REQUEST FOR QUALIFICATIONS

Orange Water and Sewer Authority
Mason Farm Wastewater Treatment Plant Storage Warehouse
CIP Project No. 278-50
Issue Date: April 1, 2025
Submittal Deadline: May 1, 2025 at 2PM

1. INTRODUCTION

Your firm is hereby invited to submit a written statement of qualifications to provide professional engineering services to design and provide construction phase services for a new Storage Warehouse Facility at the Mason Farm Wastewater Treatment Plant (WWTP). OWASA will conduct a Qualification-Based Selection process to identify the best qualified firm with which to negotiate a contract. All firms submitting qualifications must have demonstrated experience and expertise in designing warehouse facilities.

To be considered by OWASA, responses to this RFQ must be received by 2:00 p.m. Eastern Time on May 1, 2025. Refer to Section 5 – Submittal Requirements for details.

2. OBJECTIVES

The primary objectives of the project are to:

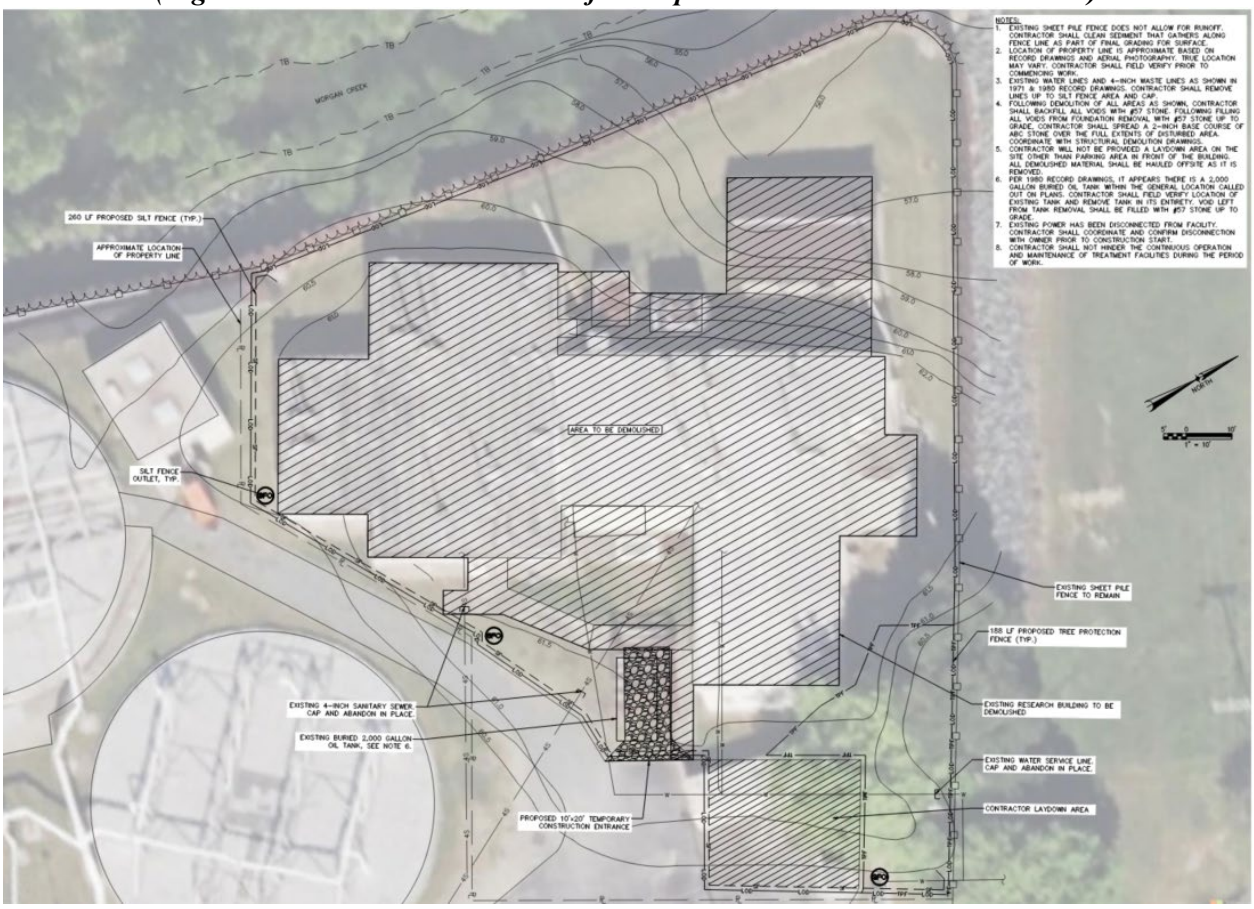
a) Utilize a recently completed Space Needs Assessment to finalize design of the proposed Storage Warehouse at the Mason Farm WWTP.
b) Complete construction of the Warehouse in general conformance with the budgetary cost estimate provided in the Space Needs Assessment.

