ADDENDUM NO. 01 **DATE: August 13th, 2024**

TO: ALL BIDDERS
FROM: The Walker Group Architecture, Inc.

RE: DACS- Tidewater Research Station- Swine Unit Replacement
SCO# 22-25072-01A

The following corrections, clarifications, or supplemental information is to be incorporated into the Contractor(s) bid to perform the Work:

1. B/A304 "Farrowing House" calls for 1/4" recovery board over R-25 Insulation. No one has long enough fasteners for that installation if you could let us know on those plans and spec please? Response: ¼" recovery board shall be omitted. Install metal roof panels over insulation and vapor barrier per manufacturer's instructions.

2. Looking for clarification on Hardware Set 1 in the Hardware specs. It has Concealed Vertical Rod Exit Device and lockset listed for Opening 109A and 112B, and 115A. Response: Omit concealed vertical rod exit devices for Hardware set 1, Lockset shall be cylindrical lever lock with F109 function.

3. Aluminum Window spec calls for impact rated windows. Can you clarify if storefront door 101A is also to be impact rated? Response: Impact rated glazing is required at storefront.

4. Is building permit going to paid for by Owner? Response: Contractor is responsible for Building permits.

5. Are the Tap and Impact fees going to be covered by Owner? Response: Tap an impact fees are by contractor.

6. There are a lot of Owner provided items on the drawings just want to make sure that none of this has changed including multiple items on Plumbing, Mechanical, and Electrical Drawings. Response: Refer to drawings for Owner provided items. Nothing has changed.

7. Plans Say Metal Hog Slats and precast concrete slats and girders are Owner provided, is this the case? Response: Owner will provide slats and lintels.

8. Are the loading chutes Owner provided as shown on plans? Response: Loading chutes and provided by owner.

9. Are feed bins Owner Provided as shown on plans? Response: Feed bins are by owner.

10. Is 4 Ga Galvanized Welded Hog Panel with 2" Openings by Owner or contractor (Plans do not say Owner provided)? Response: The Welded hog panel will be by the contractor. Anything shown in the drawings that is not specifically stated to be by owner shall be provided by the contractor.

11. Is ¼" Polyethylene Board on Walls provided by Owner(plans do not say Owner provided)? Response: Polyethylene boards are by contractor.

12. Are evaporative Coolers Furnished by Owner and installed by contractor as shown on plans? Response: Evaporative cooler are furnished by owner and installed by contractor.

13. Is all equipment on equipment drawings furnished and installed by Owner as shown on drawings? Response: Refer to drawings for specifics on Owner provided equipment.

14. Is Owner taking care of power company fees to bring transformer to site? This is normally the case. The power company does not normally deal directly with contractor. Response: Owner will be responsible for power company fees.

15. The plans show we are running empty conduits to the transformer, is this the intent to let the Permanent power company pull power to the meter base? Response: Secondary conductors from the service transformer will be provided and pulled by Dominion Energy. Coordinate all service details with Dominion Energy to ensure the service transformer is located and installed in accordance with the Dominion Blue Book to ensure Dominion will provide the secondary conductors.

16. Clarify more on the Construction Entrance:
    1) 18in of Stone needed. 6" Layer of 2"-3" on top of 12" Stone Base? No Fabric? Response: No Fabric. Provide per drawings.

17. We see pavement markings in the gravel parking area detail, would you still like pavement markings on the stone? Response: No pavements markings on stone.

18. How will undercut and backfill be paid? Is the Owner adding an allowance for this? Response: As a part of the Contractor's pricing, the Contractor shall provde site preparation in strict accordance with the project Geotechnical Report (attached). The Contractor shall employ the services of a Geotechnical Engineer to monitor and evaluate the site in accordance with the project Geotechnical Report. Contractor to also provide unit price for excavation and new structural fill. See revised Form of proposal.

19. We see concrete wheel stop @3,000 PSI, what about the PSI for concrete sidewalk, enclosed walkway & concrete apron. Response: 3,000 psi.

20. We believe a wider construction entrance would be more suitable for the job site. We believe 20' wide would not be ideal for large delivery trucks entering the job. Response: Provide per drawings.

21. Can we get a copy of the Geotech report? Response: See attached for Geotechnical Report.

22. It was mentioned that pea gravel may be used in the internal grass areas. Is this still the plan? Response: Contractor to provide pea gravel in lieu of grass for 4' around perimeter of each building and walkway.

23. If the existing access road past the gate to the site is damaged and needs tobe repaired due to construction traffic, will this improvement be considered extra work? Response: No. Damaged caused by Contractor shall be repaired by Contractor

24. Notes 9, 10 on sheet A-204 says owner will provide equipment and contractor to install, but note on QA 101-QA 103 says owner will provide and install all equipment, contractor just to hook up plumbing and electrical. Can you clarify which is correct? Response: Loading chutes and feed bins will be installed by owner. Refer to QA sheets and PME drawings for owner provided contractor installed equipment.

25. On CG101 can we get clarification on required pipe materials? Can SDR 35 or HDPE be used for the 8" and 12"? Also, Schedule 80 PVC is called out under the access drive, there are many cheaper/better alternatives. I think It's around $70/LF material only. Response: Provide materials per specifications.

26. Door 101A indicates the material is Aluminum, but the framing indicates HM. Please clarify which material the Door & Framing need to be. Response: Door 101A shall be aluminum storefront type.

27. Do you want Large Missile Impact-Resistant on windows, if so then the entry glass on the doors will need to be Impact-Resistant also. Response: Storefront glazing shall be impact rated.

28. Can you identify the amount of mobilizations Hog Slat intends to make for the hog slat installation. Phasing of multiple buildings vs. getting all buildings to install point could change pricing. Response: Hogslat will make multiple mobilizations for slat installation.

29. The project manual shows the trusses requiring PT lumber. Is that a requirement? Response: Trusses are not required to be pressure treated.

30. See attached Pre-Bid Meeting Notes.

31. See attached Pre-Bid Sign -In Sheet

END OF ADDENDUM 01

F O R M OF P R O P O S A L

Swine Unit Replacement Contract:_____

At Tidewater Research Station

NC Dept. of Agriculture and Consumer Services Bidder: _____

SCO-ID #. 22-25072-01A

Date:_____

The undersigned, as bidder, hereby declares that the only person or persons interested in this proposal as principal or principals is or are named herein and that no other person than herein mentioned has any interest in this proposal or in the contract to be entered into; that this proposal is made without connection with any other person, company or parties making a bid or proposal; and that it is in all respects fair and in good faith without collusion or fraud. The bidder further declares that he has examined the site of the work and the contract documents relative thereto, and has read all special provisions furnished prior to the opening of bids; that he has satisfied himself relative to the work to be performed. The bidder further declares that he and his subcontractors have fully complied with NCGS 64, Article 2 in regards to E-Verification as required by Section 2.(c) of Session Law 2013-418, codified as N.C. Gen. Stat. § 143-129(j).

.

The Bidder proposes and agrees if this proposal is accepted to contract with the

State of North Carolina through the Department of Agriculture and Consumer Services

in the form of contract specified below, to furnish all necessary materials, equipment, machinery, tools, apparatus, means of transportation and labor necessary to complete the construction of

Swine Unit Replacement at Tidewater Research Station in Plymouth NC

in full in complete accordance with the plans, specifications, and contract documents, to the full and entire satisfaction of the State of North Carolina, and the

Tidewater Research Station

with a definite understanding that no money will be allowed for extra work except as set forth in the General Conditions and the contract documents, for the sum of:

SINGLE PRIME CONTRACT:

Base Bid:

_____Dollars($)_____

General Subcontractor:

_____Lic_____

UNIT PRICES:

Unit prices quoted and accepted shall apply throughout the life of the contract, except as otherwise specifically noted. Unit prices shall be applied, as appropriate, to compute the total value of changes in the base bid quantity of the work all in accordance with the contract documents.

GENERAL CONTRACT:

No. G-1 Excavation of unsuitable soils and backfill with structural fill (*CY*) Unit Price ($)_____

GS143-128(d) requires all single prime bidders to identify their subcontractors for the above subdivisions of work. A contractor whose bid is accepted shall not substitute any person as subcontractor in the place of the subcontractor listed in the original bid, except (i) if the listed subcontractor's bid is later determined by the contractor to be non-responsible or non-responsive or the listed subcontractor refuses to enter into a contract for the complete performance of the bid work, or (ii) with the approval of the awarding authority for good cause shown by the contractor.

MINORITY BUSINESS PARTICIPATION REQUIREMENTS

Provide with the bid - Under GS 143-128.2(c) the undersigned bidder shall identify **on its bid** (Identification of Minority Business Participation Form) the minority businesses that it will use on the project with the total dollar value of the bids that will be performed by the minority businesses. **Also** list the good faith efforts (Affidavit **A**) made to solicit minority participation in the bid effort.

NOTE: A contractor that performs all of the work with its own workforce may submit an Affidavit (**B)** to that effect in lieu of Affidavit (**A)** required above. The MB Participation Form must still be submitted even if there is zero participation.

After the bid opening - The Owner will consider all bids and alternates and determine the lowest responsible, responsive bidder. Upon notification of being the apparent low bidder, the bidder shall then file within 72 hours of the notification of being the apparent lowest bidder, the following:

An Affidavit (**C**) that includes a description of the portion of work to be executed by minority businesses, expressed as a percentage of the total contract price, which is equal to or more than the 10% goal established. This affidavit shall give rise to the presumption that the bidder has made the required good faith effort and Affidavit **D** is not necessary;

*** OR ***

If less than the 10% goal, Affidavit (**D**) of its good faith effort to meet the goal shall be provided. The document must include evidence of all good faith efforts that were implemented, including any advertisements, solicitations and other specific actions demonstrating recruitment and selection of minority businesses for participation in the contract.

Note: Bidders must always submit **with their bid** the Identification of Minority Business Participation Form listing all MB contractors, vendors and suppliers that will be used. If there is no MB participation, then enter none or zero on the form. Affidavit A **or** Affidavit B, as applicable, also must be submitted with the bid. Failure to file a required affidavit or documentation with the bid or after being notified apparent low bidder is grounds for rejection of the bid.

Proposal Signature Page

The undersigned further agrees that in the case of failure on his part to execute the said contract and the bonds within ten (10) consecutive calendar days after being given written notice of the award of contract, the certified check, cash or bid bond accompanying this bid shall be paid into the funds of the owner's account set aside for the project, as liquidated damages for such failure; otherwise the certified check, cash or bid bond accompanying this proposal shall be returned to the undersigned.

Respectfully submitted this day of _____

_____
(Name of firm or corporation making bid)

WITNESS:

_____
(Proprietorship or Partnership)

By: _____
Signature

Name: _____
Print or type

Title _____
(Owner/Partner/Pres./V.Pres)

Address _____

_____

ATTEST:

By: _____

Title: _____
(Corp. Sec. or Asst. Sec. only)

License No. _____

Federal I.D. No. _____

Email Address: _____

(CORPORATE SEAL)

Addendum received and used in computing bid:

Addendum No. 1 _____ Addendum No. 3 _____ Addendum No. 5 _____ Addendum No. 6 _____

Addendum No. 2 _____ Addendum No. 4 _____ Addendum No. 6 _____ Addendum No. 7 _____

DACS- Tidewater Research Station- Swine Unit Replacement
SCO# 22-25072-01A

Pre-Bid Meeting Agenda
07.31.24

- Meeting Sign-in Sheet

- Date, Time, and Place of Bid Opening
  Thursday August 22nd, 2024 at 3:00pm at The Tidewater Research Center Conference Room.

  - Bids shall be in a sealed envelope per submittal procedures in Project Manual.
  - No bids will be accepted after bid time is called.

- 5% bid bond or a cashier's check must accompany the bid.
  Bid bond or cashiers check (ensured by FDIC) must be provided with bid.

- A Performance & Payment Bond is required for 100% of the contract price.

- MBE Form and Affidavit A or B must be submitted with Bid
  Affidavit C or D required after notice of low bid within 24hrs

- Proposal to be a lump sum amount. There are no bid alternates at this time.

- Contractor's responsibility to visit project site and review contract documents before bidding project.

- Request for Information.
  All pre-bid RFI's must be submitted to admin@wgarc.com before 5:00pm on August 13th, 2024.

