CVET) is pleased to submit to you our Geotechnical Engineering Report for the renovations for Catawba County Board of Elections located at 145 Government Drive in Newton, North Carolina. This study was authorized by Ms. Tina M. Wright on April 2, 2019. This report presents the findings of our subsurface exploration and provides geotechnical recommendations for design and construction of the project.

CVET appreciates the opportunity to provide our geotechnical engineering services for this project. If you have any questions regarding the contents of this report, or if we can provide additional services for the project such as construction materials testing, please do not hesitate to contact us.

Sincerely,

**CATAWBA VALLEY ENGINEERING AND TESTING, P.C.**

Cody Dobbins, E.I.
Project Manager

NORTH CAROLINA PROFESSIONAL SEAL 041419 ENGINEER DAVID M. LeGRAND JR.

04/23/19

David M. LeGrand, Jr., P.E.
Principal Engineer
NC 041419

# TABLE OF CONTENTS

## 1.0 EXECUTIVE SUMMARY

The following items represent a short summary of (1) the findings of our subsurface exploration, (2) our conclusions, and (3) our recommendations for design and construction of the renovations for Catawba County Board of Elections located at 145 Government Drive in Newton, North Carolina.

1. The area being evaluated generally consists of asphaltic pavement (B-1 through B-4) or topsoil (B-5 through B-8) underlain by fill and residual soils. Asphalt thickness was measured to be approximately 3.5, 3.0, 4.0, and 3.0 in borings B-1 through B-4, respectively. The underlying ABC stone base was measured to be approximately 6.0, 3.0, 8.0, and 6.0 inches, respectively, at each test location. Surficial topsoil, ranging from 1.0 to 4.0 inches, was encountered in borings B-5 through B-8. Existing fill soils were encountered in all test borings to depths ranging from approximately 5.0 to 10.0 feet below existing site grades. The encountered fill soil consists mainly of clayey sand (SC), fat clay (CH), elastic silt (MH), and lesser amounts of sandy silt/silty sand (ML/SM). SPT N-values within the fill soils ranges from 2 to 13 blows per foot (bpf) indicating very soft to stiff consistencies. Organic content encountered within the existing fill soil in boring B-4 was measured to range from approximately 4.7 to 5.2 percent by weight to a depth of approximately 5.0 feet below existing site grades. Generally, the existing fill soil contains minor traces of root fragments. Residual soils were encountered in all eight (8) soil test borings. The residuum mainly consists of sandy silt (ML), silty sand (SM), and/or clayey sand (SC). SPT N-values within the residuum ranges from 0 to 44 bpf indicating very loose to dense soil consistency. Partially weathered rock resulting in auger refusal conditions was encountered at approximately 42.5 feet below existing site grades in boring B-8. Groundwater was encountered in soil test boring B-8 at the time of drilling (ATD) at a depth of approximately 24.0 feet below existing site grades and at the end of drilling (EOD) operations at approximately 23.0 feet below existing site grades.

2. We conclude that the site is suitable for the proposed development, however, the existing fill soils at the site will require remediation depending on the result of the initial test pits and proofrolling activities.

3. We offer the following design and construction recommendations for the renovations for Catawba County Board of Elections located at 145 Government Drive in Newton, North Carolina.

    - Site preparation should consist of the relocation or proper abandonment of any existing utilities that may be affected by the proposed construction, removal of the existing asphalt and ABC stone base, along with all other soft or unsuitable material from the extents of the proposed development. Site preparation operations should

extend a minimum of 10 feet beyond the planned limits of the facilities and a minimum of 5 feet beyond the planned limits of the pavement areas. We recommend that during clearing operations a series of test pits be extended within the existing fill soils to confirm consistency and evaluate the suitability to remain in place, be utilized as structural fill, or need removal and replacement with alternate soils. Laboratory testing indicates that the surficial site soils are plastic/elastic in nature and are anticipated to be unstable during initial proofrolling observations if insitu moisture contents are at or above the optimum moisture content.

- Any required fill soils should be compacted to at least 98 percent of the maximum dry density obtained in accordance with ASTM Specification D-698, Standard Proctor Method, with a moisture content within +/- 3% of the optimum moisture content (OMC). Acceptable fill soils should be soil that has less than 5 percent organic content and a liquid limit and plasticity index less than 50 and 20, respectively. Soils with USCS group symbols of SP, SW, SM, SC, and ML are recommended for use as controlled fill, although it is important to note that silty soils are moisture sensitive and can be difficult to place with in-situ moisture contents at or above the OMC. We do not recommend reuse of any elastic/plastic site soils (MH/CH) as structural fill, unless placed within the deepest fill sections under direct supervision of CVET.

- Based upon the encountered subsurface conditions across the site, we recommend supporting the proposed building on shallow foundations bearing on approved residual soils or newly compacted approved fill soils. Shallow foundations for buildings should be designed for an allowable net bearing pressure of up to 2,500 pounds per square foot. We recommend minimum foundation widths and embedment depths of 16 and 24 inches, respectively, for building foundations.

- We believe that a concrete slab-on-grade floor system is appropriate for the proposed building. Regardless if the floor slab will bear on controlled fill, approved existing fill, or approved residual soil, we recommend a modulus of subgrade reaction (k) of up to 100 pounds per cubic inch for structural design of the floor slab. If plastic/elastic site soils are encountered at foundation subgrade elevation, we recommend undercut and replacement.

- We recommend thicknesses of 2.0, 0 and 8.0 inches for surface course, base course and ABC crushed stone, respectively, for light-duty pavement. For heavy-duty pavement, we recommend thicknesses of 1.5, 2.0 and 8.0 inches for surface course, binder course, and ABC crushed stone, respectively. We recommend standard thicknesses for both light and heavy-duty asphalt pavements.

- It is our opinion that a Site Seismic Classification of D is appropriate for this site.

This executive summary should be used in conjunction with the entire contents of the report, in order to gain a complete understanding of all conclusions and recommendations contained within the report. If conditions revealed during construction vary from those described in this report, the on-site geotechnical engineer shall contact the engineer of said report to discuss potential options to address the varying site conditions.

## 2.0 PURPOSE AND SCOPE OF WORK

The purpose of the subsurface exploration and geotechnical engineering evaluation was to explore the subsurface conditions at the site, collect representative samples of soil for examination in our laboratory, and provide conclusions and recommendations for the renovations for Catawba County Board of Elections located at 145 Government Drive in Newton, North Carolina:

- Drilling of eight (8) soil test borings at the site;
- Collection of representative soil samples from the soil test borings;
- Classification of collected soil samples and laboratory testing as necessary;
- Preparation of boring logs, boring location plan, and general subsurface profile;
- Evaluation of the encountered subsurface conditions at the site; and
- Preparation of this geotechnical report.

## 3.0 PROJECT INFORMATION

This project consists of the evaluation of subsurface conditions to facilitate renovations for Catawba County Board of Elections facility located at 145 Government Drive in Newton, North Carolina. The subject property was previously utilized as the Catawba County Animal Shelter.

Based on the Site Plan provided by Catawba County, dated 03/07/19 prepared by YCH Architects, we understand that renovations to the existing building will be performed as well as construction of a new loop roadway, new loading dock area, and office space.

Existing site grades were estimated using the Catawba County GIS Website and appear to range from approximately 920 to 890 feet above mean sea level (MSL). A grading plan was not provided at the time of this report, however we understand that proposed grades will remain generally consistent with existing grades, except within the southwestern corner of the site which will require approximately 10 to 15 feet of new structural fill.

# 4.0 EXPLORATION PROCEDURES

Exploration procedures for this project included drilling test borings at the site and laboratory testing of representative soil samples at our laboratory in Hickory, North Carolina.

## 4.1 Field Exploration

The subsurface conditions at the site were explored by drilling eight (8) soil test borings (denoted B-1 through B-8) at the locations indicated on Figure 2 – Boring Location Plan in Appendix A. The borings were drilled on April 9 and April 10, 2019, and extended to depths ranging from 10.0 to 42.5 feet below existing site grades. The boring locations were selected and located in the field by CVET using existing site features as a reference. Ground elevations at the boring locations were estimated using the Catawba County GIS Website. Therefore, the boring locations and elevations shown on Figure 2 and 3; plus the boring logs should be considered approximate.

Drilling was performed with a Geoprobe 7822DT atv-mounted drill rig using continuous-flight hollow stem augers (HSA). Soil samples were obtained by means of the split-barrel sampling procedures performed in general accordance with ASTM D1586. A 2-inch O.D., split-barrel sampler was driven into the soil a distance of 18 inches by means of an automatic hammer. The number of blows required to drive the sampler through the final 12-inch interval is termed the Standard Penetration Test (SPT) "N" value and is indicated for each sample on the boring logs. This value can be used to provide an indication of the in-place relative density of cohesionless soils, but is a less reliable indicator of the consistency of cohesive soils. For cohesive soils, the measurement of unconfined compressive strength $Q_u$ is a better indicator of consistency; this value is also listed on the boring logs.

Representative portions of each SPT sample were sealed in airtight containers and returned to our laboratory for classification, laboratory testing, and storage. See the individual soil test boring logs in Appendix B for more details. Note that the soil samples will be discarded after 60 days from this report date, unless otherwise directed by Catawba County.

## 4.2 Laboratory Testing

Representative samples of soil obtained during the field exploration were transported to CVET's laboratory in Hickory, North Carolina, where they were examined and classified by a geotechnical engineer. The soil samples were visually classified in general accordance with the Unified Soil Classification System (USCS), per ASTM D2487. Laboratory testing for this portion of the study consisted of Soil Moisture Content (ASTM D2216), Grain Size

Distribution (ASTM D422) and Atterberg limits for plasticity (ASTM D4318). The soil laboratory results are included in Appendix C.