3. BACKGROUND AND DESCRIPTION

OWASA would like to construct a storage warehouse at the Mason Farm WWTP to store maintenance and facilities related equipment. Mason Farm Wastewater Treatment Plant is located at 170 Old Mason Farm Rd in Chapel Hill, North Carolina. The warehouse will include at least one conditioned space for electrical equipment storage and testing. OWASA has identified a location on the site for the warehouse, at the recently demolished UNC Lab Facility as shown in Figure 1. OWASA has recently completed a space needs assessment for the warehouse (Attachment 1). The purpose of this space needs assessment was to assess the current and long-term needs with an emphasis on equipment storage, translate those needs into a building program, and develop a conceptual plan and project budget for planning purposes.



(Figure 1: Location on WWTP Site for Proposed Warehouse Outlined in Red)



(Old UNC Research Facility Demolition Plan)



(Photo above of UNC Research Facility demolition complete)

4. SCOPE OF SERVICES

The engineering services required for this project are expected to be completed to meet the objectives outlined above and in general accordance with a scope of services as needed to accomplish the tasks listed below. **However, the final scope of services will be negotiated with the selected engineering firm and may include modified and/or additional tasks.**

Scope of Services may include (but not limited to):

1. Engineering & Design Services
    i. Prepare Design Plans and Specifications for Construction.
    ii. Permitting Assistance
    iii. Review previously completed Geotechnical Engineering Report (Attachment 2).
    iv. Conduct a Subsurface Utility Engineering Assessment if needed.
    v. Cost Estimation
2. Construction Services
    i. Provide Bid phase services.
    ii. Provide Construction Observation and Construction Administration.
    iii. Prepare Record Drawings and assist with obtaining Close Out Documentation.

The draft and final plans, reports, etc. will be provided in electronic and hard copy formats. The actual list and format of deliverables will be negotiated with the selected firm.

5. SUBMITTAL REQUIREMENTS

Responses to this RFQ must be received by OWASA no later than 2:00 p.m. Eastern Time on Thursday, May 1, 2025. To be considered, please submit four (4) hard copies and one (1) electronic copy in PDF format of the required qualifications to:

Bill Rosa.
brosa@owasa.org
Project Manager – Capital Projects
Orange Water and Sewer Authority
400 Jones Ferry Road
Carrboro, North Carolina 27510

The Statement of Qualifications (**including** resumes) shall be limited to a maximum of 10 double-sided pages (i.e., 20 pages printed double-sided onto 10 sheets of 8-1/2"x11" paper). Please note that all Submittals shall become public documents upon delivery to OWASA. If there is sensitive or confidential information that cannot be shared publicly, please include additional documentation along with your submittal.

Along with completed copies of forms in Attachment 1, each submittal must include the following in order to be considered:

a) ***Statement of Interest***: explaining your firm's interest in performing the work on this project, including how the project aligns with your firm's capabilities.
b) ***Project Team/Org Chart*** **[25 points]** showing the proposed project team members, including sub-consultants (if any), identifying their respective roles on the project, and indicating their availability to support this project. Each proposal shall include resumes of key team members. The primary contact shall be clearly identified.
c) ***Project Approach*** **[25 points]** describing your proposed approach to accomplish the work to meet the project objectives, identifying how you will manage schedule, risks, etc. Provide detailed information that will allow OWASA staff to distinguish your team from other firms that may be competing for this project.
d) ***Project Schedule*** **[15 points]** provide sufficient delineation of phasing and tasks to demonstrate your understanding of the necessary project activities and reasonable durations, interdependencies, etc.
e) ***Past Experience and References*** **[35 points]** describing the five most similar projects completed by your project team in the last (5) years for other clients. Identify who served as project manager and key lead technical roles in those projects.
f) ***Contract Objections:*** It is OWASA's intention to use a contract similar to the one included as Attachment 2. If your firm objects to any element of the contract, please state the objections in the submittal.
g) ***Completed Attachment 1 forms***

6. TIMELINE AND SELECTION PROCESS

The timeline for this solicitation is as follows:

Advertisement	April 1, 2025
Questions Close	April 24, 2025
Statement of Qualifications Due	May 1, 2025
Anticipated Notice of Selection	May 8, 2025
Anticipated Completion of Final Scoping and Contracting	June 8, 2025

All dates in the above table are subject to change.

OWASA reserves the right to reject any and all proposals, to waive any minor formalities, and to disregard all nonconforming or conditional submittals.

OWASA may elect to conduct face-to-face interviews with two or more firms being evaluated prior to making a final selection.

If OWASA cannot reach an agreement with the initially selected firm, OWASA will then proceed to negotiate with the next best qualified firm or will reissue the RFQ.