- List of contacts
  Chris Walker- Walker Group Architecture
  chris@wgarc.com - 252-636-8778

  admin@wgarc.com- Questions/RFI's prior to bid date

  Rusty Collins
  stephen.collins@ncagr.gov – 252-793-4118

- Addenda
  Final addenda will be issued no later than August 15th, 2024 at 5:00pm.
  - Ensure all addenda has been acknowledged in bid Form of proposal

- Scope of work
    - Construction of (4) New Swine facilities. Biosecurity Building, Farrowing Barn, Breeding & Gestation Barn, and a Ween to Finish Barn.
    - New Facilities are to replace old facilities on an adjacent piece of land.
    - New site development with gravel drives, new well and septic, pump station, security fencing
    - The existing Lagoon will be utilized for new facilities.
    - Partially enclosed wood walkways will connect all buildings
    - Small Well house building
    - Propane Tanks & Pad
    - Concrete Pads for Feed Bins
    - Concrete Pad for Incinerator

Biosecurity Building:

- Wood construction over slab on grade
- Two separated areas (clean side and dirty side)
- Split System HVAC

Farrowing Building:

- Wood construction over Elevated Concrete Pit
- Two farrowing rooms with 52 crates each
- Slab on grade everywhere except pits, which will have metal grating by Hogslat
- All interior equipment provided and installed by owner
- Contractor to provide electrical and plumbing infrastructure
- Fans and evaporative coolers by Hoglslat, contractor to coordinate utilities

Breeding Gestation Building:

- Wood construction over Elevated Concrete Pit
- Open room building
- Bottom pit slab, foundation walls, and concrete piers by contractor. Hoglsat to provide precast lintels and concrete slat flooring
- All interior equipment provided and installed by owner
- Contractor to provide electrical and plumbing infrastructure
- Fans and evaporative coolers by Hoglslat, contractor to coordinate utilities

Wean to Finish Building:

- Wood construction over Elevated Concrete Pit
- 2 Large Open rooms
- Bottom pit slab, foundation walls, and concrete piers by contractor. Hoglsat to provide precast lintels and concrete slat flooring
- All interior equipment provided and installed by owner
- Contractor to provide electrical and plumbing infrastructure
- Fans by Hoglslat, contractor to coordinate utilities

- Site conditions
  - Parking – cant block access to existing complex
  - Material storage requirements
  - Access to building/site - 7-3:30, can make arrangements
  - Use of facilities- contractor to provide porty potty and temp power
  - Working on site (noise, safety requirements, hours etc.)
    -No noise requirements, standard safety requirements

- Additional Owner Concerns
  -Tidewater is looking to have fiber run to buildings
  -May want pea gravel instead of sod, only in fenced area

- Additional Contractor Concerns
  -GC will need to install fans in barn walls.
  -Electrical connections by GC
  -Ventilation controller connections by GC
  -Weight limit on slat flooring- no lifts can be used on flooring
  -GC shall provide a Grout joint at perimeter slats less than 1"
  -1-2 days for lintel/stat installation
  -Geotech has been performed and can be provided.
  -Contractor asked to bring small excavator for test holes, tidewater ok with it just make sure to fill holes
  -There will be 1" openings in breeding/gestation slats instead of 1-1/2"
  -GC to hook up power to pen/scale
  -Tidewater will remove any fencing required around lagoon

- Schedule for completion
  The project is scheduled to be completed 545 days after notice to proceed.

- Liquidated damages
  Liquidated damages will be accessed at $500 per day past the contract completion date.

- Site walk throughs.
  The site is accessible for contractor walkthroughs when coordinated with the Tidewater staff. Contact Rusty Collins to schedule access.

- Nothing stated at the conference will change the project documents unless a subsequent addendum is issued.

- Recap and questions

Pre-Bid Meeting Sign-In Sheet

Project Name/Location: DACS- Tidewater Research Station- Swine Unit Replacement, Plymouth NC
SCO# 22-25072-01A
Meeting Date: July 31st, 2024

Attendee Name	Company	e-mail Address	Phone
Chris Walker	Walker Group Architecture	chris@wgarc.com	252-636-8778
Fritz Richards	Hog Slat, Inc	frichards@hogslat.com	910-590-6366
Will Gautier	AR Chesson	will@archesson.com	252-217-5512
Dustin Faulkner	Barnhill Contracting	dfaulkner@barnhillcontracting.com	252-384-2126
Darin Akers	Barnhill Contracting	dakers@barnhillcontracting.com	252-933-6460
Thomas Wall	Pitt Electric	Twall@pittelectric.com	252-862-6656
Anthony Sawyer	Sawyer & Sons Const. Inc	Sawyer2@centurylink.net	252-796-7197
Brent Garlington	Trend Const.	bgarlington@trendinc.biz	910-723-3743
Bishop Williams	Waters Contracting	bishopw@waterscontracting.net	919-279-7265
Tommy Corbett	NCDA & CS RSD	Tommy.corbett@ncagr.gov	252-902-6992
Steve Simon	Daniels & Daniels	estimating@danddcc.com	252-565-6878

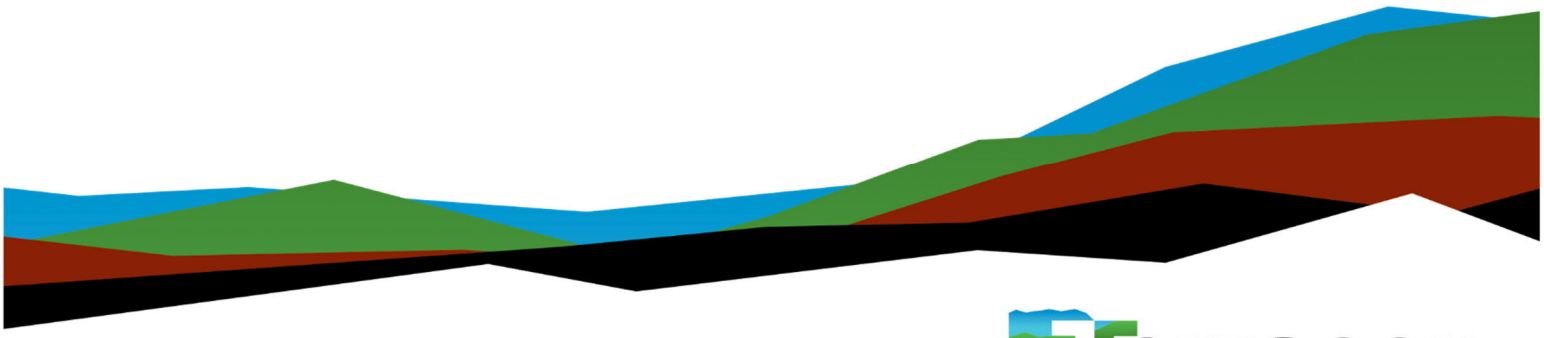
Tidewater Research Station – Swine Unit Replacement, Phase 1

Geotechnical Engineering Report

May 24, 2023 | Terracon Project No. K5225062

Prepared for:

NRW Engineering
748 Lord Dunmore Drive #101
Virginia Beach, VA 23464



Terracon
Explore with us

Nationwide
Terracon.com

- Facilities
- Environmental
- Geotechnical
- Materials

106 Capital Trace, Unit E
Elizabeth City, North Carolina
P (252) 335-9765
Terracon.com

May 24, 2023

NRW Engineering
748 Lord Dunmore Drive #101
Virginia Beach, VA 23464

Attn: Peyton Mulé
P: 757-474-0612
E: pdm@nrwengineering.com

Re: Geotechnical Engineering Report
Tidewater Research Station – Swine Unit Replacement, Phase 1
East side of Research Station Rd.
Plymouth, North Carolina
Terracon Project No. K5225062

Dear Mr. Phillips:

We have completed the scope of Geotechnical Engineering services for the above referenced project in general accordance with Terracon Proposal No. PK5225062 dated November 4, 2022. This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning earthwork and the design and construction of foundations and floor slabs for the proposed project.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report or if we may be of further service, please contact us.

Sincerely,

Terracon

Gerald W. Stalls, Jr., P.E.
Senior Geotechnical Engineer

Bruce R. Spiro, P.E.
Senior Geotechnical Engineer

Table of Contents

Figures

Attachments

Note: Blue Bold text in the report indicates a referenced section heading. This PDF report also includes hyperlinks which direct the reader to that section and clicking on the Terracon logo will bring you back to this page.

Refer to each individual Attachment for a listing of contents.

Report Summary

Topic [1]	Overview Statement [2]
Project Description	The project includes the construction of a new Swine Research and Production facility including 4 new structures ranging from about 2,000 sf to 11,000 sf along with the associated infrastructure components. Estimated maximum loads: columns - 50 kips; wall loads - 2 kips/ft; slabs - 100 psf. Up to 1 to 2 feet of fill to achieve final grade. Minor excavation other than foundation construction and utility installation.
Geotechnical Characterization	Lean clays to a depth ranging from about 2 to 6 feet. Below this, granular and cohesive soils extending to boring termination depths. Groundwater observed during our exploration and noted to occur at depths ranging from 5 to 7 feet below surface grades.
Earthwork	Remove existing surficial and/or shallow subsurface Organic laden soils (Topsoil and/or Clay with Organics) extending to depths ranging from 6 inches to 2 feet. Existing soils extending to depths ranging from 4 to 8 feet should not be used for engineered fill. Clays are sensitive to moisture variation.
Shallow Foundations	Shallow foundations are recommended for building support provided the recommended bearing improvements are successfully completed. Allowable bearing pressure = 2,000 psf Expected settlements: < 1-inch total, < 1/2-inch differential
Below-Grade Structures	Earth pressures acting are provided in the Lateral Earth Pressure section. Native shallow subsurface soils should not be used as backfill.
Pavements	Not included in scope of services.
General Comments	This section contains important information about the limitations of this geotechnical engineering report.

1. If the reader is reviewing this report as a pdf, the topics above can be used to access the appropriate section of the report by simply clicking on the topic itself.
2. This summary is for convenience only. It should be used in conjunction with the entire report for design purposes.

Introduction

This report presents the results of our subsurface exploration and Geotechnical Engineering services performed for the proposed Tidewater Research Station – Swine Unit Replacement, Phase 1 project to be located along the East side of Research Station Rd. in Plymouth, North Carolina. The purpose of these services was to provide information and geotechnical engineering recommendations relative to:

- Subsurface soil conditions
- Groundwater conditions
- Seismic site classification per IBC
- Site preparation and earthwork
- Dewatering considerations
- Foundation design and construction
- Floor slab design and construction
- Lateral earth pressure

The geotechnical engineering Scope of Services for this project included the advancement of test borings, laboratory testing, engineering analysis, and preparation of this report.

Drawings showing the site and boring locations are shown on the Site Location and Exploration Plan, respectively. The results of the laboratory testing performed on soil samples obtained from the site during our field exploration are included on the boring logs and/or as separate graphs in the Exploration Results section.

Project Description

Our initial understanding of the project was provided in our proposal and was discussed during project planning. A period of collaboration has transpired since the project was initiated, and our final understanding of the project conditions is as follows:

Item	Description
Information Provided	Email correspondence received on November 3 and 4, 2022, and March 22, 2023 including a site layout plan dated March 15, 2023.
Project Description	The project includes the construction of a new Swine Research and Production facility including 4 new structures along with the associated infrastructure components.
Proposed Structure	Proposed structures associated with the project include a Bio-security building, a farrowing building, a finishing building, and a gestation building.
Building Construction	The structures will have footprint areas ranging from about 2,000 sf to 11,000 sf. The structures will be of Pre-Engineered Metal framing, and/or masonry foundation walls supported by shallow foundations. Also, both elevated slabs over below grade pits and slabs on grade are to be included.
Finished Floor Elevation	Estimated to coincide with or be within 2 feet above existing site grade elevations.
Maximum Loads	In the absence of information provided by the design team, we used the following loads in estimating settlement based on our experience with similar projects ■ Columns: 50 kips ■ Walls: 2 kips per linear foot (klf) ■ Slabs: 100 pounds per square foot (psf)
Grading/Slopes	Unknown at this time; Proposed finished grade elevation for the building pad is expected to be no greater than 3 feet above existing grades. Up to about 1 to 2 feet of fill will be required to develop final grades within the pavement and building addition areas (respectively), excluding remedial grading requirements.
Below-Grade Structures	Approximate 2 to 3-foot deep below grade pits constructed of concrete slab and retaining wall designs supporting elevated slabs and/or metal grating.
Pavements	Not included in scope of services.
Building Code	2015 IBC

Terracon should be notified if any of the above information is inconsistent with the planned construction, especially the grading limits, as modifications to our recommendations may be necessary.