## 5.0 SUBSURFACE CONDITIONS

The subsurface conditions at the site are described in the following paragraphs.

### 5.1 Site Geology

The site is located in the Piedmont Physiographic Province of North Carolina. The name "piedmont" means "foot-of-the-mountains" which reflect remnants of an ancient mountain range that has since been extensively weathered, decomposed and eroded to form rolling terrain and hillsides. The bedrock is metamorphic in nature (igneous or sedimentary rocks that have been changed by heat and/or pressure) and typically consists of schist, gneiss and/or granite. Extensive weathering over time has reduced the bedrock in-place to form overburden residual soils that range from clay topsoil to sandy silts and silty sandy that grade with depth back to saprolite and partially-weathered-bedrock. The degree of weathering varies both laterally and vertically. Based on the 1985 North Carolina Geologic map, the site appears to be underlain by Amphibolite, Biotite Gneiss and Schist.

### 5.2 Soils

A generalized subsurface profile has been prepared for the site - see Figure 3 in Appendix A. Soil boring logs are included in Appendix B. The area being evaluated generally consists of asphaltic pavement (B-1 through B-4) or topsoil (B-5 through B-8) underlain by fill and residual soils. The generalized subsurface conditions are described below.

Asphalt thickness was measured to be approximately 3.5, 3.0, 4.0, and 3.0 in borings B-1 through B-4, respectively. The underlying ABC stone base as measured to be approximately 6.0, 3.0, 8.0, and 6.0 inches, respectively, at each test location. Surficial topsoil, ranging from 1.0 to 4.0 inches, was encountered in borings B-5 through B-8. Existing fill soils were encountered in all test borings to depths ranging from approximately 5.0 to 10.0 feet below existing site grades. The encountered fill soil consists mainly of clayey sand (SC), fat clay (CH), elastic silt (MH), and lesser amounts of sandy silt/silty sand (ML/SM). SPT N-values within the fill soils ranges from 2 to 13 blows per foot (bpf) indicating very soft to stiff consistencies. Organic content encountered within the existing fill soil in boring B-4 was measured to range from approximately 4.7 to 5.2 percent by weight to a depth of approximately 5.0 feet below existing site grades. Generally, the existing fill soil contains minor traces of root fragments.

Residual soils were encountered in all eight (8) soil test borings. The residuum mainly consists of sandy silt (ML), silty sand (SM), and/or clayey sand (SC). SPT N-values within the residuum ranges from 0 to 44 bpf indicating very loose to dense soil consistency.

### 5.3 Bedrock

Partially weathered rock resulting in auger refusal conditions was encountered at approximately 42.5 feet below existing site grades in boring B-8.

### 5.4 Groundwater

Groundwater was encountered in soil test boring B-8 at the time of drilling (ATD) at a depth of approximately 24.0 feet below existing site grades and at the end of drilling (EOD) operations at approximately 23.0 feet below existing site grades. Note that boreholes are left open for only a short period of time during the drilling operation, so the detection of groundwater during this brief period is difficult. Also note that soil moisture and groundwater conditions vary depending on conditions such as temperature, precipitation and season. Therefore, soil moisture and groundwater location at other times of the year may vary from those observed at the time of this subsurface exploration and as described in this report.

The borehole cave-in depths ranged from 5.2 to 25.0 feet below existing site grades. In this geology, the cave-in depth of a boring is sometimes an indication of the stabilized water level, although the water level may be a few feet below the cave-in depth and therefore cannot be directly observed.

## 6.0 RECOMMENDATIONS FOR DESIGN AND CONSTRUCTION

The following recommendations are provided for the construction of the renovations for Catawba County Board of Elections located at 145 Government Drive in Newton, North Carolina. The recommendations stated herein shall not be applied to any other project, or used in conjunction with any other recommendation, and shall be used explicitly for this project.

### 6.1 Site Preparation

Site preparation should consist of the relocation or proper abandonment of any existing utilities that may be affected by the proposed construction, removal of the existing asphalt and ABC stone base, along with all other soft or unsuitable material from the extents of the proposed development. Site preparation operations should extend a minimum of 10 feet beyond the planned limits of the facilities and a minimum of 5 feet beyond the planned limits of the pavement areas. We recommend that the existing ABC stone, within

the areas to receive structural fill soil, be stockpiled and reserved for backfill material if undercut is required during construction of the proposed pavement areas.

We recommend that during clearing operations a series of test pits be extended within the existing fill soils to confirm consistency and evaluate the suitability to remain in place, be utilized as structural fill, or need removal and replacement with alternate soils. Laboratory testing indicates that the surficial site soils are plastic/elastic in nature and are anticipated to be unstable during initial proofrolling observations if insitu moisture contents are at or above the optimum moisture content. In addition, these soils are susceptible to shrink/swell behaviors as moisture content fluctuates, which typically results in premature pavement distress and associated maintenance if left in place at pavement subgrade elevation. Additionally, the elevated organic content observed in boring B-4 may require removal and replacement with approved structural fill soils.

Once stripping and rough excavation has been accomplished, the exposed subgrade should be evaluated by proofrolling. Proofrolling consists of driving the appropriate equipment, typically a dump truck with axle weights of 10 or 20 tons for single and double axles respectively, over the subgrade at a walking pace. The proofrolling equipment should first make overlapping passes across the subgrade in one direction, followed by passes in a perpendicular direction. Unstable areas that exhibit excessive rutting, pumping and similar distress should be undercut to a competent material and backfilled with controlled fill or other materials as recommended by a qualified geotechnical engineer. We recommend that the proofrolling be observed by a qualified engineer or engineering technician.

If conditions revealed during site preparation operations vary from those described in this report, the on-site geotechnical engineer shall contact the engineer of said report to discuss potential options to address the varying site conditions.

## 6.2 Earthwork

Existing site grades were estimated using the Catawba County GIS Website and appear to range from approximately 920 to 890 feet above mean sea level (MSL). A grading plan was not provided at the time of this report, however we understand that proposed grades will remain generally consistent with existing grades, except within the southwestern corner of the site which will require approximately 10 to 15 feet of new structural fill.

Any required fill soils should be compacted to at least 98 percent of the maximum dry density obtained in accordance with ASTM Specification D-698, Standard Proctor Method, with a moisture content within +/- 3% of the optimum moisture content (OMC). Acceptable fill soils should be soil that has less than 5 percent organic content and a liquid limit and plasticity index less than 50 and 20, respectively. Soils with USCS group symbols

of SP, SW, SM, SC, and ML are recommended for use as controlled fill, although it is important to note that silty soils are moisture sensitive and can be difficult to place with in-situ moisture contents at or above the OMC. We do not recommend reuse of any elastic/plastic site soils (MH/CH) as structural fill, unless placed within the deepest fill sections under direct supervision of CVET. Any plastic/elastic site soils utilized as structural fill as noted above, shall maintain a minimum of 5 feet below finished subgrade elevation in pavement areas only and shall be stable and compacted to project specifications within allowable soil moisture contents.

All fill soils should be placed in horizontal loose lifts and compacted with adequately-sized equipment. Loose lift thicknesses will vary depending on the size of the compaction equipment: we recommend a maximum of 8 inches for large self-propelled compactors, 6 inches for small self-propelled compactors, and 4 inches for remote-controlled compactors and hand-operated equipment (plate tampers, wacker-packers, or jumping jacks). Vibratory smooth-drum rollers are appropriate for cohesionless/coarse-grained soils while sheepsfoot rollers are appropriate for cohesive/fine-grained soils.

We recommend that positive site drainage be maintained during earthwork operations to prevent the ponding of water on exposed subgrades. Soil subgrades should be protected from inclement weather (rain especially) by 'sealing' the subgrades prior to forecasted inclement weather. 'Sealing' can be performed by rolling with a smooth steel-drum roller without vibration. Ruts should not be created during the 'sealing' operation. Prior to the placement of additional fill, the 'sealed' subgrade should be scarified.

If earthwork is performed during winter months or after inclement weather, the subgrade soil conditions could potentially be more unstable due to wet soil conditions, which could potentially require additional stabilization or undercutting.

## 6.3 Groundwater Control

Groundwater was encountered in soil test boring B-8 at the time of drilling (ATD) at a depth of approximately 24.0 feet below existing site grades and at the end of drilling (EOD) operations at approximately 23.0 feet below existing site grades. Due to the depth of groundwater encountered, we do not anticipate that groundwater control will be necessary for this project. Note that soil moisture and groundwater conditions vary depending on conditions such as temperature, precipitation and season. Therefore soil moisture and groundwater location at other times of the year may vary from those observed at the time of this subsurface exploration and as described in this report.

## 6.4 Foundations

Based upon the encountered subsurface conditions across the site, we recommend supporting the proposed building on shallow foundations bearing on approved residual soils or newly compacted approved fill soils. Shallow foundations for buildings should be designed for an allowable net bearing pressure of up to 2,500 pounds per square foot. We recommend minimum foundation widths and embedment depths of 16 and 24 inches, respectively, for building foundations. Please note that a finished floor elevation for the proposed development has not been provided. The recommended bearing pressure assumes any existing fill soil is addressed, during construction, in accordance with this report. We do not recommend bearing any foundations directly on elastic/plastic soils, especially perimeter foundations which have a greater chance of being subjected to surface water. If such conditions are encountered, we recommend an undercut of the plastic/elastic soil to a depth of at least 36 inches from where encountered at the foundation bearing elevation and replacement with approved fill materials, ABC stone, and/or flowable fill.

A site-specific settlement analysis has not been performed. However, based upon the expected loading and the requirement that the foundations bear on approved existing fill soil, competent residuum, or structural fill soils (to be verified by CVET or another qualified CMT firm), we expect total settlements of structure foundations to not exceed acceptable industry standard tolerances. In general, differential settlements between building components are expected to be on the order of 1/3 to 1/2 of the total settlements. We expect settlements in the building foundations to occur relatively soon after the loads are applied.