In accordance with North Carolina State law (NC GS 143-128.2(g)) regarding Minority/Women Business Enterprises (M/WBE), it is the policy of OWASA to encourage and promote the use of minority-owned businesses in the procurement of goods and services. Proposers are strongly encouraged to include minority and women-owned businesses to the fullest extent possible when assembling their teams.

7. OWASA POINT OF CONTACT

Bill Rosa will be OWASA's primary point of contact for all consultant selection matters relating to this project. **All questions regarding this Request for Qualifications must be emailed on or before April 24, 2025** to Mr. Rosa at brosa@owasa.org.

8. SUPPLEMENTAL INFORMATION

Attachment 1: Procurement Forms
Attachment 2: OWASA Standard Design Services Agreement
Attachment 3: 278-50 WWTP Warehouse Report of Subsurface Exploration & Geotechnical Engineering Evaluation
Attachment 4: 278-50 WWTP Warehouse Space Needs Assessment

ACKNOWLEDGEMENT OF ADDENDA

The undersigned hereby acknowledges that their submission is reflective of any addenda posted for this solicitation by checking the appropriate box(es) below:

☐ N/A – no Addenda issued

☐ Addendum 1
☐ Addendum 2
☐ Addendum 3
☐ Addendum 4
☐ Addendum 5

Signature Date

Printed Name Title

E-VERIFY AFFIDAVIT

I,_____(the individual attesting below), being duly authorized by and on behalf of

_____ (the entity identified as the "Employer") after first being duly sworn hereby swears or affirms as follows:

1. Employer understands that E-Verify is the federal E-Verify program operated by the United States Department of Homeland Security and other federal agencies, or any successor or equivalent program used to verify the work authorization of newly hired employees pursuant to federal law in accordance with Article 2 of Chapter 64 of the North Carolina General Statutes.

2. Employer understands that Employers Must Use E-Verify. Each employer, after hiring an employee to work in the United States, shall verify the work authorization of the employee through E-Verify in accordance with Article 2 of Chapter 64 of the North Carolina General Statutes.

3. Employer will ensure compliance with E-Verify by any subcontractors subsequently hired by Employer for specified contracts subject to E-Verify entered into with the Orange Water and Sewer Authority.

This_____day of_____,_____.

_____

Signature of Affiant

Print or Type Name: _____

State of_____County of _____

Signed and sworn to (or affirmed) before me, this the __

day of_____,_____.

My Commission Expires:

_____ _____

Notary Public

(Affix Official/Notarial Seal)

Name of Counterparty:

_____

IRAN DIVESTMENT ACT CERTIFICATION REQUIRED BY N.C.G.S. 143C-6A-5(a)

N.C.G.S. 143C-6A-5(a) requires this certification for bids or contracts with the State of North Carolina, a North Carolina local government, or any other political subdivision of the State of North Carolina.

N.C.G.S. 143C-6A-5(b) requires that contractors with the State, a North Carolina local government, or any other political subdivision of the State of North Carolina must not utilize any subcontractor found on the State Treasurer's Final Divestment List.

As of the date listed below, the vendor or bidder listed above is not listed on the Final Divestment List created by the State Treasurer pursuant to N.C.G.S. 143-6A-4.

The undersigned hereby certifies that he or she is authorized by the vendor or bidder listed above to make the foregoing statement.

Signature	Date
Printed Name	Title

Notes to persons signing this form:

The State Treasurer's Final Divestment List can be found on the State Treasurer's website at: https://www.nctreasurer.com/about/transparency/commitment-transparency/divestment-and-do-not-contract-rules
and will be updated every 180 days.

COMPANIES BOYCOTTING ISRAEL DIVESTMENT ACT CERTIFICATION REQUIRED BY N.C.G.S. §147-86.81*et seq.* *

Pursuant to N.C.G.S. §**147-86.81**, any company identified as engaging in a boycott of Israel, as defined by this Act, is ineligible to contract with the State of North Carolina or any political subdivision of the State. In addition, State agencies must divest from investments in such restricted companies, determined by appearing on the Final Divestment List created by the State Treasurer pursuant to G.S. 147-86.81.

As of the date listed below, the supplier or bidder listed above is not listed on the Final Divestment List created by the State Treasurer pursuant to N.C.G.S. §147-86.81.

The undersigned hereby certifies that he or she is authorized by the contracting party or bidder listed above to make the foregoing statement.

Signature Date

Printed Name Title

Notes to persons signing this form:

The State Treasurer's Final Divestment List can be found on the State Treasurer's website at: https://www.nctreasurer.com/about/transparency/commitment-transparency/divestment-and-do-not-contract-rules
and will be updated every 180 days.