Site Conditions

The following description of site conditions is derived from our site visit in association with the field exploration and our review of publicly available geologic and topographic maps.

Item	Description
Parcel Information	This project site is located along the east side of Research Station Road in Plymouth, North Carolina. Latitude/Longitude (approximate): 35.85499 °/76.656403° See Site Location
Existing Improvements	N/A
Current Ground Cover	Agricultural field.
Existing Topography	Relatively level with elevations ranging from about 16 to 17 feet (WGS84) based on publicly available topographic maps published by Google Earth Pro™ as well as the project existing conditions site plan.

Geotechnical Characterization

We have developed a general characterization of the subsurface conditions based upon our review of the subsurface exploration, laboratory data, geologic setting and our understanding of the project. This characterization, termed GeoModel, forms the basis of our geotechnical calculations and evaluation of the site. Conditions observed at each exploration point are indicated on the individual logs. The individual logs can be found in the Exploration Results and the GeoModel can be found in the Figures attachment of this report.

As part of our analyses, we identified the following model layers within the subsurface profile. For a more detailed view of the model layer depths at each boring location, refer to the GeoModel.

Model Layer	Layer Name	General Description	Depth Range	SPT N-Value Range
1	Surficial Soils	Topsoil and/or Lean CLAY (CL) with Organics	0 to 0.5 – 2	-
2	Clay / Sand	Moist to wet, Lean CLAY (CL) with varying amounts of Sand, medium stiff to stiff and/or SAND (SM, SC) with varying amounts of Silt and/or Clay, very loose to loose	0.5 – 2 to 4 – 8	4 to 12
3	Sand	Moist to wet, SAND (SP-SM, SM) with varying amounts of Silt and/or Clay, very loose to loose	4 – 8 to 8 – 10	3 to 9
4	Clay [1]	Wet, Lean CLAY (CL) with varying amounts of Sand and/or Marine Shell Fragments, very soft to soft	8 to 13	2 to 4
5	Sand	Wet, SAND (SM, SC-SM, SC) with varying amounts of Clay, Silt, and/or Marine Shell Fragments, very loose	8 – 13 to 13 – 20	W.O.H. [2] to 6
6	Clay [3]	Wet, Lean CLAY (CL) with varying amounts of Sand and/or Marine Shell Fragments, medium stiff	13 - 18 to 20	2 to 7

1. Encountered at boring B-03 only
2. W.O.H. = Weight Of Hammer
3. Not encountered at borings B-03 and B-05 only

The borings were advanced using a mud rotary drilling technique. Drilling fluids (water) are introduced into the bore holes during the drilling operations impairing the ability to accurately determine the groundwater levels. Groundwater was encountered at the time of our field explorations and noted to range from about 5 to 7 feet below existing surface grades. Groundwater conditions may be different at the time of construction. Mapping by the Natural Resources Conservation Service (NRCS) indicates a seasonal high groundwater level within 0 to 12 inches of ground surface, which may be contributed by perched water conditions above shallow subsurface cohesive soils. Groundwater conditions may change because of seasonal variations in rainfall, runoff, and other conditions not apparent at the time of drilling. Long-term groundwater monitoring was outside the scope of services for this project.

Field Exploration

In order to explore the general subsurface soil types and to aid in developing associated foundation design parameters, the following exploration program was performed:

- Seven (7) 20-foot deep Standard Penetration Test (SPT) borings (designated as B-01 through B-07), drilled within the footprints of the proposed building limits.

The SPT borings were performed with the use of rotary wash "mud" drilling procedures in general accordance with ASTM D 1586. The tests were performed continuously from the existing ground surface to depths of 12-feet, and at 5-foot intervals thereafter starting at a depth of 13-feet. The soil samples were obtained with a standard 1.4" I.D., 2" O.D., 30" long split-spoon sampler. The sampler was driven with blows of a 140 lb. hammer falling 30 inches, using an automatic hammer. The number of blows required to drive the sampler each 6-inch increment of penetration was recorded and is shown on the boring logs. The sum of the second and third penetration increments is termed the SPT N-value (uncorrected for automatic hammer). A representative portion of each disturbed split-spoon sample was collected with each SPT, placed in a glass jar, sealed, labeled, and returned to our laboratory for review. All boreholes that penetrated the groundwater table were backfilled upon completion with the drilling spoils.

The boring locations were established by Terracon and were approved by the Client prior to mobilization. The boring locations were staked in the field by a representative of Terracon with a handheld GPS device and by corroborating the location with easily identifiable landmarks. The borings were denoted with their respective boring name using spray paint for the topographical survey personnel. The approximate boring and groundwater monitoring well locations are shown in the Figures attachment of this report.

Field and Laboratory Testing

Soil testing provided by Terracon was performed in accordance with American Society for Testing and Materials (ASTM) standards. All soils and materials tests were performed in our AASHTO re:source (formally AMRL) certified Elizabeth City, North Carolina laboratory.

Soil Classification and Index Testing

Representative portions of all soil samples collected during drilling operations were labeled, preserved and transferred to our laboratory in accordance with ASTM D4220 for classification and analysis. Soil descriptions on the boring logs are provided using visual-manual methods in general accordance with ASTM D2488 using the Unified Soil Classification System (USCS).

Soil samples that were selected for index testing were classified in general accordance with ASTM D2487. It should be noted that some variation can be expected between samples classified using the visual-manual procedure (ASTM D2488) and the USCS (ASTM D2487). A summary of the soil classification system is provided in the Supporting Information section of this report.

Representative split-spoon soil samples were selected and subjected to natural moisture, #200 sieve wash, and Atterberg Limits testing in order to corroborate the visual classification. These test results are presented in the Exploration and Laboratory Results section of this report and on the soil test boring logs provided in the Exploration Results section of this report. Generalized subsurface soil profiles are provided in the Figures attachment of this report.

Geologic Setting

The project site is located within the Atlantic Coastal Plain physiographic province. Numerous transgressions and regressions of the Atlantic Ocean have deposited marine, lagoonal, and fluvial (stream lain) sediments. The regional geology is very complex, and generally consists of interbedded layers of varying mixtures of sands, silts and clays. During the Mesozoic era, the coastal plain was a broad sloping region well above sea level with loose soil continually eroded from rains and streams flowing toward the ocean. During the Cenozoic era and occasionally the Mesozoic era, the ocean covered the lowland and then subsided repeatedly, creating terraces each time. Based on our review of existing geologic and soil boring data, the geologic stratigraphy encountered in our subsurface explorations generally conforms to the regional depositional pattern.

Geologic Hazards

Based on NRCS soil mapping, the project site contains hydric soils. Hydric soils are defined by the National Technical Committee for Hydric Soils (NTCHS) as soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (Federal Register, 1994). Under natural conditions, these soils are either saturated or inundated long enough during the growing season to support the growth and reproduction of hydrophytic vegetation.

The presence of hydric soils is an indicator that the site is susceptible to excessively moist and/or saturated soil conditions that can easily become unstable during construction. Additionally, the site is susceptible to varying surficial and/or near surface soil conditions as well as varying organic laden soil thicknesses given its prior agricultural use.

Seismic Site Class

The seismic design requirements for buildings and other structures are based on Seismic Design Category. Site Classification is required to determine the Seismic Design Category for a structure. The Site Classification is based on the upper 100 feet of the site profile defined by a weighted average value of either shear wave velocity, standard penetration resistance, or undrained shear strength in accordance with Section 20.4 of ASCE 7 and the International Building Code (IBC). Based on the soil properties observed at the site and as described on the exploration logs and results, our professional opinion is that a Seismic Site Classification of D be considered for the project. Subsurface explorations at this site were extended to a maximum depth of 20 feet. The site properties below the boring depth to 100 feet were estimated based on our experience and knowledge of geologic conditions of the general area. Additional deeper borings or geophysical testing may be performed to confirm the conditions below the current boring depth.

The USGS Earthquake Hazards Program (US Seismic Design Maps) and the 2015 IBC indicate the following seismic site characteristics for a location at the following coordinates:

Latitude….. 35.85498811°
Longitude…. -76.65640273°

Max. Considered Earthquake Ground Motion, 0.2 sec. Spectral Response, Ss…….0.102g
Max. Considered Earthquake Ground Motion for 1.0 sec. Spectral Response, S1….0.053g
Site Coefficient, Fa….. 1.6
Site Coefficient, Fv….. 2.4
Design Spectral Response Acceleration, SDS… 0.109g
Design Spectral Response Acceleration, SD1… 0.085g

Geotechnical Overview

The site appears suitable for the proposed construction based upon geotechnical conditions encountered in the test borings, provided that the recommendations provided in this report are implemented in the design and construction phases of this project.

The subsurface materials generally consisted of Clay with varying amounts of Sand underlain by Sand with varying amounts of silt and clay extending to the maximum depth of the borings. Groundwater was encountered at depths ranging from about 5 to 7 feet below existing surface grades during or at the completion of drilling. Based on the existing surface elevations indicated on Google Earth Pro™, it is estimated that the groundwater elevation generally ranges from about 10 to 12 feet (WGS84).

Based on the conditions encountered and estimated load-settlement relationships, the proposed structures can be supported on conventional continuous or isolated, shallow spread footings. Grading for the proposed foundations should incorporate the limits of the foundations plus a lateral distance beyond the outside edge of footings, where space is available. On-site soils to depths ranging from 4 to 8 feet are not considered suitable to be used as engineered fill materials.

The near surface, medium stiff to stiff medium plasticity lean clay could become unstable with typical earthwork and construction traffic, especially after precipitation events. Effective drainage should be completed early in the construction sequence and maintained after construction to avoid potential issues. If possible, the grading should be performed during the warmer and drier times of the year. If grading is performed during the winter months, an increased risk for possible undercutting and replacement of unstable subgrade will persist. Additional site preparation recommendations, including subgrade improvement and fill placement, are provided in the Earthwork section.

The soils which form the bearing stratum for shallow foundations are plastic and exhibit limited potential for shrink-swell movements with changes in moisture. Maintaining a minimum dead load pressure on footings should reduce the anticipated swell movements to tolerable levels. The Shallow Foundations section addresses support of the building directly bearing on native medium stiff to stiff lean clay or engineered fill. However, the anticipated finished floor elevation along with the initial clearing and grading efforts to remove topsoil is expected to provide at least 1.5 feet of well compacted structural fill between the floor slab and the near-surface limited plasticity clays. This structural fill thickness is typically adequate to mitigate the shrink-swell effects of the limited plastic clays. The Floor Slabs section addresses slab-on-grade support of the building.

The recommendations contained in this report are based upon the results of field and laboratory testing (presented in the Exploration Results section), engineering analyses, and our current understanding of the proposed project. The General Comments section provides an understanding of the report limitations.

Earthwork

Earthwork is anticipated to include clearing and grubbing, excavations, and engineered fill placement. The following sections provide recommendations for use in the preparation of specifications for the work. Recommendations include critical quality criteria, as necessary, to render the site in the state considered in our geotechnical engineering evaluation for foundations and floor slabs.

Site Preparation

Prior to placing fill, existing vegetation, topsoil, and root mats should be removed. Complete stripping of the topsoil and/or organic laden clay should be performed in the proposed building areas. We estimate that a cut depth ranging from about 6 inches to 2 feet below existing surface grades will be required to remove the topsoil as well as the organic laden clay (Boring B-06) from within the building areas. Topsoil and/or organic laden clay thicknesses may extend deeper within isolated areas. The stripping of topsoil and/or organic laden clay should extend at least 5 feet beyond the outside edge of building foundations.

Where fill is placed on existing slopes steeper than 5H:1V, benches should be cut into the existing slopes prior to fill placement. The benches should have a minimum vertical face height of 1 foot and a maximum vertical face height of 3 feet and should be cut wide enough to accommodate the compaction equipment. This benching will help provide a positive bond between the fill and natural soils and reduce the possibility of failure along the fill/natural soil interface.

Although no evidence of fill or underground facilities (such as septic tanks, cesspools, basements, and utilities) was observed during the exploration and site reconnaissance, such features could be encountered during construction. If unexpected fills or underground facilities are encountered, such features should be removed, and the excavation thoroughly cleaned prior to backfill placement and/or construction.

Subgrade Preparation

Following the site stripping to remove topsoil and prior to structural fill placement the natural subgrade soils should be evaluated by a Geotechnical Engineer. Structural fill placed beneath the entire footprint of the building and pavement areas should extend horizontally a minimum distance of 5 feet beyond the outside edge of footings and 3 feet beyond pavement perimeters. The majority of the near-surface materials (CLAY: CL) anticipated to be developed as excavation spoils are not considered suitable for use as structural fill.