## 6.5 Floor Slabs

We recommend that grade slabs be supported on approved residual soils or newly compacted structural fill. The recommended subgrade modulus assumes any existing fill soil is addressed, during construction, in accordance with this report.

If grade slabs are supported on newly compacted, structural fill soils or residual we recommend a modulus of subgrade reaction (k) of up to 100 pounds per cubic inch for structural design of the floor slab. This value is representative of a 1-ft square loaded area and may need to be adjusted depending the size and shape of the loaded area and the method of structural analysis. The floor slab should be isolated from building foundations unless the connection is designed to accommodate anticipated differential settlement between the slab and foundation systems.

We recommend the use of 4 to 6 inches of free-draining granular material (NCDOT No. 57 stone or recycled concrete) as both aggregate base course under the slab and capillary

break. Prior to placing the granular material, the subgrade for the entire floor slab area should be proofrolled. Plastic/elastic soils, if present, are moisture sensitive and prone to shrink/swell with moisture changes. If plastic/elastic soil is exposed at the floor slab elevation, we recommend an undercut of at least 18 inches of the elastic/plastic soil, and replacement with quality non-plastic fill materials. If fill soils are placed to reach final grades, we recommend an 18-inch buffer of non-plastic fill soils between the bottom of foundations and the elastic/plastic soils. Stabilization can also include the installation of a biaxial geogrid (Mirafi BX1200 or approved equivalent) or a heavy woven geotextile fabric (Mirafi HP 370 or approved equivalent) depending on the exposed subgrade soil conditions. If conditions revealed during slab on grade preparation operations vary from those described in this report, the on-site geotechnical engineer shall contact the engineer of said report to discuss potential options to address the varying site conditions.

The use of a vapor retarder should be considered beneath concrete slabs on grade which will be covered with wood, tile, carpet or other moisture-sensitive or impervious coverings, per ACI 302 and/or ACI 360. Construction joints, contraction joints, and isolation joints should be provided in the slab to reduce the impacts of cracking and shrinkage. See ACI 302 for additional details regarding slab joint design.

## 6.6 Pavements

Traffic loading conditions for this project have not been provided. Pavement for this project is assumed to consist of light-duty asphalt parking areas (only personal vehicle traffic) and heavy-duty asphalt drives (drive lanes).

Based on the subsurface conditions encountered in the test borings, and assuming all pavement areas pass a proofroll as described in section 6.1 of this report, we recommend thicknesses of 2.0, 0 and 8.0 inches for surface course, base course and ABC crushed stone, respectively, for light-duty pavement. For heavy-duty pavement, we recommend thicknesses of 1.5, 2.0 and 8.0 inches for surface course, binder course, and ABC crushed stone, respectively. We recommend an 8-inch thick Portland cement concrete slab bearing on 8.0 inches of ABC crushed stone for the approach and slab for any trash dumpster on site. If concrete pavements are desired, we recommend a minimum of 8.0 inches of concrete overlying 8.0 inches of ABC crushed stone base. The concrete should be air-entrained and have a minimum of 4,000 psi after 28 days of laboratory curing per ASTM C-31. It should be noted that the design recommendations stated may not satisfy North Carolina Department of Transportation guidelines; therefore, we recommend that any roadways constructed for public use with maintenance provided by the State be designed in accordance with State regulatory requirements.

If a proofroll reveals unstable soils, stabilization and/or undercut should be anticipated.

Remedial recommendations should be generated as a result of the observations from the test pits and proofrolling activities. Generally, recommendations to address the existing site soils includes (1) Lowest Risk - undercut of a minimum of 12-inches of the plastic/elastic soils below subgrade elevation and replacement with non-plastic, structural fill soils (2) Moderate Risk - limited undercut (maximum 4-inches) and replacement with a geotextile and additional ABC stone base (3) High Risk – undercut and replace only unstable areas and leave plastic/elastic site soils at pavement subgrade. Please note that option 3 is not recommended by CVET. If fill soils will be placed to reach final grades, we recommend an 18 inch buffer of non-plastic fill soils between the pavement subgrade and the elastic soils. Stabilization could consist of the installation of a biaxial geogrid (Tensar BX1200 or approved equivalent) or a heavy woven geotextile fabric (Mirafi HP 370 or approved equivalent) depending on the exposed subgrade soil conditions.

Careful control of storm water is one of the best ways to endure adequate long-term performance of any pavement. The surface of the pavement should be sloped to gutters and/or catch basins to prevent water from ponding and infiltrating through the pavement into the sub-base and subgrade.

We recommend compaction testing of the ABC crushed stone base prior to asphalt/concrete placement, and full-time inspection during asphalt/concrete placement.

## 6.7 Seismic Site Classification

Based on our soil test boring data at the proposed site, it is our opinion that a Site Seismic Classification of D is appropriate for this site. This opinion is based on calculations that use SPT and unconfined compressive strength data from the boring logs, in accordance with the 2012 North Carolina State Building Code. Note that a site seismic classification of D correlates with an average N value between 15 and 50 and "stiff soil profile" for the upper 100 feet of overburden.

## 6.8 Construction Materials Testing and Special Inspections

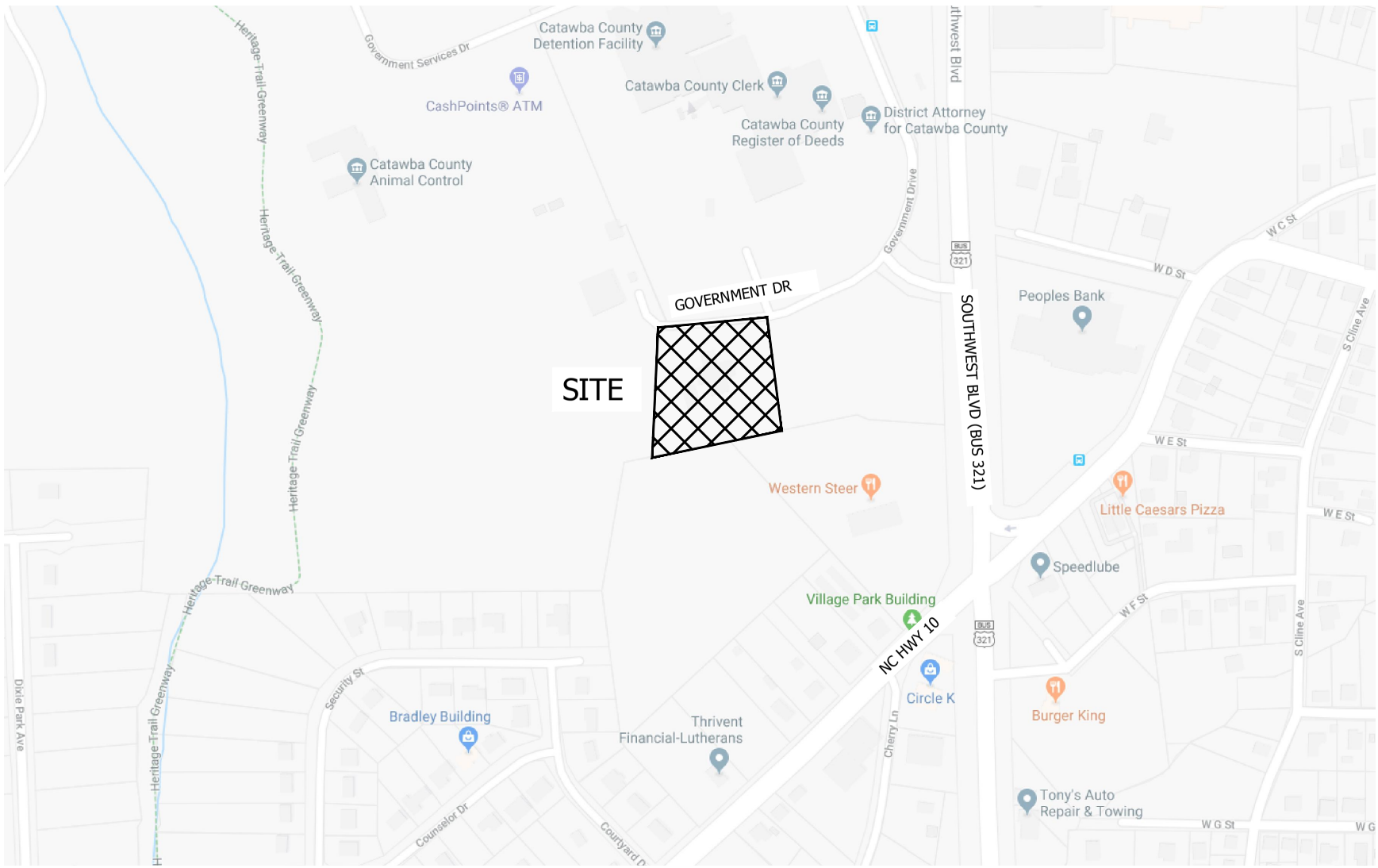
Construction materials testing (CMT) and special inspections (SI) should be performed at regular intervals throughout the course of the project. CVET is qualified for this work and would be pleased to provide these services during construction.

# 7.0 LIMITATIONS

This report has been prepared for the exclusive use of Catawba County and their agents for specific application to the referenced property, in accordance with generally accepted soils and foundation engineering practices. No warranties, express or implied, are intended or made. The conclusions and recommendations presented in this report are

based on the specific test borings and laboratory testing performed as part of our scope of work, and do not reflect variations in subsurface conditions that may exist between test boring locations or in unexplored portions of the site. Note that the soil data presented in this report is for the specific time of this subsurface exploration. While the type of material encountered in the test borings will not likely change significantly over time, the properties of the materials can and will change over time, including soil moisture content, density, consistency, SPT "N" values, etc. Fluctuations in the groundwater level can have a significant impact on the material properties, as can seasonal changes. Site safety, excavation support related to OSHA requirements, and construction dewatering requirements are the responsibility of others, not CVET. In the event changes are made to the proposed construction plans, design or location of the project as described within this report, the conclusions and recommendations provided in this report shall not be considered valid unless CVET is given the opportunity to review the changes, and either verifies or modifies the conclusions and recommendations contained in this report in writing.