NON-COLLUSION AFFIDAVIT

The submitter, being duly sworn, solemnly swears (or affirms) that neither he, nor any official, agent or employee has entered into any agreement, participated in any collusion, or otherwise taken any action which is in restraint of free competition in connection with any bid or contract, that the bidder has not been convicted of violating *N.C.G.S. § 133-24* within the last three years, and that the submitter intends to do the work with its own bonafide employees or subcontractors and will not submit for the benefit of another contractor.

By submitting this non-collusion affidavit, the Submitter certifies, under penalty of perjury according to North Carolina law, their compliance with non-collusion standards. This affidavit affirms the Submitter's adherence to the required non-collusion guidelines without any exceptions.

SIGNATURE OF BIDDER

Name of Submitter_____
Print or type name

Address _____

Signature of Submitter_____
Print or type Signer's Name

Signature of Witness_____
Print or type Signer's name

AFFIDAVIT MUST BE NOTARIZED
Subscribed and sworn to before me this the

_____ day of _____ 20__ .

Signature of Notary Public

of _____County

State of _____

My Commission Expires: _____ **NOTARY SEAL**

CERTIFICATION REGARDING CONFLICT OF INTEREST

All Vendors should be aware of OWASA'S Code of Ethics, which prohibits OWASA Employees and Board Members from having certain relationships with persons or entities conducting (or proposing to conduct) business with OWASA and which prohibits the acceptance of gifts from Vendors. If the Vendor has an actual or potential conflict, the Vendor shall disclose any Conflict of Interest that may exist.

Conflicts of Interest (potential or actual) will be evaluated by OWASA'S General Counsel to determine the proper course of action. Failure to comply with the provisions established above may render the vendor ineligible to participate in OWASA'S procurement process.

The Submitter is required to certify that performance of the work will not create any conflicts of interest or disclose any actual or potential conflicts of interest by completing and signing <u>one</u> of the following statements:

The Submitter hereby discloses no conflicts of interest.

DATE: _____

AUTHORIZED SIGNATURE: _____

TITLE: _____

SUBMITTER/COMPANY NAME: _____

OR

The Submitter hereby discloses the following circumstances that could give rise to a conflict of interest for the Submitter, any affiliates, any proposed subconsultants, and key personnel of any of these organizations. (Attach additional sheets as needed.)

Name of the Individual/Company to which potential conflict of interest might apply:

_____

Nature of potential conflict of interest:

_____

_____

Proposed Remedy:

_____

_____

_____

DATE: _____

AUTHORIZED SIGNATURE: _____

TITLE: _____

SUBMITTER/COMPANY NAME: _____

AGREEMENT
BETWEEN

ORANGE WATER AND SEWER AUTHORITY,

a political subdivision of the State of North Carolina, its successors and assigns, hereinafter referred to as "Owner" through its Board of Directors,

and

CONSULTANT NAME

its successors and assigns, hereinafter referred to as "Consultant"

IN ORANGE COUNTY NORTH CAROLINA

FOR
CONSULTING SERVICES

W I T N E S S E T H :

WHEREAS, Owner intends to conduct a study of the sanitary sewer system within its service area; and,

WHEREAS, Owner requires certain consulting services in connection with the project (the Services); and,

WHEREAS, Consultant is prepared to provide the Services;

NOW THEREFORE, in consideration of the mutual terms and conditions, promises and payments contained in this Agreement, Owner and Consultant agree as follows:

ARTICLE 1 - TIME FOR PERFORMANCE

1.1 The effective date of this Agreement is _____ and shall remain in effect until terminated. Consultant shall perform the services described in Attachment B (herein, the Project Scope of Services) to this Agreement. Owner will issue a separate Notice to Proceed for the work, and the work shall proceed according to the schedule as described in the Project Scope of Services. Any work initiated by Consultant prior to the Owner's written authorization of the Project will be at the Consultant's sole risk.

ARTICLE 2 - GOVERNING LAW

2.1 This Agreement shall be governed by the laws of the state of North Carolina. Any disputes which may arise out of this agreement shall be filed in the North Carolina Court of Justice, The Superior Court of Orange County NC.

ARTICLE 3 - SERVICES TO BE PERFORMED

3.1 Consultant shall perform the Services described in the Project Scope of Services as authorized

under this Agreement. Consultant shall provide all services as set forth in the Project Scope of Services, including the necessary, incidental and related activities and services required and contemplated in the Consultant's level of effort.

3.2 Consultant and Owner acknowledge that the Scope of Services described for the Project does not delineate every detail and minor work task required to be performed by Consultant to complete the work authorized by the Scope of Services. If during the course of the performance of the services authorized by this Agreement, Consultant determines that work should be performed to complete the Project which is in the Consultant's opinion outside the level of effort originally anticipated, whether or not the Project Scope of Services identifies the work items, Consultant shall notify Contract Administrator in writing within 30 days and wait for Owner approval before proceeding with the work. If Consultant proceeds with said work without notifying the Contract Administrator, said work shall be deemed to be within the original level of effort described in the Project Scope of Services. Notice to the Contract Administrator does not constitute authorization or approval by Owner to perform the work. Performance of work by Consultant outside the originally anticipated level of effort without prior written Owner approval is at the Consultant's sole risk.