The natural subgrade should be proofrolled with an adequately loaded vehicle such as a fully-loaded tandem-axle dump truck. The proofrolling should be performed under the observation of the Geotechnical Engineer or representative. Areas excessively deflecting under the proofroll should be delineated and subsequently addressed by the Geotechnical Engineer and removed by the contractor. Excessively wet or dry material should either be removed or moisture conditioned and recompacted.

Based upon the subsurface conditions determined from the geotechnical exploration, subgrade soils exposed during construction are anticipated to be relatively workable; however, the workability of the subgrade may be affected by precipitation, repetitive construction traffic or other factors. If unworkable conditions develop, workability may be improved by scarifying and drying.

Excavation

We anticipate that excavations for the proposed construction can be accomplished with conventional earthmoving equipment. The bottom of excavations should be thoroughly cleaned of loose soils and disturbed materials prior to backfill placement and/or construction.

Fill Material Types

Fill required to achieve design grade should be classified as structural fill and general fill. Structural fill is material used below, or within 5 feet of structures or constructed slopes. General fill is material used to achieve grade outside of these areas.

Reuse of On-Site Soil: Excavated on-site soils extending to depths ranging from 4 to 8 feet are not recommended to be reused as Structural Fill and should not be placed beneath settlement sensitive structures and within foundation bearing zones. Portions of the on-site soil have an elevated fines content and will be sensitive to moisture conditions (particularly during seasonally wet periods) and may not be suitable for reuse when above optimum moisture content.

Material property requirements for on-site soil for use as general fill and structural fill are noted in the table below:

Property	General Fill	Structural Fill
Composition	Free of deleterious material	Free of deleterious material
Maximum particle size	6 inches (or 2/3 of the lift thickness)	3 inches
Fines content	Not limited	Less than 20% Passing No. 200 sieve
Plasticity	Not limited	Maximum plasticity index of 6
GeoModel Layer Expected to be Suitable[1]	1, 2, 3	3

1. Based on subsurface exploration. Actual material suitability should be determined in the field at time of construction.

Imported Fill Materials: Imported fill materials should meet the following material property requirements. Regardless of its source, compacted fill should consist of approved materials that are free of organic matter and debris. Frozen material should not be used, and fill should not be placed on a frozen subgrade.

Soil Type [1]	USCS Classification	Acceptable Parameters (for Structural Fill)
Granular	GW, GP, GM, SW, SP, SM	Less than 20% passing No. 200 sieve Liquid Limit less than 20 Plasticity index less than 6

1. Structural and general fill should consist of approved materials free of organic matter and debris. A sample of each material type should be submitted to the Geotechnical Engineer for evaluation prior to use on this site.

Fill Placement and Compaction Requirements

Structural and general fill should meet the following compaction requirements.

Item	Structural Fill	General Fill
Maximum Lift Thickness	10 inches or less in loose thickness when heavy, self-propelled compaction equipment is used. 4 to 6 inches in loose thickness when hand-guided equipment (i.e. jumping jack or plate compactor) is used.	Same as structural fill
Minimum Compaction Requirements [1]	98% of maximum	92% of maximum
Water Content Range [1]	Granular: -2% to +2% of optimum	As required to achieve min. compaction requirements

1. Maximum density and optimum water content as determined by the Standard Proctor test (ASTM D 698).

Utility Trench Backfill

Any soft or unsuitable materials encountered at the bottom of utility trench excavations should be removed and replaced with structural fill or bedding material in accordance with public works specifications for the utility be supported. This recommendation is particularly applicable to utility work requiring grade control and/or in areas where subsequent grade raising could cause settlement in the subgrade supporting the utility. Trench excavation should not be conducted below a downward 1:1 projection from existing foundations without engineering review of shoring requirements and geotechnical observation during construction.

Trench backfill should be mechanically placed and compacted as discussed earlier in this report. Compaction of initial lifts should be accomplished with hand-operated tampers or other lightweight compactors. Where trenches are placed beneath slabs or footings, the backfill should satisfy the gradation and expansion index requirements of engineered fill discussed in this report. Flooding or jetting for placement and compaction of backfill is not recommended.

For low permeability subgrades, utility trenches are a common source of water infiltration and migration. Utility trenches penetrating beneath the building should be effectively sealed to restrict water intrusion and flow through the trenches, which could migrate below the building. The trench should provide an effective trench plug that extends at least 5 feet from the face of the building exterior. The plug material should consist of cementitious flowable fill or low permeability clay. The trench plug material should be placed to surround the utility line. If used, the clay trench plug material should be placed and compacted to comply with the water content and compaction recommendations for structural fill stated previously in this report.

Grading and Drainage

All grades must provide effective drainage away from the building during and after construction and should be maintained throughout the life of the structure. Water retained next to the building can result in soil movements greater than those discussed in this report. Greater movements can result in unacceptable differential floor slab and/or foundation movements, cracked slabs and walls, and roof leaks. The roof should have gutters/drains with downspouts that discharge onto splash blocks at a distance of at least 10 feet from the building.

Exposed ground should be sloped and maintained at a minimum 5% away from the building for at least 10 feet beyond the perimeter of the building. Locally, flatter grades may be necessary to transition ADA access requirements for flatwork. After building construction and landscaping have been completed, final grades should be verified to document effective drainage has been achieved. Grades around the structure should also be periodically inspected and adjusted, as necessary, as part of the structure's maintenance program. Where paving or flatwork abuts the structure, a maintenance program should be established to effectively seal and maintain joints and prevent surface water infiltration.

Earthwork Construction Considerations

Shallow excavations for the proposed structure are anticipated to be accomplished with conventional construction equipment. Upon completion of filling and grading, care should be taken to maintain the subgrade water content prior to construction of grade-supported improvements such as floor slabs and pavements. Construction traffic over the completed subgrades should be avoided. The site should also be graded to prevent ponding of surface water on the prepared subgrades or in excavations. Water collecting over or adjacent to construction areas should be removed. If the subgrade freezes, desiccates, saturates, or is disturbed, the affected material should be removed, or the materials should be scarified, moisture conditioned, and recompacted prior to floor slab construction.

The groundwater table could affect overexcavation efforts, especially for overexcavation and replacement of lower strength soils. A temporary dewatering system consisting of sumps with pumps may be necessary to achieve the recommended depth of overexcavation depending on groundwater conditions at the time of construction.

As a minimum, excavations should be performed in accordance with OSHA 29 CFR, Part 1926, Subpart P, "Excavations" and its appendices, and in accordance with any applicable local and/or state regulations.

Construction site safety is the sole responsibility of the contractor who controls the means, methods, and sequencing of construction operations. Under no circumstances shall the information provided herein be interpreted to mean Terracon is assuming responsibility for construction site safety or the contractor's activities; such responsibility shall neither be implied nor inferred.

Excavations or other activities resulting in ground disturbance have the potential to affect adjoining properties and structures. Our scope of services does not include review of available final grading information or consider potential temporary grading performed by the contractor for potential effects such as ground movement beyond the project limits. A preconstruction/ precondition survey should be conducted to document nearby property/infrastructure prior to any site development activity. Excavation or ground disturbance activities adjacent or near property lines should be monitored or instrumented for potential ground movements that could negatively affect adjoining property and/or structures.

Construction Observation and Testing

The earthwork efforts should be observed by the Geotechnical Engineer (or others under their direction). Observation should include documentation of adequate removal of surficial materials (vegetation, topsoil, and pavements), evaluation and remediation of existing fill materials, as well as proofrolling and mitigation of unsuitable areas delineated by the proofroll.

Each lift of compacted fill should be tested, evaluated, and reworked, as necessary, as recommended by the Geotechnical Engineer prior to placement of additional lifts. Each lift of fill should be tested for density and water content at a frequency of at least one test for every 2,000 square feet of compacted fill in the building areas and 5,000 square feet in pavement areas. Where not specified by local ordinance, one density and water content test should be performed for every 100 linear feet of compacted utility trench backfill and a minimum of one test performed for every 12 vertical inches of compacted backfill.

In areas of foundation excavations, the bearing subgrade should be evaluated by the Geotechnical Engineer. If unanticipated conditions are observed, the Geotechnical Engineer should prescribe mitigation options.

In addition to the documentation of the essential parameters necessary for construction, the continuation of the Geotechnical Engineer into the construction phase of the project provides the continuity to maintain the Geotechnical Engineer's evaluation of subsurface conditions, including assessing variations and associated design changes.

Shallow Foundations

If the site has been prepared in accordance with the requirements noted in Earthwork, the following design parameters are applicable for shallow foundations.

Design Parameters – Compressive Loads

Item	Description
Maximum Net Allowable Bearing Pressure [1, 2]	2,000 psf - foundations bearing upon structural fill or undisturbed natural soils
Required Bearing Stratum [3]	GeoModel Layer 2 or undisturbed native soils or structural fill extending to suitable undisturbed native soils as confirmed during foundation construction by Terracon.
Minimum Foundation Dimensions	Continuous Wall Footings: 24-inch Width Isolated Spread Footings: 3 feet by 3 feet
Minimum Embedment below Finished Grade [4]	Exterior footings in unheated areas: 18 inches Exterior footings in heated areas: 18 inches Interior footings in heated areas: 18 inches
Estimated Total Settlement from Structural Loads [2]	Less than about 1 inch
Estimated Differential Settlement [2, 5]	About 1/2 of total settlement

1. The maximum net allowable bearing pressure is the pressure in excess of the minimum surrounding overburden pressure at the footing base elevation. Values assume that exterior grades are no steeper than 20% within 10 feet of structure.
2. Values provided are for maximum loads noted in Project Description. Additional geotechnical consultation will be necessary if higher loads are anticipated.
3. Unsuitable or soft soils should be overexcavated and replaced per the recommendations presented in Earthwork.
4. Embedment necessary to minimize the effects of frost and/or seasonal water content variations. For sloping ground, maintain depth below the lowest adjacent exterior grade within 5 horizontal feet of the structure.
5. Differential settlements are noted for equivalent-loaded foundations and bearing elevation as measured over a span of 50 feet.

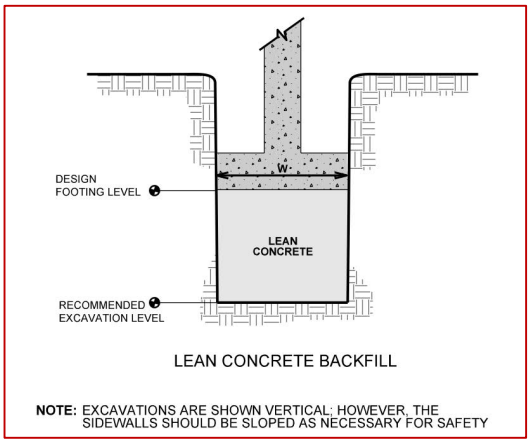
Foundation Construction Considerations

As noted in Earthwork, the footing excavations should be evaluated under the observation of the Geotechnical Engineer. The base of all foundation excavations should be free of water and loose soil, prior to placing concrete. Concrete should be placed soon after excavating to reduce bearing soil disturbance. Care should be taken to prevent wetting or drying of the bearing materials during construction. Excessively wet or dry material or any loose/disturbed material in the bottom of the footing excavations should be removed/reconditioned before foundation concrete is placed.

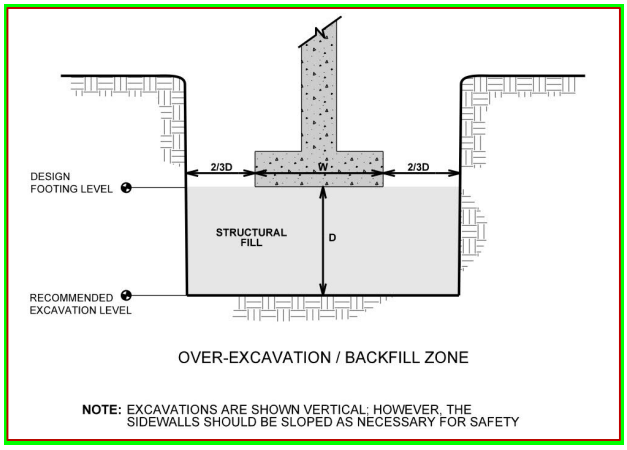
Sensitive soils exposed at the surface of footing excavations may require surficial compaction with hand-held dynamic compaction equipment prior to placing structural

fill, steel, and/or concrete. Should surficial compaction not be adequate, construction of a working surface consisting of either crushed stone or a lean concrete mud mat may be required prior to the placement of reinforcing steel and construction of foundations.