# APPENDIX A – PROJECT FIGURES




# SITE MAP

SCHEMATIC

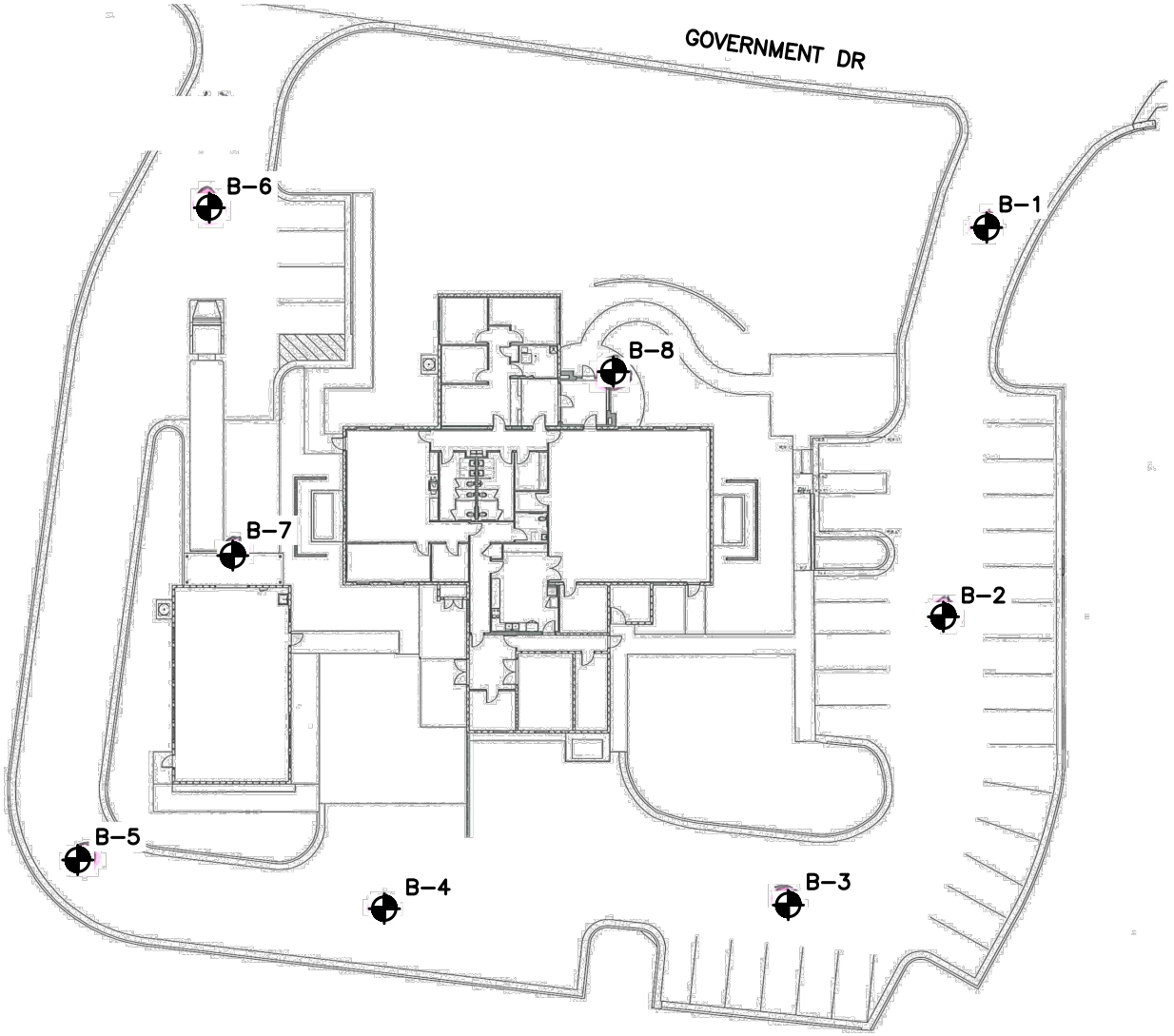
CATAWBA VALLEY
ENGINEERING & TESTING

P.O.B. 747 HICKORY, NORTH CAROLINA 28603
TELE: 828-578-9972 FAX: 828-322-1801

# CATAWBA COUNTY B.O.E.

GOVERNMENT DRIVE
NEWTON, NORTH CAROLINA

| DRAWN BY | PROJECT NO. |
|---|---|
| EMB | 19-517 |
| DATE | SHEET NO. |
| 04-15-19 | FIG. 1 |




# BORING LOCATIONS

SCHEMATIC

CATAWBA VALLEY
ENGINEERING & TESTING

P.O.B. 747 HICKORY, NORTH CAROLINA 28603
TELE: 828-578-9972 FAX: 828-322-1801

## CATAWBA COUNTY B.O.E.

GOVERNMENT DRIVE
NEWTON, NORTH CAROLINA

| DRAWN BY | PROJECT NO. |
|---|---|
| EMB | 19-517 |
| DATE | SHEET NO. |
| 04-15-19 | FIG. 2 |

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CVET
308 15th St SE
Hickory, NC 28702
Telephone: 828 578 9972

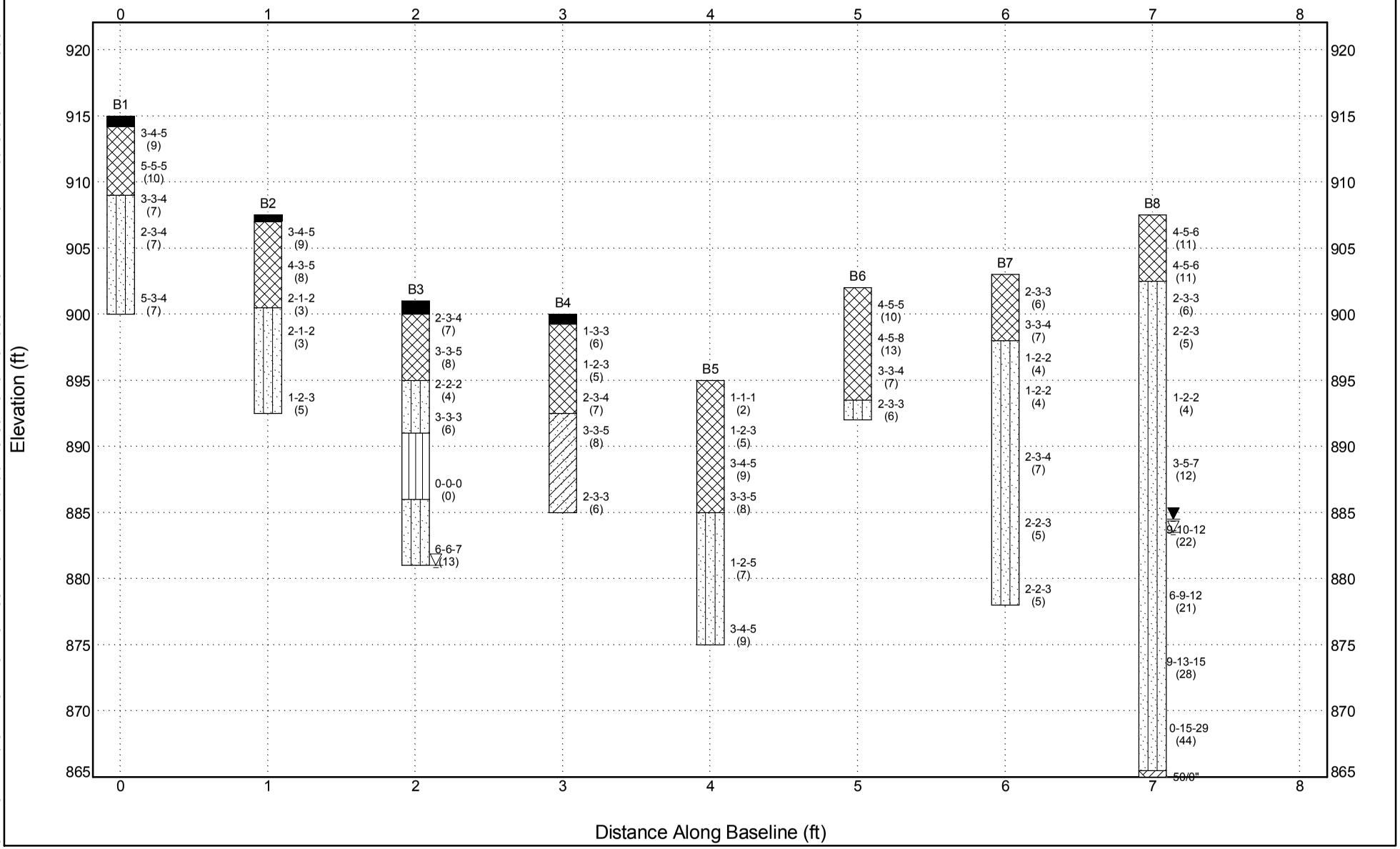
# SUBSURFACE DIAGRAM

**CLIENT** Catawba County

**PROJECT NAME** Catawba County BOE

**PROJECT NUMBER** 19-517

**PROJECT LOCATION** 25 Government Drive, Newton, NC



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# KEY TO SYMBOLS

**CLIENT** Catawba County
**PROJECT NAME** Catawba County BOE
**PROJECT NUMBER** 19-517
**PROJECT LOCATION** 25 Government Drive, Newton, NC