3.3 Upon mutual written agreement, the Project Scope of Services may be modified. The Owner and the Consultant may negotiate additional scopes of services, compensation, time of performance and other matters related to the project. If the Owner and Consultant cannot contractually agree, Owner shall have the right to immediately terminate negotiations at no cost to the Owner and to procure services from another source.

ARTICLE 4 - OWNER'S RESPONSIBILITIES

4.1 Owner shall be responsible for all matters described in the Project Scope of Services (Attachment B).

ARTICLE 5 - COMPENSATION AND METHOD OF PAYMENT

5.1 Owner agrees to pay Consultant as compensation for performance of services as described in the Project Scope of Services. Compensation may be as a lump sum or as maximum amount not-to-exceed. The maximum amount not-to-exceed method of compensation will utilize hourly billing rates established as part of this Agreement.

5.2 Consultant shall separately invoice for services rendered each month. Each project invoice shall reflect percentage of work completed to date and for the invoiced month. Invoices shall provide a detailed breakdown of hours worked, hourly billing rates by each individual, and the expenses attributable to the project during the period.

5.3 The Owner shall assign a Project CIP Number, as well as a Purchase Order Number for the Project to facilitate internal contract administration. Each Project Invoice must reference the assigned CIP Number and the Purchase Order Number for the Project and be sent directly to the Owner’s Project Manager as assigned. Payment terms shall be the net invoice amount within 30 days.

5.4 The hourly billing rates for this agreement are set forth in Attachment A to this agreement and shall be used for maximum not-to-exceed compensation**.**

5.5 The reimbursable expenses for this agreement are set forth in Attachment A to this agreement and shall be used for maximum amount not-to-exceed compensation. Consultant shall be allowed to adjust expense items in accordance with changes in IRS criteria for deductible expenses.

5.6 Consultant shall keep such records and accounts and require any and all consultants and sub-consultants to keep records and accounts as may be necessary in order to record complete and correct entries as to personnel hours charged to the project and any expenses for which Consultant expects to be reimbursed. All books and records relative to the project shall be available at all reasonable times for examination and audit by Owner and shall be kept for a period of three (3) years after completion of all work pursuant to this Agreement. Incomplete or incorrect entries in such books and records shall be grounds for Owner's disallowance of any fees or expenses based upon such entries.

ARTICLE 6 - STANDARD OF CARE

6.1 General: Consultant shall exercise the same degree of care and diligence in the performance of the Services as is ordinarily exercised by a professional serving under similar circumstances.

ARTICLE 7 - LIABILITY AND INDEMNIFICATION

7.1 General: Having considered the potential liabilities that may exist during the performance of the Scope of Services, the benefits of the project, and the Consultant's fee for the Services, and in consideration of the promises contained in this Agreement, Owner and Consultant agree to allocate and limit such liabilities in accordance with this Article.

7.2 Indemnification by Consultant: Consultant agrees to defend, indemnify, and hold harmless Owner, its agents, and its employees from and against legal liability for all claims, losses, damages, and expenses to the extent such claims, losses, damages, or expenses are caused by Consultant's negligent acts, errors, or omissions.

7.3 Employee Claims: Consultant shall indemnify Owner against legal liability for damages arising out of claims by Consultant's employees to the extent such claims arise out of Consultant's negligent acts, errors or omissions.

7.4 Survival: Upon completion of all Services, obligations, and duties provided for in this Agreement, or if this Agreement is terminated for any reason, the terms and conditions of this Article shall survive.

ARTICLE 8 - INSURANCE

8.1 During the performance of the Services under this Agreement, Consultant shall maintain the minimum levels of insurance shown below and provide certificates of such coverage to Owner prior to performance. All policies must provide ten (10) days advance written notice to Owner in the event of cancellation, expiration, or alteration.

8.1.1 General Liability Insurance, with a combined single limit of $1,000,000 for each occurrence and $1,000,000 in the aggregate.

8.1.2 Automobile Liability Insurance, with a combined single limit of $1,000,000 for each person and $1,000,000 for each accident.

8.1.3 Workers' Compensation Insurance in accordance with statutory requirements and Employers' Liability Insurance, with a limit of $500,000 for each occurrence.