If unsuitable bearing soils are observed at the base of the planned footing excavation, the excavation should be extended deeper to suitable soils, and the footings could bear directly on these soils at the lower level or on lean concrete backfill placed in the excavations. The lean concrete replacement zone is illustrated on the sketch below.



Overexcavation for structural fill placement below footings should be conducted as shown below. The overexcavation should be backfilled up to the footing base elevation, with describe soil type placed, as recommended in the Earthwork section of this report.



Floor Slabs

Design parameters for floor slabs assume the requirements for Earthwork have been followed. Specific attention should be given to positive drainage away from the structure and positive drainage of the aggregate base beneath the floor slab.

Floor Slab Design Parameters

Item	Description
Floor Slab Support[1]	Overlying 1 to 1.5 feet of well compacted granular structural fill materials for limited shrink-swell potential of the native Clays. Subgrade compacted to recommendations in Earthwork. Directly supported by at least a 4-inch layer of relatively clean, compacted, poorly graded Sand (SP) or Gravel (GP) with less than 5% passing the No. 200 Sieve (0.074 MM). Alternatively, the concrete slabs may be directly supported by a 6 to 8-inch layer of well compacted aggregate base stone (NCDOT Aggregate Base Course: ABC).
Estimated Modulus of Subgrade Reaction [2]	125 pounds per square inch per inch (psi/in) for point loads.

1. Floor slabs should be structurally independent of building footings or walls to reduce the possibility of floor slab cracking caused by differential movements between the slab and foundation.
2. Modulus of subgrade reaction is an estimated value based upon our experience with the subgrade condition, the requirements noted in Earthwork, and the floor slab support as noted in this table. It is provided for point loads. For large area loads the modulus of subgrade reaction would be lower.

It is common to reduce the k-value to account for dimensional effects of large, loaded areas. For such features, the value of K_c in the formula below is the corrected or design modulus value in units of psi/in, k is the table value above, and b is the mat width (short dimension) or tributary loaded area measured in units of feet. Soft or unstable subgrade will be remediated by scarifying and re-compacting or by over-excavation and replacement. For sand subgrades, this can be estimated as:

$$K\_c = k((b+1)/2b)\text{^}2$$

Our engineer can provide refined estimates of K_c if provided more detailed information regarding the loads and application area to conduct settlement analysis.

The use of a vapor retarder should be considered beneath concrete slabs on grade covered with wood, tile, carpet, or other moisture sensitive or impervious coverings, when the project includes humidity-controlled areas, or when the slab will support equipment sensitive to moisture. When conditions warrant the use of a vapor retarder, the slab designer should refer to ACI 302 and/or ACI 360 for procedures and cautions regarding the use and placement of a vapor retarder.

Saw-cut contraction joints should be placed in the slab to help control the location and extent of cracking. For additional recommendations, refer to the ACI Design Manual. Joints or cracks should be sealed with a waterproof, non-extruding compressible compound specifically recommended for heavy duty concrete pavement and wet environments.

Where floor slabs are tied to perimeter walls or turn-down slabs to meet structural or other construction objectives, our experience indicates differential movement between the walls and slabs will likely be observed in adjacent slab expansion joints or floor slab cracks beyond the length of the structural dowels. The Structural Engineer should account for potential differential settlement through use of sufficient control joints, appropriate reinforcing or other means.

Floor Slab Construction Considerations

Finished subgrade, within and for at least 10 feet beyond the floor slab, should be protected from traffic, rutting, or other disturbance and maintained in a relatively moist condition until floor slabs are constructed. If the subgrade should become damaged or desiccated prior to construction of floor slabs, the affected material should be removed, and structural fill should be added to replace the resulting excavation. Final conditioning of the finished subgrade should be performed immediately prior to placement of the floor slab support course.

The Geotechnical Engineer should observe the condition of the floor slab subgrades immediately prior to placement of the floor slab support course, reinforcing steel, and concrete. Attention should be paid to high traffic areas that were rutted and disturbed earlier, and to areas where backfilled trenches are located.

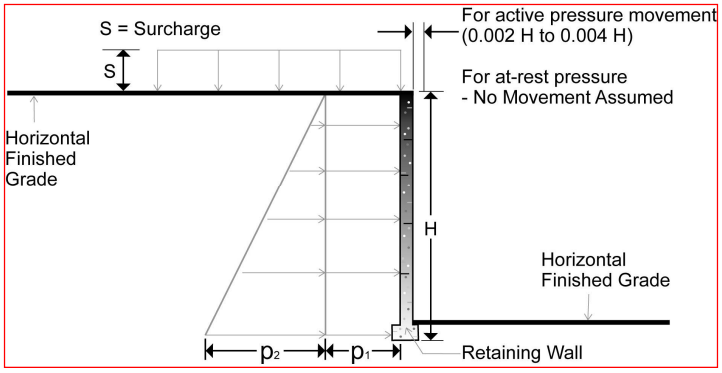
Below-Grade Structures

A portion of the proposed structures at this site will include below-grade structures having a depth of about 2 to 3 feet and constructed of concrete slabs and reinforced walls. The below grade walls will support elevated slabs and/or metal grating. The estimated design parameters provided in the following section of this report may be used for design purposes.

Lateral Earth Pressures

Design Parameters

Structures with unbalanced backfill levels on opposite sides should be designed for earth pressures at least equal to values indicated in the following table. Earth pressures will be influenced by structural design of the walls, conditions of wall restraint, methods of construction, and/or compaction and the strength of the materials being restrained. Two wall restraint conditions are shown in the diagram below. Active earth pressure is commonly used for design of free-standing cantilever retaining walls and assumes wall movement. The “at-rest” condition assumes no wall movement and is commonly used for basement walls, loading dock walls, or other walls restrained at the top. The recommended design lateral earth pressures do not include a factor of safety and do not provide for possible hydrostatic pressure on the walls (unless stated).



Lateral Earth Pressure Design Parameters

Earth Pressure Condition [1]	Coefficient for Structural Backfill Type [2,3,4]
Active (Ka)	0.31
At-Rest (Ko)	0.47
Passive (Kp)	3.25
Friction Angle (degrees)	32
Cohesion (psf)	0
Moist Unit Weight (pcf)	115
Saturated Unit Weight (pcf)	120
Buoyant Unit Weight (pcf)	58

1. For active earth pressure, wall must rotate about base, with top lateral movements 0.002 H to 0.004 H, where H is wall height. For passive earth pressure, wall must move horizontally to mobilize resistance. Fat clay or other expansive soils should not be used as backfill behind the wall.
2. Uniform, horizontal backfill, with a maximum unit weight of 115 pcf for granular soils.
3. Uniform surcharge, where S is surcharge pressure.
4. Loading from heavy compaction equipment is not included.
5. To achieve “Unsaturated” conditions, follow guidelines in Subsurface Drainage for Below-Grade Walls below. “Submerged” conditions are recommended when drainage behind walls is not incorporated into the design.

Backfill placed against structures should consist of granular soils or low plasticity cohesive soils. For the granular values to be valid, the granular backfill must extend out and up from the base of the wall at an angle of at least 45 degrees from vertical for the active case.

Footings, floor slabs or other loads bearing on backfill behind walls may have a significant influence on the lateral earth pressure. Placing footings within wall backfill and in the zone of active soil influence on the wall should be avoided unless structural analyses indicate the wall can safely withstand the increased pressure.

The lateral earth pressure recommendations given in this section are applicable to the design of rigid retaining walls subject to slight rotation, such as cantilever, or gravity type concrete walls. These recommendations are not applicable to the design of modular block - geogrid reinforced backfill walls (also termed MSE walls). Recommendations covering these types of wall systems are beyond the scope of services for this assignment. However, we would be pleased to develop a proposal for evaluation and design of such wall systems upon request.

Subsurface Drainage for Below-Grade Walls

A perforated rigid plastic drain line installed behind the base of walls and extends below adjacent grade is recommended to prevent hydrostatic loading on the walls. The invert of a drain line around a below-grade building area or exterior retaining wall should be placed near foundation bearing level. The drain line should be sloped to provide positive gravity drainage to daylight or to a sump pit and pump. The drain line should be surrounded by clean, free-draining granular material having less than 5% passing the No. 200 sieve, such as No. 57 aggregate. The free-draining aggregate should be encapsulated in a filter fabric.

As an alternative to free-draining granular fill, a prefabricated drainage structure may be used. A prefabricated drainage structure is a plastic drainage core or mesh which is covered with filter fabric to prevent soil intrusion and is fastened to the wall prior to placing backfill.

General Comments

Our analysis and opinions are based upon our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration. Variations will occur between exploration point locations or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. Terracon should be retained as the Geotechnical Engineer, where noted in this report, to provide observation and testing services during pertinent construction phases. If variations appear, we can provide further evaluation and supplemental recommendations. If variations are noted in the absence of our observation and testing services on-site, we should be immediately notified so that we can provide evaluation and supplemental recommendations.

Our Scope of Services does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

Our services and any correspondence are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third-party beneficiaries intended. Any third-party access to services or correspondence is solely for information purposes to support the services provided by Terracon to our client. Reliance upon the services and any work product is limited to our client and is not intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly effect excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety and cost estimating including excavation support and dewatering requirements/design are the responsibility of others. Construction and site development have the potential to affect adjacent properties. Such impacts can include damages due to vibration, modification of groundwater/surface water flow during construction, foundation movement due to undermining or subsidence from excavation, as well as noise or air quality concerns. Evaluation of these items on nearby properties are commonly associated with contractor means and methods and are not addressed in this report. The owner and contractor should consider a preconstruction/precondition survey of surrounding development. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing.

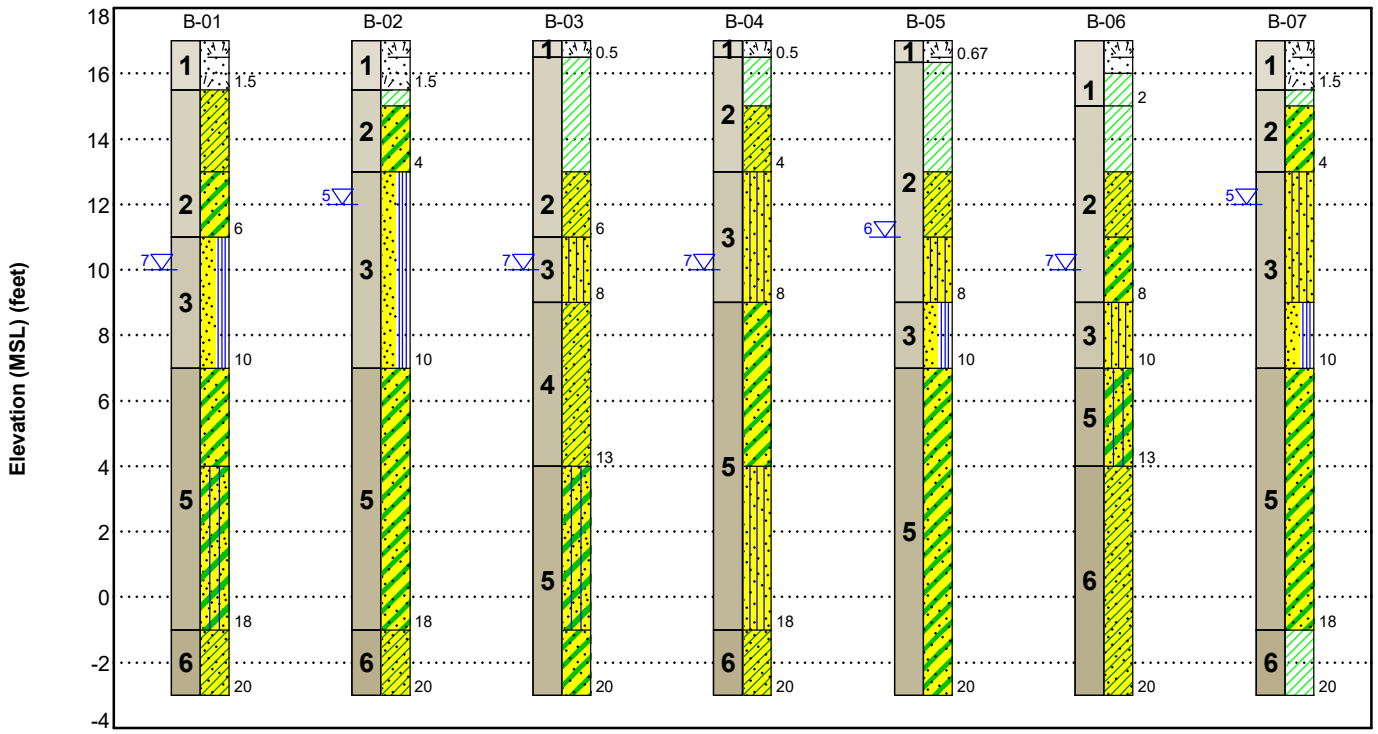
Figures

Contents:

Tidewater Research Station - Swine Unit
207 Research Station Rd | Plymouth, NC
Terracon Project No. K5225062

Terracon
106 Capital Trace, Unit E
Elizabeth City, NC

GeoModel



This is not a cross section. This is intended to display the Geotechnical Model only. See individual logs for more detailed conditions.