## LITHOLOGIC SYMBOLS
## (Unified Soil Classification System)

- ASPHALT: Asphalt
- BEDROCK: Bedrock
- FILL: Fill (made ground)
- ML: USCS Silt
- SC: USCS Clayey Sand
- SM: USCS Silty Sand

## SAMPLER SYMBOLS

- Split Spoon

## WELL CONSTRUCTION SYMBOLS

## ABBREVIATIONS

LL - LIQUID LIMIT (%)
PI - PLASTIC INDEX (%)
W - MOISTURE CONTENT (%)
DD - DRY DENSITY (PCF)
NP - NON PLASTIC
-200 - PERCENT PASSING NO. 200 SIEVE
PP - POCKET PENETROMETER (TSF)
TV - TORVANE
PID - PHOTOIONIZATION DETECTOR
UC - UNCONFINED COMPRESSION
ppm - PARTS PER MILLION
Water Level at Time Drilling, or as Shown
Water Level at End of Drilling, or as Shown
Water Level After 24 Hours, or as Shown

# APPENDIX B – BORING LOGS

## REFERENCE NOTES FOR BORING LOGS

### I. Drilling Sampling Symbols

| | | | |
|---|---|---|---|
| SS | Split Spoon Sampler | ST | Shelby Tube Sampler |
| RC | Rock Core, NX, BX, AX | PM | Pressure meter |
| DC | Dutch Cone Penetrometer | RD | Rock Bit Drilling |
| BS | Bulk Sample of Cuttings | PA | Power Auger (no sample) |
| HSA | Hollow Stem Auger | WS | Wash Sample |
| REC | Rock Sample Recovery % | RQD | Rock Quality Designation % |

### II. Correlation of Penetration Resistance to Soil Properties

Standard penetration (blows/ft) refers to the blows per foot of a 140 lb. hammer falling 30 inches on a 2 inch OD split spoon sampler, as specified in ASTM D 1586. The blow count is commonly referred to as the N-value.

#### A. Non-Cohesive Soils (Silt, Sand, Gravel and Combinations)

| *Density* | *Adjective Form* |
|---|---|
| Under 4 blows/ft | Very Loose |
| 5 to 10 blows/ft | Loose |
| 11 to 30 blows/ft | Medium Dense |
| 31 to 50 blows/ft | Dense |
| Over 51 blows/ft | Very Dense |

| *Particle Size Identification* | | |
|---|---|---|
| Boulders | | 8 inches and larger |
| Cobbles | | 3 to 8 inches |
| Gravel | Coarse | 1 to 3 inches |
| | Medium | ½ to 1 inch |
| | Fine | ¼ to ½ inch |
| Sand | Coarse | 2.00 mm to ¼ inch |
| | Medium | 0.42 to 2.0 mm |
| | Fine | 0.074 to 0.42 mm |
| Silt and Clay | | 0.0 to 0.074 mm |

#### B. Cohesive Soils (Clay, Silt, and Combinations)

| *Blows/ft* | *Consistency* | *Unconfined Comp. Strength $Q_p$ (tsf)* | *Degree of Plasticity* | *Plasticity Index* |
|---|---|---|---|---|
| Under 2 | Very Soft | Under 0.25 | None to Slight | 0-4 |
| 3 to 4 | Soft | 0.25-0.49 | Slight | 5-7 |
| 5 to 8 | Medium Stiff | 0.50-0.99 | Medium | 8-22 |
| 9 to 15 | Stiff | 1.00-1.99 | High to Very High | Over 22 |
| 16 to 30 | Very Stiff | 2.00-3.00 | | |
| 31 to 50 | Hard | 4.00-8.00 | | |
| Over 51 | Very Hard | Over 8.00 | | |

### III. Water Level Measurement Symbols

| | | |
|---|---|---|
| WL Water Level | BCR Before Casing Removal | DCI Dry Cave-in |
| WS While Sampling | ACR After Casing Removal | WCI Wet Cave-in |
| WD While Drilling | ▽ Est. Groundwater Level | ▽ Est. Seasonal High GWT |

The water levels are those levels actually measured in the borehole at the times indicated by the symbol. The measurements are relatively reliable when augering, without adding fluids, in a granular soil. In clay and plastic silts, the accurate determination of water levels may require several days for the water level to stabilize. In such cases, additional methods of measurement are generally applied.

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# BORING NUMBER B1



**CLIENT** Catawba County
**PROJECT NAME** Catawba County BOE
**PROJECT NUMBER** 19-517
**PROJECT LOCATION** 25 Government Drive, Newton, NC
**DATE STARTED** 4/9/19 **COMPLETED** 4/9/19
**GROUND ELEVATION** 915 ft MSL **HOLE SIZE** 2.25 inches
**DRILLING CONTRACTOR** CVET
**GROUND WATER LEVELS:**
**DRILLING METHOD** 2.25 Hollow Stem Auger
**AT TIME OF DRILLING** --- Cave at 9.2 ft.
**LOGGED BY** TV **CHECKED BY** CBD
**AT END OF DRILLING** ---
**NOTES**
**AFTER DRILLING** ---

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | SAMPLE TYPE NUMBER | RECOVERY % (RQD) | BLOW COUNTS (N VALUE) | POCKET PEN. (tsf) | DRY UNIT WT. (pcf) |
|---|---|---|---|---|---|---|---|
| 0.0 | | ASPHALT (3.5") 7 Stone (6") | | | | | |
| | | (CH) FILL: Sandy Fat CLAY, Dark Red, Moist, Stiff | SS 1 | 100 | 3-4-5 (9) | | |
| 2.5 | | | | | | | |
| | | | SS 2 | 100 | 5-5-5 (10) | | |
| 5.0 | | | | | | | |
| | | (SM) RESIDUAL: Silty SAND with Black Inclusions, Orange-Brown, Red-Orange, Dry to Moist, Loose | SS 3 | 100 | 3-3-4 (7) | | |
| 7.5 | | | | | | | |
| | | | SS 4 | 100 | 2-3-4 (7) | | |
| 10.0 | | | | | | | |
| 12.5 | | | | | | | |
| | | | SS 5 | 100 | 5-3-4 (7) | | |
| 15.0 | | Bottom of borehole at 15.0 feet. | | | | | |

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

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# BORING NUMBER B2



**CLIENT** Catawba County
**PROJECT NAME** Catawba County BOE
**PROJECT NUMBER** 19-517
**PROJECT LOCATION** 25 Government Drive, Newton, NC
**DATE STARTED** 4/9/19 **COMPLETED** 4/9/19
**GROUND ELEVATION** 907.5 ft MSL **HOLE SIZE** 2.25 inches
**DRILLING CONTRACTOR** CVET
**GROUND WATER LEVELS:**
**DRILLING METHOD** 2.25 Hollow Stem Auger
**AT TIME OF DRILLING** --- Cave at 9.2 ft.
**LOGGED BY** TV **CHECKED BY** CBD
**AT END OF DRILLING** ---
**NOTES**
**AFTER DRILLING** ---

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | SAMPLE TYPE NUMBER | RECOVERY % (RQD) | BLOW COUNTS (N VALUE) | POCKET PEN. (tsf) | DRY UNIT WT. (pcf) |
|---|---|---|---|---|---|---|---|
| 0.0 | | ASPHALT (3") 7 Stone (3") | | | | | |
| | | (ML) FILL: Sandy SILT, Orange, Moist, Medium Stiff to Stiff | SS 1 | 100 | 3-4-5 (9) | | |
| 2.5 | | | SS 2 | 100 | 4-3-5 (8) | | |
| 5.0 | | | SS 3 | 100 | 2-1-2 (3) | | |
| 7.5 | | (SM) RESIDUAL: Silty Fine SAND, Tan, Light Brown, Moist, Very Loose to Loose | SS 4 | 100 | 2-1-2 (3) | | |
| 10.0 | | | | | | | |
| 12.5 | | | SS 5 | 100 | 1-2-3 (5) | | |
| 15.0 | | Bottom of borehole at 15.0 feet. | | | | | |

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

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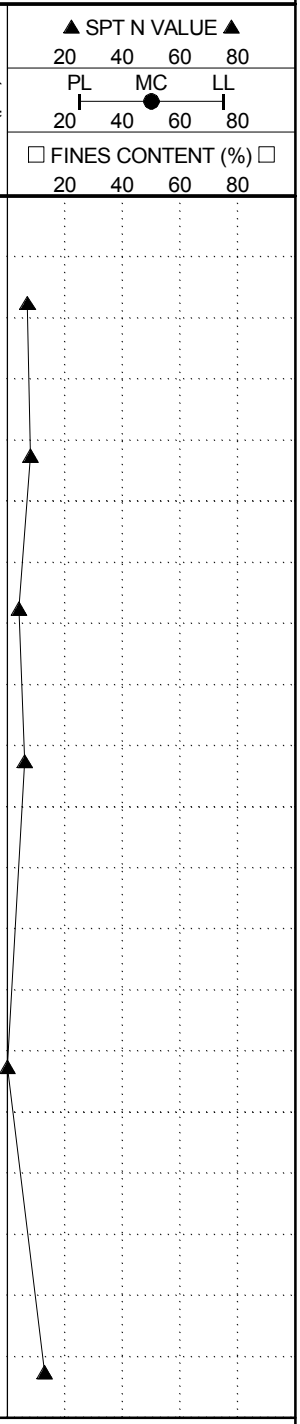
# BORING NUMBER B3



**CLIENT** Catawba County
**PROJECT NAME** Catawba County BOE
**PROJECT NUMBER** 19-517
**PROJECT LOCATION** 25 Government Drive, Newton, NC
**DATE STARTED** 4/9/19 **COMPLETED** 4/9/19
**GROUND ELEVATION** 901 ft MSL **HOLE SIZE** 2.25 inches
**DRILLING CONTRACTOR** CVET
**GROUND WATER LEVELS:**
**DRILLING METHOD** 2.25 Hollow Stem Auger
▽ **AT TIME OF DRILLING** 20.00 ft / Elev 881.00 ft Cave at 14.0 ft.
**LOGGED BY** TV **CHECKED BY** CBD
**AT END OF DRILLING** ---
**NOTES**
**AFTER DRILLING** ---