8.1.4 Professional Liability Insurance, with a limit of $1,000,000 annual aggregate.

ARTICLE 9 - OWNERSHIP OF DOCUMENTS AND INTELLECTUAL PROPERTY

9.1 Except as otherwise provided herein, documents and reports prepared by Consultant as part of the Services shall become the property of Owner upon payment for same. All finished or unfinished documents, data studies, surveys, drawings, maps, models, photographs and reports prepared or provided by Consultant in connection with this Agreement become the property of the Owner, whether the projects are completed or not, and shall be delivered by Consultant to the Owner within ten (10) days after receipt of written notice and upon payment for same. Consultant shall retain its rights to its specifications, databases, computer software, and other proprietary property. Rights to intellectual property developed, utilized, or modified in the performance of the Services shall remain the property of Consultant. Any use by Consultant of intellectual property owned by Owner is authorized solely for the project.

ARTICLE 10 - TERMINATION

10.1 This Agreement may be terminated by either party upon written notice in the event of substantial failure by the other party to perform in accordance with the terms of this Agreement. The nonperforming party shall have fifteen calendar days from the date of the termination notice to cure or to submit a plan for cure acceptable to the other party.

10.2 Owner may terminate or suspend performance of this Agreement for Owner's convenience upon written notice to Consultant. Consultant shall terminate or suspend performance of the Services on a schedule acceptable to Owner. If termination or suspension is for Owner's convenience, Owner shall pay Consultant for all the Services performed and termination or suspension expenses. Upon restart, an equitable adjustment shall be made to Consultant's compensation.

ARTICLE 11 - DELAY IN PERFORMANCE

11.1 Neither Owner nor Consultant shall be considered in default of this Agreement for delays in performance caused by circumstances beyond the reasonable control of the nonperforming party. For purposes of this Agreement, such circumstances include: floods; earthquakes; fire; epidemics; war, riots, and other civil disturbances; strikes, lockouts, and other labor disturbances; sabotage; judicial restraint; and the inability to procure permits, licenses, or authorizations from any local, state, or federal agency for which such permits have been properly applied for in accordance with the specified Project Schedule for any of the supplies, materials, accesses, or services required to be provided by either Owner or Consultant under this Agreement.

11.2 Should such circumstances occur, the nonperforming party shall, within a reasonable time of being prevented from performing, give written notice to the other party describing the circumstances preventing continued performance and the efforts being made to resume performance of this Agreement. Consultant shall be entitled to an equitable adjustment in schedule and compensation in the event such circumstances occur.

ARTICLE 12 - COMMUNICATIONS

12.1 Any communication required by this Agreement shall be made in writing to the address specified in the Project Scope of Services. The Contract Administrator for the Owner shall be specified in the Project Scope of Services. Nothing contained in this Article or the Project Scope of Services shall be construed to restrict the transmission of routine communications between representatives of Owner and Consultant.

ARTICLE 13 - WAIVER

13.1 No waiver by either Owner or Consultant of any breach of this Agreement shall be of any effect unless it shall be written and signed by the waiving party. Such a waiver shall not affect the waiving party's rights with respect to any other or further breach.

ARTICLE 14 - SEVERABILITY

14.1 The invalidity, illegality, or unenforceability of any provision of this Agreement, or the occurrence of any event rendering any portion or provision of this Agreement void, shall in no way affect the validity or enforceability of any other portion or provision of this Agreement. Any void provision shall be deemed severed from this Agreement, and the balance of this Agreement shall be construed and enforced as if this Agreement did not contain the particular portion or provision held to be void. The parties further agree to amend this Agreement to replace any stricken provision with a valid provision that comes as close as possible to the intent of the stricken provision. The provisions of this Article shall not prevent this entire Agreement from being void should a provision which is of the essence of this Agreement be determined void.

ARTICLE 15 - SUCCESSORS AND ASSIGNS

15.1 Owner and Consultant each binds itself and its directors, officers, partners, successors, executors, administrators, assigns, and legal representatives to the other party to this Agreement and to the directors, officers, partners, successors, executors, administrators, assigns, and legal representatives of such other party in respect to all provisions of this Agreement.

ARTICLE 16 - ASSIGNMENT

16.1 Neither Owner nor Consultant shall assign any rights or duties under this Agreement without the prior written consent of the other party. Unless otherwise stated in the written consent to an assignment, no assignment will release or discharge the assignor from any obligation under this Agreement. Nothing contained in this Article shall prevent Consultant from employing independent consultants, associates, and subcontractors to assist in the performance of the Services. Consultant will not employ subcontractors for the performance of the Services without the prior written approval of Owner, which approval shall not be unreasonably withheld. Consultant shall have the right to assign duties to any of Consultant’s related or affiliated companies.

ARTICLE 17 - THIRD PARTY RIGHTS

17.1 Nothing in this Agreement shall be construed to give any rights or benefits to anyone other than Owner and Consultant.