Model Layer	Layer Name	General Description
1	Surficial Soils	Topsoil and/or Lean CLAY (CL) with Organics
2	Clay/Sand	Moist to wet Lean CLAY (CL) with varying amounts of Sand, medum stiff to stiff and/or SAND (SM, SC) with varying amounts of Silt, and/or Clay, very loose to loose
3	Sand	Moist to wet, SAND (SP-SM, SM) with varying amounts of Silt, and/or Clay, very loose to loose
4	Clay	Wet, Lean CLAY (CL) with varying amounts of Sand and/or Marine Shell Fragments, very soft to soft
5	Sand	Wet, SAND (SM, SC-SM, SC) with varying amounts of Clay, Silt, and/or Marine Shell Fragments, very loose
6	Clay	Wet, Lean CLAY (CL) with varying amounts of Sand and/or Marine Shell Fragments, medium stiff

LEGEND

- Topsoil
- Sandy Lean Clay
- Clayey Sand
- Poorly-graded Sand with Silt
- Silty Clayey Sand
- Lean Clay
- Silty Sand

NOTES:
Layering shown on this figure has been developed by the geotechnical engineer for purposes of modeling the subsurface conditions as required for the subsequent geotechnical engineering for this project.

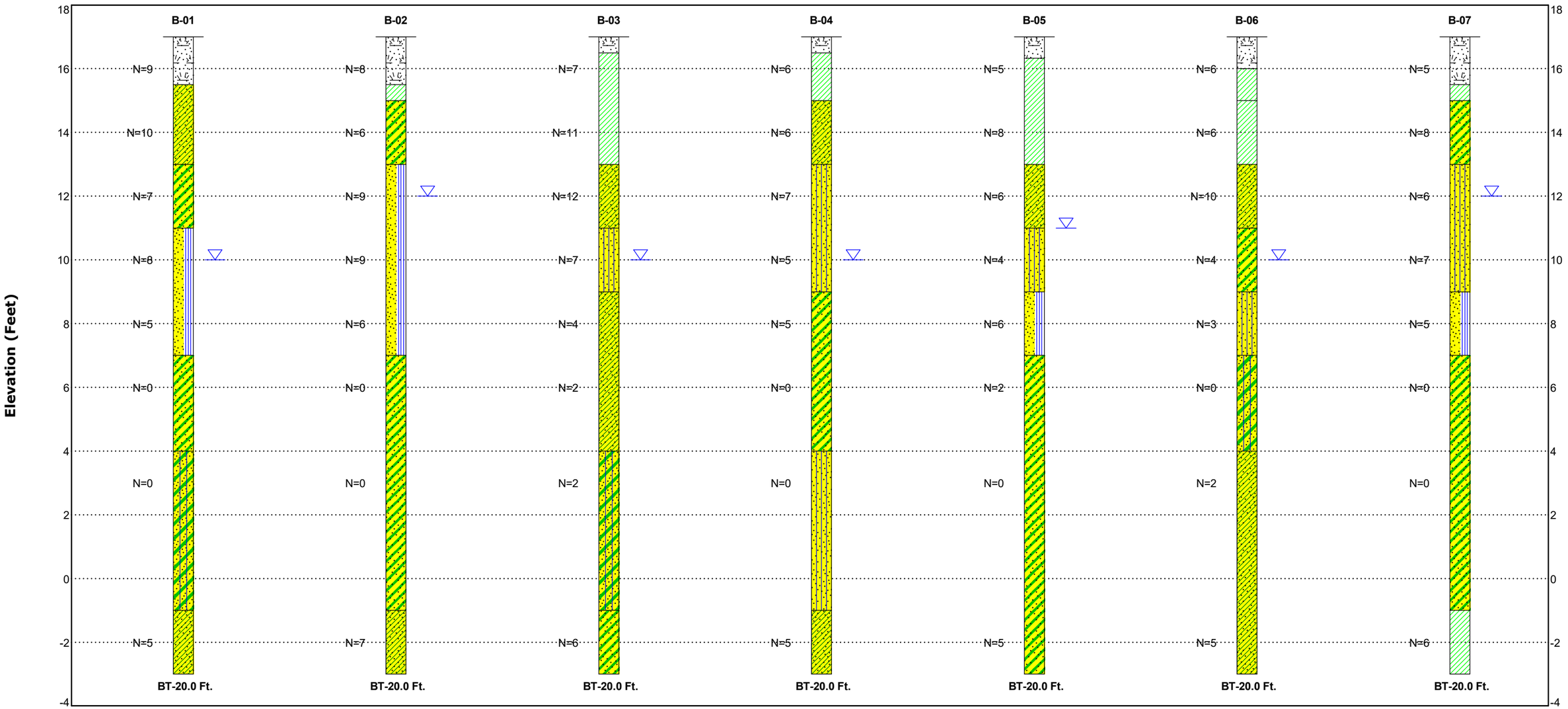
▽ First Water Observation

The groundwater levels shown are representative of the date and time of our exploration. Significant changes are possible over time.
Water levels shown are as measured during and/or after drilling. In some cases, boring advancement methods mask the presence/absence of groundwater. See individual logs for details.

Tidewater Research Station - Swine Unit Replacement, Phase 1
207 Research Station Rd | Plymouth, NC
Terracon Project No. K5225062

Subsurface Profile

Terracon
106 Capital Trace, Unit E
Elizabeth City, NC



Notes	Water Level Observations	Explanation
See Exploration Plan for orientation of soil profile. See General Notes in Supporting Information for symbols and soil classifications. Soils profile provided for illustration purposes only. Soils between borings may differ AR - Auger Refusal BT - Boring Termination	▽ Water Level Reading at time of drilling. Water Level Reading after drilling.	B-01 — Borehole Number Moisture Content — %w LL PL — Liquid and Plastic Limits Sampling (See General Notes) Borehole Lithology AR / BT — Borehole Termination Type

Material Legend

Topsoil | Sandy Lean Clay | Clayey Sand | Poorly-graded Sand with Silt | Silty Clayey Sand
Lean Clay | Silty Sand

Attachments

Exploration and Testing Procedures

Field Exploration

Number of Borings	Approximate Boring Depth (feet)	Location
7	20	Building areas

Boring Layout and Elevations: Terracon personnel provided the boring layout using handheld GPS equipment (estimated horizontal accuracy of about ±10 feet) and referencing existing site features. Approximate ground surface elevations were obtained by interpolation from the Approximate ground surface elevations were estimated using Google Earth ProTM, which uses the vertical datum WGS84. If elevations and a more precise boring layout are desired, we recommend borings be surveyed.

Subsurface Exploration Procedures: We advanced the borings with track-mounted, ATV-mounted rotary drill rig using mud rotary procedures. Six samples were obtained in the upper 12 feet of each boring and at intervals of 5 feet thereafter. In the split barrel sampling procedure, a standard 2 inch outer diameter split barrel sampling spoon was driven into the ground by a 140 pound automatic hammer falling a distance of 30 inches. The number of blows required to advance the sampling spoon the middle 12 inches of a normal 24 inch penetration is recorded as the Standard Penetration Test (SPT) resistance value. The SPT resistance values, also referred to as N-values, are indicated on the boring logs at the test depths. We observed and recorded groundwater levels during drilling and sampling. The groundwater levels are shown on the attached boring logs. For safety purposes, all borings were backfilled with auger cuttings after their completion.

The sampling depths, penetration distances, and other sampling information was recorded on the field boring logs. The samples were placed in appropriate containers and taken to our soil laboratory for testing and classification by a Geotechnical Engineer. The final boring logs represent the Geotechnical Engineer's visual classifications of the sampled materials, interpretation of the subsurface conditions between samples, and include modifications based on observations and tests of the samples in our laboratory.

Laboratory Testing

The project engineer reviewed the field data and assigned laboratory tests. The laboratory testing program included the following types of tests:

- Moisture Content
- Atterberg Limits
- Sieve Analysis

The laboratory testing program often included examination of soil samples by an engineer. Based on the results of our field and laboratory programs, we described and classified the soil samples in accordance with the Unified Soil Classification System.

Site Location and Exploration Plans

Contents:

Site Location Plan
Exploration Plan with Aerial Image and Project Overlay

Note: All attachments are one page unless noted above.