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | SAMPLE TYPE NUMBER | RECOVERY % (RQD) | BLOW COUNTS (N VALUE) | POCKET PEN. (tsf) | DRY UNIT WT. (pcf) |
|---|---|---|---|---|---|---|---|
| 0 | | ASPHALT (4") 7 Stone (8") | | | | | |
| | | (SM) FILL: Silty SAND with Intervals of Sandy Fat CLAY and Trace Organic Material from 1.0 - 2.5 ft. Dark Red, Orange, Moist, Loose | SS 1 | 100 | 2-3-4 (7) | | |
| 5 | | | SS 2 | 100 | 3-3-5 (8) | | |
| | | (SM) POSSIBLE FILL/RESIDUAL: Silty SAND, White, Grey, Moist to Wet, Very Loose to Loose | SS 3 | 100 | 2-2-2 (4) | | |
| 10 | | | SS 4 | 100 | 3-3-3 (6) | | |
| | | (ML) RESIDUAL: Sandy SILT, Orange, Black, Wet, Very Soft | SS 5 | 100 | 0-0-0 (0) | | |
| 15 | | | | | | | |
| | | (SM) RESIDUAL: Silty SAND, Grey, Brown, Tan, Wet, Medium Dense | SS 6 | 100 | 6-6-7 (13) | | |
| 20 | | ▽ | | | | | |

Bottom of borehole at 20.0 feet.



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# BORING NUMBER B4



**CLIENT** Catawba County
**PROJECT NAME** Catawba County BOE
**PROJECT NUMBER** 19-517
**PROJECT LOCATION** 25 Government Drive, Newton, NC
**DATE STARTED** 4/10/19 **COMPLETED** 4/10/19
**GROUND ELEVATION** 900 ft MSL **HOLE SIZE** 2.25 inches
**DRILLING CONTRACTOR** CVET
**GROUND WATER LEVELS:**
**DRILLING METHOD** 2.25 Hollow Stem Auger
**AT TIME OF DRILLING** --- Cave at 9.0 ft.
**LOGGED BY** TV **CHECKED BY** CBD
**AT END OF DRILLING** ---
**NOTES**
**AFTER DRILLING** ---

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | SAMPLE TYPE NUMBER | RECOVERY % (RQD) | BLOW COUNTS (N VALUE) | POCKET PEN. (tsf) | DRY UNIT WT. (pcf) |
|---|---|---|---|---|---|---|---|
| 0.0 | | ASPHALT (3") 7 Stone (6") | | | | | |
| | | (SC) FILL: Clayey SAND with Heavy Organic Content from 0.75 - 5.0 ft. Dark Red, Black, Brown, Orange, Moist to Wet, Loose | SS 1 | 100 | 1-3-3 (6) | | |
| 2.5 | | | | | | | |
| | | | SS 2 | 100 | 1-2-3 (5) | | |
| 5.0 | | | | | | | |
| | | | SS 3 | 100 | 2-3-4 (7) | | |
| 7.5 | | (SC) RESIDUAL: Clayey SAND, White, Red, Orange, Moist, Loose | | | | | |
| | | | SS 4 | 100 | 3-3-5 (8) | | |
| 10.0 | | | | | | | |
| 12.5 | | | | | | | |
| | | | SS 5 | 100 | 2-3-3 (6) | | |
| 15.0 | | Bottom of borehole at 15.0 feet. | | | | | |

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

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# BORING NUMBER B5



**CLIENT** Catawba County
**PROJECT NAME** Catawba County BOE
**PROJECT NUMBER** 19-517
**PROJECT LOCATION** 25 Government Drive, Newton, NC
**DATE STARTED** 4/10/19 **COMPLETED** 4/10/19
**GROUND ELEVATION** 895 ft MSL **HOLE SIZE** 2.25 inches
**DRILLING CONTRACTOR** CVET
**GROUND WATER LEVELS:**
**DRILLING METHOD** 2.25 Hollow Stem Auger
**AT TIME OF DRILLING** --- Cave at 14.2 ft.
**LOGGED BY** TV **CHECKED BY** CBD
**AT END OF DRILLING** ---
**NOTES**
**AFTER DRILLING** ---

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | SAMPLE TYPE NUMBER | RECOVERY % (RQD) | BLOW COUNTS (N VALUE) | POCKET PEN. (tsf) | DRY UNIT WT. (pcf) |
|---|---|---|---|---|---|---|---|
| 0 | | (SM) FILL: Silty SAND with Root Fragments Throughout, Light Brown, Tan, Grey, Moist to Wet, Very Loose to Loose | | | | | |
| | | | SS 1 | 100 | 1-1-1 (2) | | |
| | | | SS 2 | 100 | 1-2-3 (5) | | |
| 5 | | | SS 3 | 100 | 3-4-5 (9) | | |
| | | | SS 4 | 100 | 3-3-5 (8) | | |
| 10 | | (SM) RESIDUAL: Silty SAND, Micaceous, Light Brown to Orange, Wet, Loose | | | | | |
| | | | SS 5 | 100 | 1-2-5 (7) | | |
| 15 | | | | | | | |
| | | | SS 6 | 100 | 3-4-5 (9) | | |
| 20 | | Bottom of borehole at 20.0 feet. | | | | | |

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

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# BORING NUMBER B6



**CLIENT** Catawba County
**PROJECT NAME** Catawba County BOE
**PROJECT NUMBER** 19-517
**PROJECT LOCATION** 25 Government Drive, Newton, NC
**DATE STARTED** 4/10/19 **COMPLETED** 4/10/19
**GROUND ELEVATION** 902 ft MSL **HOLE SIZE** 2.25 inches
**DRILLING CONTRACTOR** CVET
**GROUND WATER LEVELS:**
**DRILLING METHOD** 2.25 Hollow Stem Auger
**AT TIME OF DRILLING** --- Cave at 5.2 ft.
**LOGGED BY** TV **CHECKED BY** CBD
**AT END OF DRILLING** ---
**NOTES**
**AFTER DRILLING** ---

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | SAMPLE TYPE NUMBER | RECOVERY % (RQD) | BLOW COUNTS (N VALUE) | POCKET PEN. (tsf) | DRY UNIT WT. (pcf) |
|---|---|---|---|---|---|---|---|
| 0.0 | | (SM) FILL: Silty SAND with Root Fragments, Red-Orange, Moist, Loose to Medium Dense | | | | | |
| | | | SS 1 | 100 | 4-5-5 (10) | | |
| 2.5 | | | | | | | |
| | | | SS 2 | 100 | 4-5-8 (13) | | |
| 5.0 | | | | | | | |
| | | | SS 3 | 100 | 3-3-4 (7) | | |
| 7.5 | | | | | | | |
| | | (SM) RESIDUAL: Silty SAND, Red-Orange to Orange, Moist, Loose | SS 4 | 100 | 2-3-3 (6) | | |
| 10.0 | | Bottom of borehole at 10.0 feet. | | | | | |

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

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# BORING NUMBER B7



**CLIENT** Catawba County
**PROJECT NAME** Catawba County BOE
**PROJECT NUMBER** 19-517
**PROJECT LOCATION** 25 Government Drive, Newton, NC
**DATE STARTED** 4/10/19 **COMPLETED** 4/10/19
**GROUND ELEVATION** 903 ft MSL **HOLE SIZE** 2.25 inches
**DRILLING CONTRACTOR** CVET
**GROUND WATER LEVELS:**
**DRILLING METHOD** 2.25 Hollow Stem Auger
**AT TIME OF DRILLING** --- Cave at 17.0 ft.
**LOGGED BY** TV **CHECKED BY** CBD
**AT END OF DRILLING** ---
**NOTES**
**AFTER DRILLING** ---

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | SAMPLE TYPE NUMBER | RECOVERY % (RQD) | BLOW COUNTS (N VALUE) | POCKET PEN. (tsf) | DRY UNIT WT. (pcf) |
|---|---|---|---|---|---|---|---|
| 0 | | (MH) FILL: Sandy Elastic SILT, Dark Red, Moist, Medium Stiff | | | | | |
| | | | SS 1 | 100 | 2-3-3 (6) | | |
| 5 | | | SS 2 | 100 | 3-3-4 (7) | | |
| | | (SM) RESIDUAL: Silty Fine SAND with Intervals of Sandy SILT, Orange, Moist to Wet, Very Loose to Loose | | | | | |
| | | | SS 3 | 100 | 1-2-2 (4) | | |
| 10 | | | SS 4 | 100 | 1-2-2 (4) | | |
| | | | SS 5 | 100 | 2-3-4 (7) | | |
| 15 | | | | | | | |
| | | | SS 6 | 56 | 2-2-3 (5) | | |
| 20 | | | | | | | |
| | | | SS 7 | 100 | 2-2-3 (5) | | |
| 25 | | | | | | | |

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

Bottom of borehole at 25.0 feet.