ARTICLE 18 - MISCELLANEOUS

18.1 INTERPRETATION: The language of this Agreement has been agreed to by both parties to express their mutual intent and no rule of strict construction shall be applied against either party hereto. The headings contained in this Agreement are for reference purposes only and shall not affect in any way the meaning or interpretation of this Agreement. All personal pronouns used in this Agreement shall include the other gender, and the singular shall include the plural, and vice versa, unless the context otherwise requires. Terms such as "herein," "hereof," "hereunder," and "hereinafter" refer to this Agreement as a whole and not to any particular sentence, paragraph, or section where they appear, unless the context otherwise requires. Whenever reference is made to a Section or Article of this Agreement, such reference is to the Section or Article as a whole, including all of the subsections of such Section unless the reference is made to a particular subsection or subparagraph of such Section or Article.

18.2 CONSULTANT'S STAFF: Consultant shall provide the key staff identified in their proposal for the Project as long as said key staff are in Consultant's employment.

18.2.1 Consultant will obtain prior written approval of Contract Administrator to change key staff members. Consultant shall provide Contract Administrator with such information as necessary to determine the suitability of proposed new key staff. Contract Administrator shall be reasonable in evaluating key staff qualifications.

18.2.2 If Contract Administrator desires to request removal of any of Consultant's staff, Contract Administrator shall first meet with Consultant and provide reasonable justification for said removal.

18.3 ENTIRE AGREEMENT: This Agreement, including all documents identified below, represents the entire understanding between the Owner and the Consultant as to this particular scope of work and shall supersede all prior and contemporaneous communications, representations, understandings, and Agreements relating to the subject matter hereof and may be amended only by written mutual Agreement of the parties.

18.4 ATTACHMENTS: Current listing of Attachments includes:

- Attachment A – Hourly Billing Rates and Reimbursable Expenses.
- Attachment B – Project Scope of Services.

ARTICLE 19 – PRE-EXISTING CONTAMINATION

19.1 Anything herein to the contrary not withstanding, title to, ownership of, and legal responsibility and liability for any and all pre-existing contamination shall at all times remain with Owner. "Pre-existing contamination" is any hazardous or toxic substance, material, or condition present at the project site or sites concerned which was not brought onto such site or sites by Consultant.

ARTICLE 20 – LIMITATIONS OF RESPONSIBILITY

20.1 Consultant shall not be responsible for: (1) construction means, methods, techniques, sequences, procedures, or safety precautions and programs in connection with the Project; (2) the failure of any contractor, subcontractor, vendor, or other participant, not under contract to Consultant, to fulfill contractual responsibilities to Owner or to comply with federal, state, or local laws, regulations, and codes; or (3) procuring permits, certificates, and licenses required for any

construction unless such responsibilities are specifically assigned to Consultant in Scope of Services.

ARTICLE 21 – NON DISCRIMINATION CLAUSE

21.1 The Consultant shall not discriminate against any person on the grounds of race, color, national origin, sex, age, or handicap in administration of this Agreement. Nor shall any person be excluded from participation in, or be denied the benefits of any project designed under this Agreement on the grounds of race, color, national origin, sex, age, or handicap.

ARTICLE 22 – MINORITY BUSINESS PARTICIPATION

22.1 It is the policy of OWASA to provide minority businesses an equal opportunity to participate in all aspects of OWASA's contract activities. Consultant shall comply with OWASA's Minority Business Participation Outreach Plan and Guidelines.

ARTICLE 23 – E-VERIFY

23.1 Consultant shall comply with the requirements of Article 2 of Chapter 64 of the General Statutes. Further, if Consultant utilizes a subcontractor, Consultant shall require the subcontractor to comply with the requirements of Article 2 of Chapter 64 of the General Statutes.

IN WITNESS WHEREOF, Owner and Consultant have executed this Agreement.

OWNER:

ORANGE WATER AND SEWER AUTHORITY

BY: _____

TITLE:

DATE: _____

CONSULTANT:

CONSULTANT NAME

BY: _____

TITLE:

DATE: _____

APPROVED AS TO FORM AND LEGALITY:

_____ _____

Date Robert Epting, Esquire
Authority General Counsel

This instrument has been pre-audited in the manner required by the Local Government Budget and Fiscal Control Act:

_____ _____

Date Kelly Satterfield
Director of Finance

ATTACHMENT A

HOURLY BILLING RATES AND REIMBURSABLE EXPENSES

INTRODUCTION

The hourly billing rates are set forth below.

Billing Category	Individual Name and Title	Hourly Billing Rate for the Agreement
Principal		
Senior Project Manager		
Senior Discipline Engineer		
Project Manager		
Project Engineer		
Engineer		
Engineering Associate		
Senior Technician		
Technician		
Administrative Assistant		

BILLING CATEGORY DEFINITIONS

The following table provides broad definitions for various Billing Categories. As a guideline, expected experience and duties for each of the categories have been included in the Billing Category Definitions. It is expected that in some instances the actual experience of an individual may be different than what is required for the corresponding Billing Category. In all such cases, Consultant will provide appropriate justification and seek approval from the Owner.