Site Location

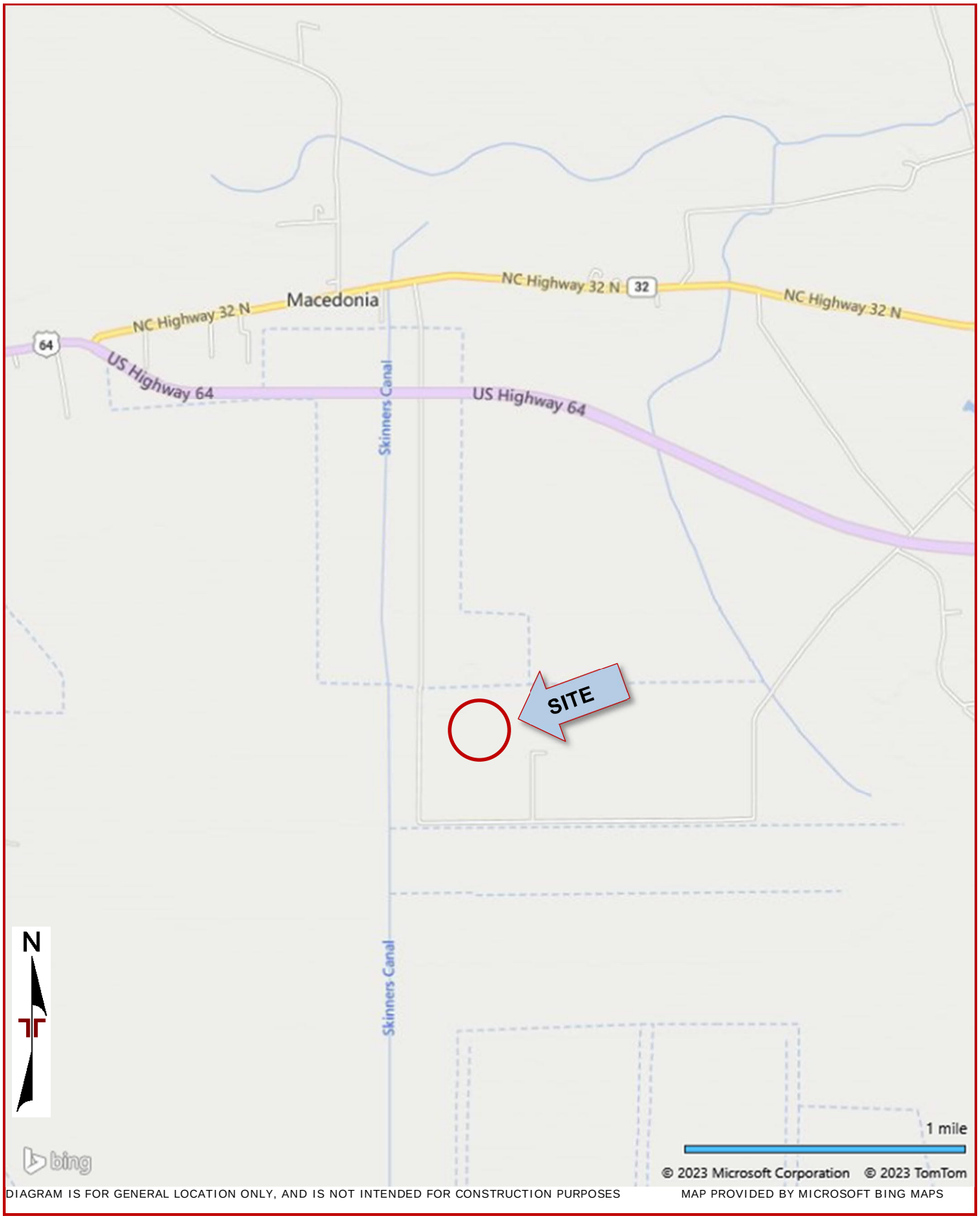


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY MICROSOFT BING MAPS

Exploration Plan

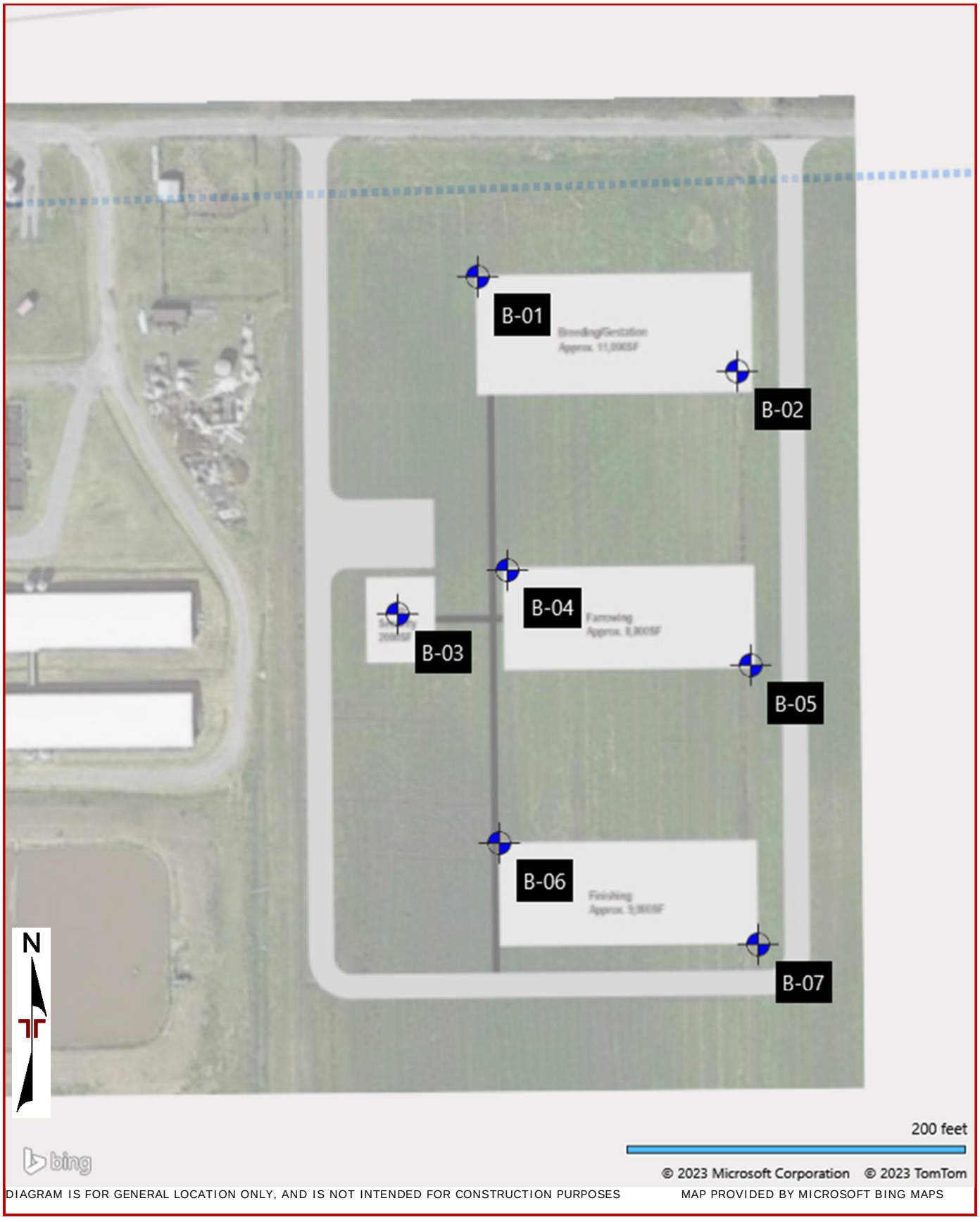


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY MICROSOFT BING MAPS

Exploration and Laboratory Results

Contents:

Boring Logs (B-01 through B-07; 7 pages)
Summary of Laboratory Results

Note: All attachments are one page unless noted above.

Tidewater Research Station - Swine Unit Replacement, Phase 1
207 Research Station Rd | Plymouth, NC
Terracon Project No. K5225062

Terracon
106 Capital Trace, Unit E
Elizabeth City, NC

Boring Log No. B-01

Location: See Exploration Plan

Latitude: 35.8555° Longitude: -76.6565°

Model Layer	Depth (Ft.)	Elevation.: 17 (Ft.)	Field Test Results	Water Content (%)	Atterberg Limits LL-PL-PI	Percent Fines
1	0.0	**TOPSOIL**, 18 inches of topsoil	3-5-4-4 N=9	19.5		60
	1.5	15.5				
2	1.5	**SANDY LEAN CLAY (CL)**, mottled dark gray and tan, moist, stiff	4-5-5-5 N=10			
	4.0	13				
	4.0	**CLAYEY SAND (SC)**, mottled gray and reddish tan, moist to very moist, loose	4-3-4-3 N=7			
	6.0	11				
3	6.0	**POORLY GRADED SAND WITH SILT (SP-SM) TO SILTY SAND (SM)**, mottled gray and reddish tan, very moist to wet, loose	3-5-3-4 N=8			
		wet from 7 feet	3-3-2-2 N=5			
	10.0	7				
	10.0	**CLAYEY SAND (SC)**, dark gray, wet, contains Marine Shell Fragments, very loose	0-0-0-0 N=0	33.5		22
	13.0	4				
5	13.0	**SILTY CLAYEY SAND (SC-SM)**, dark gray, wet, very loose	0-0-0-0 N=0			
	18.0	-1				
6	18.0	**SANDY LEAN CLAY (CL)**, gray, wet, medium stiff	2-2-3-3 N=5			
	20.0	-3				
		Boring Terminated at 20 Feet				

Depth (Ft.) 5 10 15 20

Water Level Observations: ▽ While drilling

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes

Advancement Method
rotary mud

Abandonment Method
Boring backfilled with soil cuttings and bentonite chips upon completion.

Drill Rig
CME-45C

Driller
J. Hofler

Logged by
D. Morrison

Boring Started
04-06-2023

Boring Completed
04-06-2023

Tidewater Research Station - Swine Unit Replacement, Phase 1
207 Research Station Rd | Plymouth, NC
Terracon Project No. K5225062

Terracon
106 Capital Trace, Unit E
Elizabeth City, NC

Boring Log No. B-02

Location: See Exploration Plan

Latitude: 35.8553° Longitude: -76.6559°

Model Layer	Graphic Log	Depth (Ft.)	Elevation.: 17 (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Water Content (%)	Atterberg Limits LL-PL-PI	Percent Fines
1		1.5	**TOPSOIL**, 18 inches of topsoil				3-3-5-5 N=8			
		2.0	**LEAN CLAY (CL)**, mottled brown and reddish tan, moist, medium stiff	15						
2		4.0	**CLAYEY SAND (SC)**, mottled tan and reddish tan, moist to very moist, loose	13			2-3-3-3 N=6	25.1		42
3		10.0	**POORLY GRADED SAND WITH SILT (SP-SM) TO SILTY SAND (SM)**, reddish tan, very moist to wet, loose wet from 5 feet tan from 6 feet mottled gray and tan from 8 feet	7	▽		3-4-5-4 N=9 3-4-5-4 N=9 3-3-3-3 N=6			
5		18.0	**CLAYEY SAND (SC)**, dark gray, wet, very loose	-1			0-0-0-0 N=0 0-0-0-0 N=0	26.9		23
6		20.0	**SANDY LEAN CLAY (CL)**, dark gray, wet, trace Marine Shell Fragments, medium stiff	-3			3-3-4-3 N=7			
			Boring Terminated at 20 Feet							

5 10 15 20

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Water Level Observations
▽ While drilling

Drill Rig
CME-45C

Driller
J. Hofler

Logged by
D. Morrison

Boring Started
04-06-2023

Boring Completed
04-06-2023

Notes

Advancement Method
rotary mud

Abandonment Method
Boring backfilled with soil cuttings and bentonite chips upon completion.

Tidewater Research Station - Swine Unit Replacement, Phase 1
207 Research Station Rd | Plymouth, NC
Terracon Project No. K5225062

Terracon
106 Capital Trace, Unit E
Elizabeth City, NC

Boring Log No. B-03

Location: See Exploration Plan

Latitude: 35.8549° Longitude: -76.6566°

Model Layer	Graphic Log	Depth (Ft.)	Elevation.: 17 (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Water Content (%)	Atterberg Limits LL-PL-PI	Percent Fines
1		0.5	**TOPSOIL**, 6 inches of topsoil 16.5							
		4.0	**LEAN CLAY (CL)**, mottled dark gray and reddish tan, moist, medium stiff to stiff mottled gray and reddish orange from 2 feet 13				3-4-3-4 N=7			
							5-6-5-6 N=11			
2		6.0	**SANDY LEAN CLAY (CL)**, mottled gray and reddish orange, moist to very moist, stiff 11	5			6-7-5-6 N=12			
3		8.0	**SILTY SAND (SM)**, gray, very moist to wet, loose 9		▽		5-4-3-4 N=7			
4		13.0	**SANDY LEAN CLAY (CL)**, gray, wet, very soft to soft dark gray with Marine Shell Fragments from 10 feet 4	10			3-2-2-2 N=4	32.8		55
							1-1-1-1 N=2			
5		18.0	**SILTY CLAYEY SAND (SC-SM)**, dark gray, wet, very loose -1	15			2-1-1-1 N=2	46.0		26
		20.0	**CLAYEY SAND (SC)**, dark gray, wet, contains Marine Shell Fragments, loose -3				3-3-3-3 N=6			
			Boring Terminated at 20 Feet	20						

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Water Level Observations
▽ While drilling

Drill Rig
CME-45C

Driller
J. Hofler

Logged by
D. Morrison

Boring Started
04-06-2023

Boring Completed
04-06-2023

Notes

Advancement Method
rotary mud

Abandonment Method
Boring backfilled with soil cuttings and bentonite chips upon completion.

Tidewater Research Station - Swine Unit Replacement, Phase 1
207 Research Station Rd | Plymouth, NC
Terracon Project No. K5225062

Terracon
106 Capital Trace, Unit E
Elizabeth City, NC

Boring Log No. B-04

Location: See Exploration Plan

Latitude: 35.8550° Longitude: -76.6564°

Model Layer	Graphic Log	Depth (Ft.)	Elevation.: 17 (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Water Content (%)	Atterberg Limits LL-PL-PI	Percent Fines
1		0.5	**TOPSOIL**, 6 inches of topsoil 16.5							
2		2.0	**LEAN CLAY (CL)**, mottled brown and reddish orange, moist, medium stiff 15				3-3-3-3 N=6			
		4.0	**SANDY LEAN CLAY (CL)**, mottled gray and reddish tan, moist, medium stiff 13				3-3-3-6 N=6			
3		8.0	**SILTY SAND (SM)**, mottled gray and reddish tan, moist to wet, loose wet from 7 feet 9	5			2-3-4-5 N=7	23.4		20
					▽		2-2-3-3 N=5			
5		13.0	**CLAYEY SAND (SC)**, dark gray, wet, very loose to loose 4				3-3-2-3 N=5			
				10			0-0-0-0 N=0	32.5		19
		18.0	**SILTY SAND WITH CLAY (SM)**, dark gray, wet, very loose -1				0-0-0-1 N=0			
6		20.0	**SANDY LEAN CLAY (CL)**, dark gray, wet, contains Marine Shell Fragments, medium stiff -3	15			3-3-2-3 N=5			
			Boring Terminated at 20 Feet	20						

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Water Level Observations
▽ While drilling

Drill Rig
CME-45C

Driller
J. Hofler

Logged by
D. Morrison

Boring Started
04-06-2023

Boring Completed
04-06-2023

Notes

Advancement Method
rotary mud

Abandonment Method
Boring backfilled with soil cuttings and bentonite chips upon completion.