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# BORING NUMBER B8



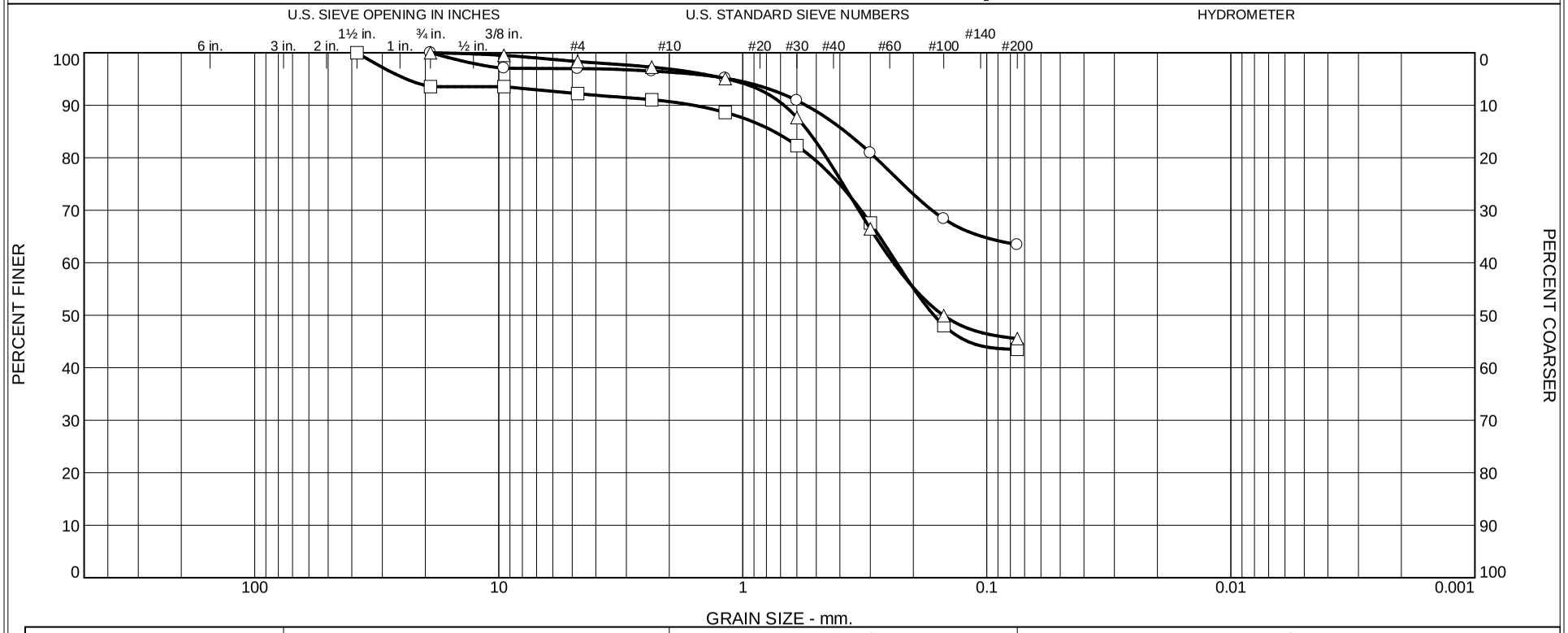
**CLIENT** Catawba County
**PROJECT NAME** Catawba County BOE
**PROJECT NUMBER** 19-517
**PROJECT LOCATION** 25 Government Drive, Newton, NC
**DATE STARTED** 4/10/19 **COMPLETED** 4/10/19
**GROUND ELEVATION** 907.5 ft MSL **HOLE SIZE** 2.25 inches
**DRILLING CONTRACTOR** CVET
**GROUND WATER LEVELS:**
**DRILLING METHOD** 2.25 Hollow Stem Auger
▽ **AT TIME OF DRILLING** 24.00 ft / Elev 883.50 ft Cave at 25.0 ft.
**LOGGED BY** TV **CHECKED BY** CBD
▼ **AT END OF DRILLING** 23.00 ft / Elev 884.50 ft
**NOTES**
**AFTER DRILLING** ---

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | SAMPLE TYPE NUMBER | RECOVERY % (RQD) | BLOW COUNTS (N VALUE) | POCKET PEN. (tsf) | DRY UNIT WT. (pcf) |
|---|---|---|---|---|---|---|---|
| 0 | | (ML) FILL: Sandy SILT, Red-Orange, Moist, Stiff | SS 1 | 100 | 4-5-6 (11) | | |
| | | | SS 2 | 100 | 4-5-6 (11) | | |
| 5 | | (SM) RESIDUAL: Silty SAND with Rock Fragments, Orange, Tan, White, Brown, Moist to Wet, Very Loose to Dense | SS 3 | 100 | 2-3-3 (6) | | |
| | | | SS 4 | 100 | 2-2-3 (5) | | |
| 10 | | | | | | | |
| | | | SS 5 | 100 | 1-2-2 (4) | | |
| 15 | | | | | | | |
| | | | SS 6 | 100 | 3-5-7 (12) | | |
| 20 | | | | | | | |
| | | ▼ ▽ | SS 7 | 100 | 9-10-12 (22) | | |
| 25 | | | | | | | |
| | | | SS 8 | 100 | 6-9-12 (21) | | |
| 30 | | | | | | | |
| | | | SS 9 | 100 | 9-13-15 (28) | | |
| 35 | | | | | | | |
| | | | SS 10 | 100 | 10-15-29 (44) | | |
| 40 | | | | | | | |
| | | PARTIALLY WEATHERED BEDROCK: NO SAMPLE | SS 11 | | 50/0" | | |
| | | Refusal at 42.5 feet. Bottom of borehole at 42.5 feet. | | | | | |

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

# APPENDIX C – LABORATORY TEST DATA

# Particle Size Distribution Report




| | % +3" | % Gravel | % Sand | | % Fines | |
|---|---|---|---|---|---|---|
| | | | Coarse | Fine | Silt | Clay |
| ○ | 0 | 4 | 9 | 24 | 63 | |
| □ | 0 | 9 | 15 | 32 | 44 | |
| △ | 0 | 3 | 19 | 32 | 46 | |

| | Source | Sample # | Depth/Elev. | Date Sampled | USCS | Material Description | NM % | LL | PL |
|---|---|---|---|---|---|---|---|---|---|
| ○ | Test Borings | 3639 | B1 1-2.5' | 4/15/19 | CH | Red Sandy Fat CLAY | 23.8 | 61 | 30 |
| □ | Test Borings | 3640 | B4 1-2.5' | 4/15/19 | SC | Dark Brown/Black Clayey SAND | 18.5 | 29 | 17 |
| △ | Test Borings | 3461 | B4 3.5-5' | 4/15/19 | SC | Dark Brown Clayey SAND | 19.4 | 28 | 17 |

Client Catawba County

Project Board of Elections

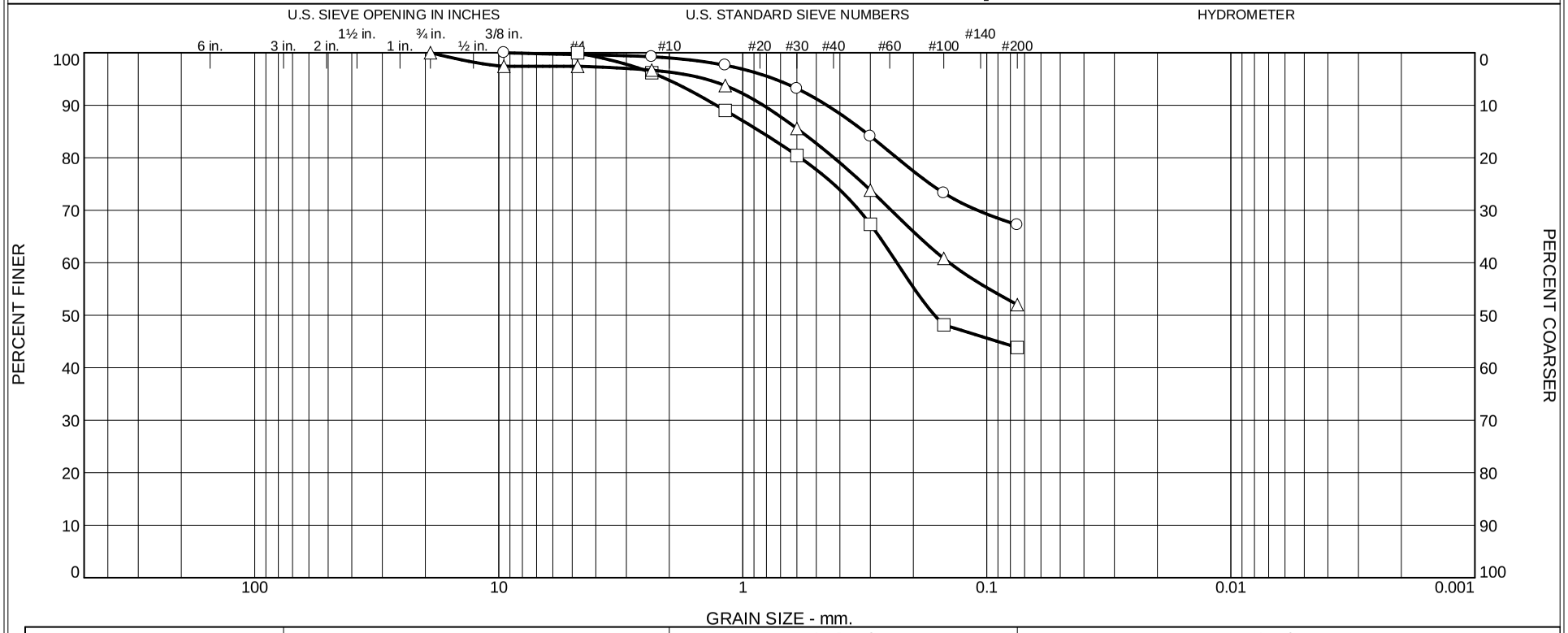
Project No. 19517 Figure

**Catawba Valley Engineering & Testing, P.C.**
**Hickory, North Carolina**

□ Organic content by weight: 4.7%
△ Organic content by weight: 5.2%

**Tested By:** JLT **Checked By:** CR

# Particle Size Distribution Report




| | % +3" | % Gravel | % Sand | | % Fines | |
|---|---|---|---|---|---|---|
| | | | Coarse | Fine | Silt | Clay |
| ○ | 0 | 1 | 10 | 22 | 67 | |
| □ | 0 | 5 | 20 | 31 | 44 | |
| △ | 0 | 4 | 16 | 28 | 52 | |

| | Source | Sample # | Depth/Elev. | Date Sampled | USCS | Material Description | NM % | LL | PL |
|---|---|---|---|---|---|---|---|---|---|
| ○ | Test Borings | 3642 | B7 1-2.5' | 4/15/19 | MH | Red Sandy Elastic SILT | 30.7 | 55 | 31 |
| □ | Test Borings | 3643 | B7 6-7.5' | 4/15/19 | SM | Red Silty SAND | 39.6 | NV | NP |
| △ | Test Borings | 3644 | B8 1-2.5' | 4/15/19 | ML | Red Sandy SILT | 27.4 | NV | NP |

Client Catawba County

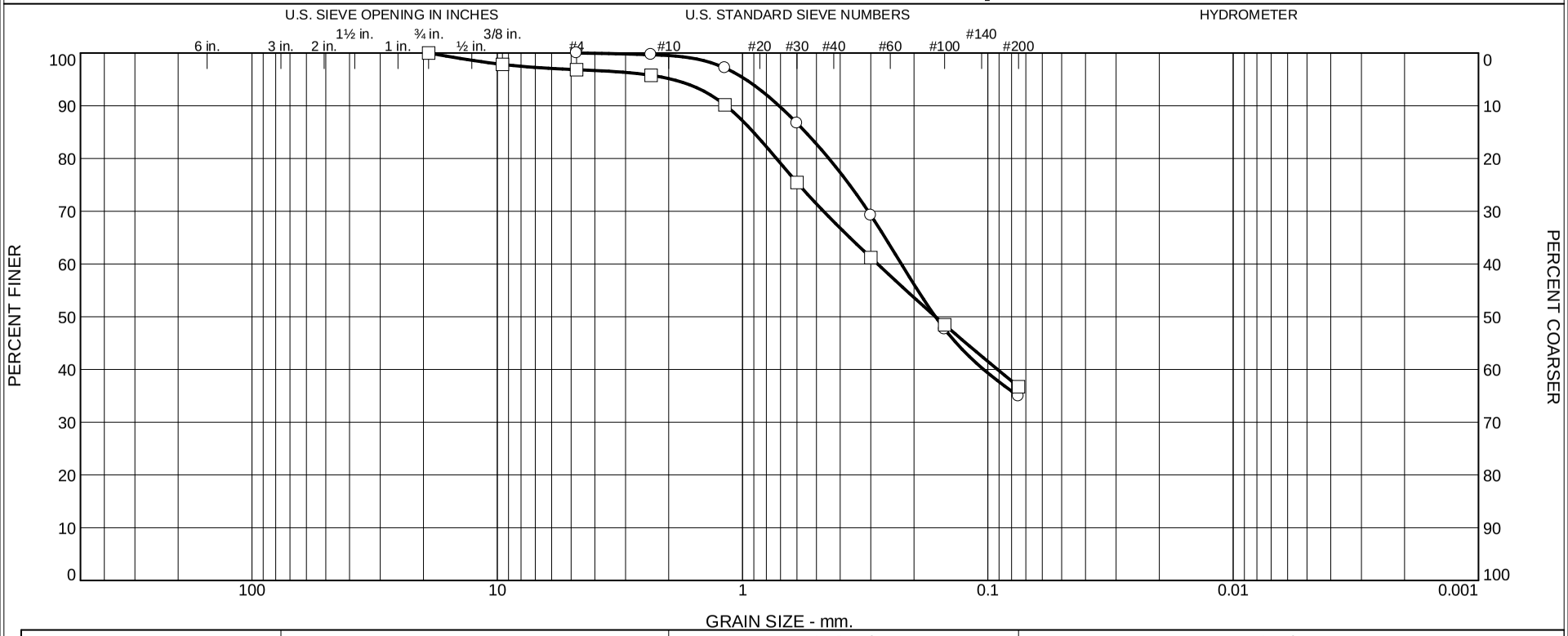
Project Board of Elections

Project No. 19517 Figure

**Catawba Valley Engineering & Testing, P.C.**
**Hickory, North Carolina**

**Tested By:** JLT **Checked By:** CR

# Particle Size Distribution Report




| | % +3" | % Gravel | % Sand | | % Fines | |
|---|---|---|---|---|---|---|
| | | | Coarse | Fine | Silt | Clay |
| ○ | 0 | 0 | 21 | 44 | 35 | |
| □ | 0 | 5 | 27 | 31 | 37 | |
| | | | | | | |

| | Source | Sample # | Depth/Elev. | Date Sampled | USCS | Material Description | NM % | LL | PL |
|---|---|---|---|---|---|---|---|---|---|
| ○ | Test Borings | 3645 | B8 8.5-10' | 4/15/19 | SM | Red Silty SAND | 30.1 | NV | NP |
| □ | Test Borings | 3646 | B8 23.5-25' | 4/15/19 | SM | Light Brown Silty SAND | 30.3 | NV | NP |
| | | | | | | | | | |

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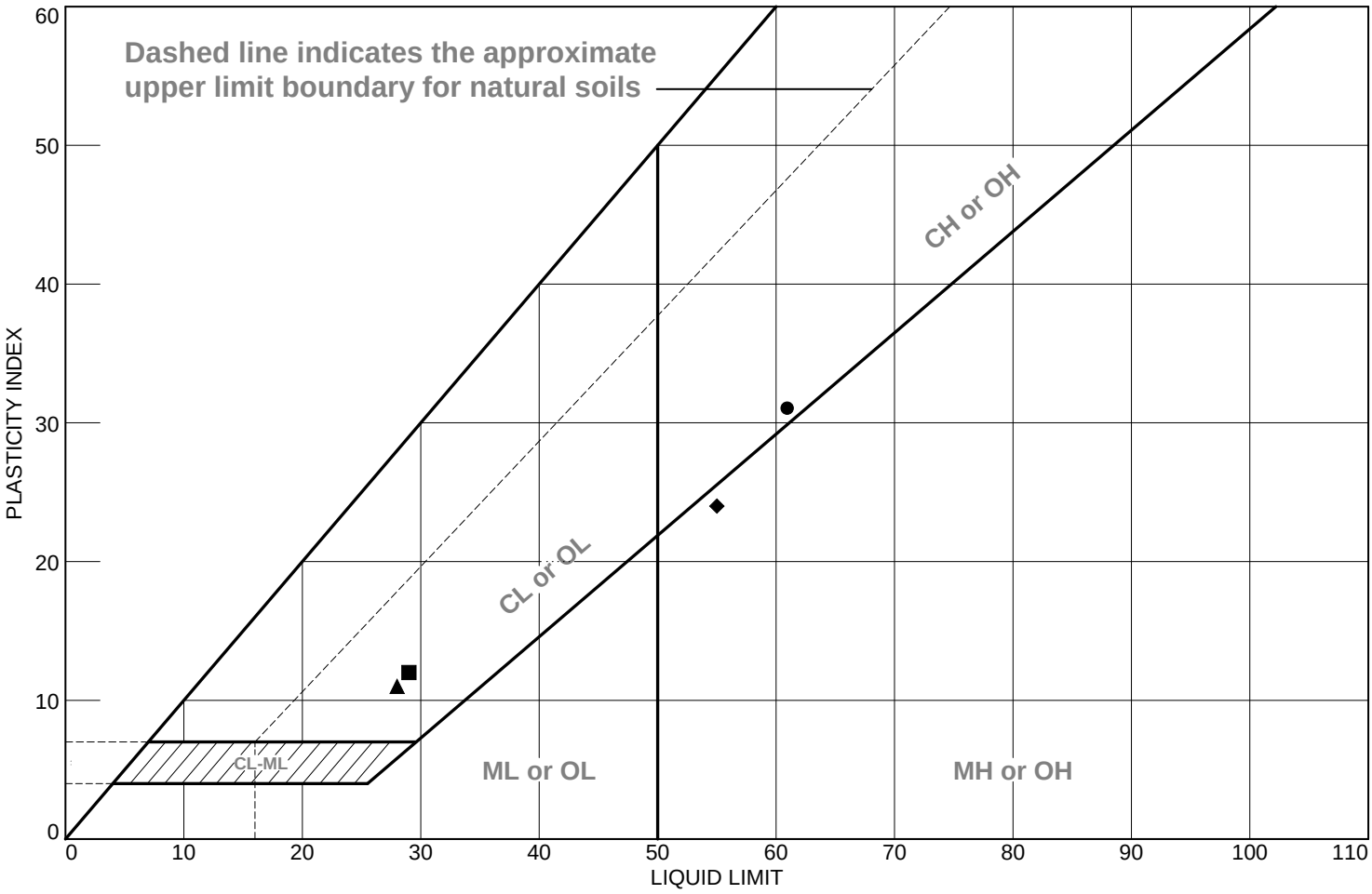
# LIQUID AND PLASTIC LIMITS TEST REPORT




## SOIL DATA

| SYMBOL | SOURCE | SAMPLE NO. | DEPTH | NATURAL WATER CONTENT (%) | PLASTIC LIMIT (%) | LIQUID LIMIT (%) | PLASTICITY INDEX (%) | USCS |
|---|---|---|---|---|---|---|---|---|
| ● | Test Borings | 3639 | B1 1-2.5' | 23.8 | 30 | 61 | 31 | CH |
| ■ | Test Borings | 3640 | B4 1-2.5' | 18.5 | 17 | 29 | 12 | SC |
| ▲ | Test Borings | 3461 | B4 3.5-5' | 19.4 | 17 | 28 | 11 | SC |
| ◆ | Test Borings | 3642 | B7 1-2.5' | 30.7 | 31 | 55 | 24 | MH |

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