Tidewater Research Station - Swine Unit Replacement, Phase 1
207 Research Station Rd | Plymouth, NC
Terracon Project No. K5225062

Terracon
106 Capital Trace, Unit E
Elizabeth City, NC

Boring Log No. B-05

Location: See Exploration Plan

Latitude: 35.8548° Longitude: -76.6559°

Model Layer	Depth (Ft.)	Elevation.: 17 (Ft.)	Field Test Results	Water Content (%)	Atterberg Limits LL-PL-PI	Percent Fines
1	0.7	**TOPSOIL**, 8 inches of topsoil	16.33				
2	4.0	**LEAN CLAY (CL)**, mottled brown, gray, and reddish tan, moist, medium stiff mottled gray and reddish tan from 2 feet	13	2-3-2-3 N=5 3-4-4-3 N=8			
2	6.0	**SANDY LEAN CLAY (CL)**, mottled gray and tan, moist to very moist, medium stiff	11	4-3-3-3 N=6			
2	8.0	**SILTY SAND (SM)**, with trace clay, gray, wet, very loose	9	2-1-3-10 N=4	28.6		27
3	10.0	**POORLY GRADED SAND WITH SILT (SP-SM)**, gray, wet, loose	7	3-3-3-3 N=6			
5	20.0	**CLAYEY SAND (SC)**, dark gray, wet, very loose to loose contains Marine Shell Fragments from 18 feet	-3	1-1-1-1 N=2 0-0-0-1 N=0 3-3-2-3 N=5	33.2		23
		Boring Terminated at 20 Feet					

Depth (Ft.) 5 10 15 20

Water Level Observations: ▽ While drilling

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes

Advancement Method
rotary mud

Abandonment Method
Boring backfilled with soil cuttings and bentonite chips upon completion.

Drill Rig
CME-45C

Driller
J. Hofler

Logged by
D. Morrison

Boring Started
04-06-2023

Boring Completed
04-06-2023

Tidewater Research Station - Swine Unit Replacement, Phase 1
207 Research Station Rd | Plymouth, NC
Terracon Project No. K5225062

Terracon
106 Capital Trace, Unit E
Elizabeth City, NC

Boring Log No. B-06

Location: See Exploration Plan

Latitude: 35.8545° Longitude: -76.6564°

Model Layer	Depth (Ft.)	Elevation.: 17 (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Water Content (%)	Atterberg Limits LL-PL-PI	Percent Fines
	1.0	**TOPSOIL**, 12 inches of topsoil 16							
1	2.0	**LEAN CLAY (CL)**, with organics, mottled black, brown, and dark gray, moist, medium stiff 15				3-3-3-4 N=6			
2	4.0	**LEAN CLAY (CL)**, mottled gray, tan, and orange, moist, medium stiff 13				3-3-3-3 N=6			
2	6.0	**SANDY LEAN CLAY (CL)**, mottled gray and reddish tan, moist to very moist, stiff 11	5			4-5-5-5 N=10			
2	8.0	**CLAYEY SAND (SC)**, gray with black, very moist to wet, very loose 9		▽		3-2-2-3 N=4	24.5		41
3	10.0	**SILTY SAND (SM)**, gray, wet, very loose 7				3-2-1-2 N=3			
5	13.0	**SILTY CLAYEY SAND (SC-SM)**, gray, wet, contains trace Marine Shell Fragments, very loose 4	10			0-0-0-0 N=0	34.3		23
6	20.0	**SANDY LEAN CLAY (CL)**, gray, wet, contains trace Marine Shell Fragments, very soft to medium stiff -3	15			1-1-1-1 N=2			
6	20.0	2-3-2-3 N=5							
		Boring Terminated at 20 Feet	20						

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Water Level Observations
▽ While drilling

Drill Rig
CME-45C

Driller
J. Hofler

Logged by
D. Morrison

Boring Started
04-06-2023

Boring Completed
04-06-2023

Notes

Advancement Method
rotary mud

Abandonment Method
Boring backfilled with soil cuttings and bentonite chips upon completion.

Tidewater Research Station - Swine Unit Replacement, Phase 1
207 Research Station Rd | Plymouth, NC
Terracon Project No. K5225062

Terracon
106 Capital Trace, Unit E
Elizabeth City, NC

Boring Log No. B-07

Location: See Exploration Plan

Latitude: 35.8544° Longitude: -76.6559°

Model Layer	Graphic Log	Depth (Ft.)	Elevation.: 17 (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Water Content (%)	Atterberg Limits LL-PL-PI	Percent Fines
1		0.0	**TOPSOIL**, 18 inches of topsoil							
		1.5		15.5			2-3-2-3 N=5			
2		2.0	**LEAN CLAY (CL)**, mottled brown, gray, and orange, moist, medium stiff	15						
			CLAYEY SAND (SC), mottled tan, gray, and reddish tan, moist to very moist, loose				4-4-4-4 N=8			
		4.0		13						
3			**SILTY SAND (SM)**, mottled gray and tan, very moist to wet, loose				2-3-3-4 N=6			
			mottled tan and reddish tan, with clay lens from 6 feet	5						
		8.0		9			2-2-5-10 N=7			
			POORLY GRADED SAND WITH SILT (SP-SM), mottled gray and tan, wet, loose				3-3-2-1 N=5			
		10.0		7						
5			**CLAYEY SAND (SC)**, dark gray, wet, very loose	10			0-0-0-0 N=0			
							0-0-0-0 N=0			
				15						
		18.0		-1						
6			**LEAN CLAY (CL)**, gray, wet, contains trace Marine Shell Fragments, medium stiff				3-3-3-3 N=6			
		20.0		-3						
			Boring Terminated at 20 Feet	20						

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Water Level Observations
While drilling

Drill Rig
CME-45C

Driller
J. Hofler

Logged by
D. Morrison

Boring Started
04-06-2023

Boring Completed
04-06-2023

Notes

Advancement Method
rotary mud

Abandonment Method
Boring backfilled with soil cuttings and bentonite chips upon completion.

Summary of Laboratory Results

BORING ID	Depth (Ft.)	Soil Classification USCS & AASHTO	Liquid Limit	Plastic Limit	Plasticity Index	% Fines	Water Content (%)
B-01	0-2					60.2	19.5
B-01	10-12					21.9	33.5
B-02	2-4					42.5	25.1
B-02	10-12					22.9	26.9
B-03	8-10					55.1	32.8
B-03	13-15					26.1	46.0
B-04	4-6					19.8	23.4
B-04	10-12					18.8	32.5
B-05	6-8					27.1	28.6
B-05	13-15					23.2	33.2
B-06	6-8					41.1	24.5
B-06	10-12					23.4	34.3

PROJECT: Tidewater Research Station - Swine Unit Replacement, Phase 1

PROJECT NUMBER: K5225062

SITE: 207 Research Station Rd
Plymouth, NC

Terracon
106 Capital Trace, Unit E
Elizabeth City, NC

CLIENT: NRW Engineering PC
Virginia Beach, VA

Supporting Information

Contents:

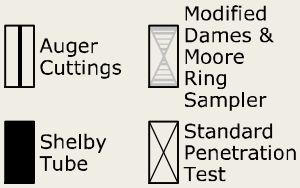
Note: All attachments are one page unless noted above.

SUPPORTING INFORMATION SHEETS

Terracon
106 Capital Trace, Unit E
Elizabeth City, NC

General Notes

Sampling



Water Level

Water Initially Encountered

Water Level After a Specified Period of Time

Water Level After a Specified Period of Time

Cave In Encountered

Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.

Field Tests

N	Standard Penetration Test Resistance (Blows/Ft.)
(HP)	Hand Penetrometer
(T)	Torvane
(DCP)	Dynamic Cone Penetrometer
UC	Unconfined Compressive Strength
(PID)	Photo-Ionization Detector
(OVA)	Organic Vapor Analyzer

Descriptive Soil Classicification

Soil classification as noted on the soil boring logs is based Unified Soil Classification System. Where sufficient laboratory data exist to classify the soils consistent with ASTM D2487 "Classification of Soils for Engineering Purposes" this procedure is used. ASTM D2488 "Description and Identification of Soils (Visual-Manual Procedure)" is also used to classify the soils, particularly where insufficient laboratory data exist to classify the soils in accordance with ASTM D2487. In addition to USCS classification, coarse grained soils are classified on the basis of their in-place relative density, and fine-grained soils are classified on the basis of their consistency. See "Strength Terms" table below for details. The ASTM standards noted above are for reference to methodology in general. In some cases, variations to methods are applied as a result of local practice or professional judgment.

Location And Elevation Notes

Exploration point locations as shown on the Exploration Plan and as noted on the soil boring logs in the form of Latitude and Longitude are approximate. See Exploration and Testing Procedures in the report for the methods used to locate the exploration points for this project. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

Strength Terms

Relative Density of Coarse-Grained Soils
(More than 50% retained on No. 200 sieve.)
Density determined by Standard Penetration Resistance

Relative Density	Standard Penetration or N-Value (Blows/Ft.)	Ring Sampler (Blows/Ft.)
Very Loose	0 - 3	0 - 6
Loose	4 - 9	7 - 18
Medium Dense	10 - 29	19 - 58
Dense	30 - 50	59 - 98
Very Dense	> 50	> 99

Consistency of Fine-Grained Soils
(50% or more passing the No. 200 sieve.)
Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance

Consistency	Unconfined Compressive Strength Qu (tsf)	Standard Penetration or N-Value (Blows/Ft.)	Ring Sampler (Blows/Ft.)
Very Soft	less than 0.25	0 - 1	< 3
Soft	0.25 to 0.50	2 - 4	3 - 4
Medium Stiff	0.50 to 1.00	4 - 8	5 - 9
Stiff	1.00 to 2.00	8 - 15	10 - 18
Very Stiff	2.00 to 4.00	15 - 30	19 - 42
Hard	> 4.00	> 30	> 42

Relevance of Exploration and Laboratory Test Results

Exploration/field results and/or laboratory test data contained within this document are intended for application to the project as described in this document. Use of such exploration/field results and/or laboratory test data should not be used independently of this document.

Unified Soil Classification System

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]				Soil Classification	
				Group Symbol	Group Name [B]
Coarse-Grained Soils: More than 50% retained on No. 4 sieve	Gravels: More than 50% of coarse fraction retained on No. 4 sieve	Clean Gravels: Less than 5% fines [C]	Cu≥4 and 1≤Cc≤3 [E]	GW	Well-graded gravel [F]
			Cu<4 and/or [Cc<1 or Cc>3.0] [E]	GP	Poorly graded gravel [F]
		Gravels with Fines: More than 12% fines [C]	Fines classify as ML or MH	GM	Silty gravel [F, G, H]
			Fines classify as CL or CH	GC	Clayey gravel [F, G, H]
	Sands: 50% or more of coarse fraction passes No. 4 sieve	Clean Sands: Less than 5% fines [D]	Cu≥6 and 1≤Cc≤3 [E]	SW	Well-graded sand [I]
			Cu<6 and/or [Cc<1 or Cc>3.0] [E]	SP	Poorly graded sand [I]
		Sands with Fines: More than 12% fines [D]	Fines classify as ML or MH	SM	Silty sand [G, H, I]
			Fines classify as CL or CH	SC	Clayey sand [G, H, I]
Fine-Grained Soils: 50% or more passes the No. 200 sieve	Silts and Clays: Liquid limit less than 50	Inorganic:	PI > 7 and plots above "A" line [J]	CL	Lean clay [K, L, M]
			PI < 4 or plots below "A" line [J]	ML	Silt [K, L, M]
		Organic:	$(LL\ oven\ dried)/(LL\ not\ dried) < 0.75$	OL	Organic clay [K, L, M, N]
					Organic silt [K, L, M, O]
	Silts and Clays: Liquid limit 50 or more	Inorganic:	PI plots on or above "A" line	CH	Fat clay [K, L, M]
			PI plots below "A" line	MH	Elastic silt [K, L, M]
		Organic:	<	OH	Organic clay [K, L, M, P]
					Organic silt [K, L, M, Q]
Highly organic soils:	Primarily organic matter, dark in color, and organic odor			PT	Peat

[A] Based on the material passing the 3-inch (75-mm) sieve.
[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.
[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.
[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay.
[E] $Cu = D_{60}/D_{10}$ $Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$
[F] If soil contains ≥ 15% sand, add "with sand" to group name.
[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.
[H] If fines are organic, add "with organic fines" to group name.
[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.
[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.
[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.
[L] If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.
[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.
[N] PI ≥ 4 and plots on or above "A" line.
[O] PI < 4 or plots below "A" line.
[P] PI plots on or above "A" line.
[Q] PI plots below "A" line.