Principal	This is the firm's corporate officer. In some cases "Principal" may be the owner or one of the partners of the firm, and is generally in a position to make all the corporate level decision for the firm as it pertains to this Agreement.
Senior Project Manager	Person in this position provides senior level project management, provides high level of professional input for the project and is generally responsible for conducting high level project review. This person has a Professional Engineering license in North Carolina and professional-level experience of over 15 years.

Senior Discipline Engineer	Person in this position is considered the firm's expert for a particular discipline. This person will oversee Engineering work of particular discipline at the highest level for the firm. This person has a Professional Engineering license in North Carolina and professional-level experience of over 18 years. Engineering Disciplines may include, but are not limited to: Structural Engineering, Water Resources, Environmental Engineering, Transportation, Electrical Engineering, Mechanical Engineering, Pump Station Design, Instrumentation and Control, Construction Management, Power Generation, etc.
Project Manager	Person in this position provides day-to-day Project Management for the Project and acts as the key client contact. This person has a professional license in North Carolina and professional-level experience of over 8 years.
Project Engineer	Person in this position provides day-to-day engineering work for various disciplines as required by individual projects. This person has a professional license in North Carolina and professional-level experience of over 8 years.
Engineer	Person in this position provides day-to-day engineering support to the Project Manager, Project Engineer and other team members as required for their respective projects. This person has a professional license in North Carolina and professional-level experience of over 3 years.
Engineering Associate	Person in this position provides day-to-day engineering support to the Project Manager, Project Engineer, Engineer and other team members as required for their respective projects. This person is an Engineering Intern or has an Engineering Associates degree with appropriate technical experience.
Senior Technician	Person in this position provides senior technical-level support to the Project Team. Support may include CAD services, GIS, or other technical-level work. This person has 10 years of experience providing technical-level work.
Technician	Person in this position provides technical-level support to the Project Team. Support may include CAD services, GIS, or other technical-level work. This person has 4 years of experience providing technical-level work.
Registered Land Surveyor	This person is a North Carolina Board of Engineers and Land Surveyors certified Land Surveyor and has 4 years of professional-level experience.
2 Person Survey Crew	These individuals form a surveying team, acting as an Instrument Person and Rod-Person.
Administrative Assistant	This person performs administrative and clerical-level work for the Project Team, including data entry, word processing, and other non-technical support work as needed for the Project.

REIMBURSABLE EXPENSES

Reimbursable expenses for each individual project shall be clearly itemized by the Consultant. The following guidelines shall be used to develop these expenses:

1. Overtime at straight time rates shall apply for exempt employees to the extent the employee works more than 40 hours per week on Owner's project.
2. Subcontracted services shall be based on Cost Plus 5%. Consultant shall obtain Owner's approval before authorizing such services.
3. Cost of printing and reproducing drawings and bid documents, except for those included in the lump sum cost.
4. Cost for use of field equipment, safety equipment and field sampling equipment.
5. Cost of courier and express mail services.
6. Living and traveling expenses when Consultant's employees are away from home on Owner's project assignments. The following limitations shall apply:
   - Base room charges (excluding taxes and other fees) shall not exceed $119 per night.
   - Base rental car charges (excluding taxes and other fees) shall not exceed $60 per day.
   - Meal charges per individual shall not exceed $51 per day.
7. Automobile mileage to be reimbursed at rate established and updated by Internal Revenue Service.

ATTACHMENT B

PROJECT SCOPE OF SERVICES

Project Title: …

OWASA's CIP #: …

Project Contract Administrators:

OWASA	**Consultant**
Bill Rosa Project Manager Orange Water and Sewer Authority 400 Jones Ferry Road Carrboro, NC 27510 Office: (919) 537-4319	**...** … … …

Project Background:

…
…

Project Scope:

Task 1 – Kickoff Meeting, Flow Monitoring and Data Collection
…
Task 2 - … …
…

Deliverables:

Specify deliverables, number of copies, and format.

Project Team:

…

Key Team Members:
…
The OWNER will be notified in writing of changes to the project team members. Other staff may participate in the project in a minor role at Consultant's discretion.

Project Schedule:

….

List durations for interim milestones and final completion in total number of days from Notice to Proceed.

Compensation:

…

Provide compensation basis (lump sum, cost ceiling) and subtotals by task.
Provide separate subtask breakdowns for projects above exemption limit, or as warranted.

Owner Responsibilities

…

Scope Exceptions, Additional Services, etc

FROEHLING & ROBERTSON, INC.

Report of Subsurface Exploration and Geotechnical Engineering Evaluation

278-50 WWTP Warehouse CIP Project
Chapel Hill, North Carolina
F&R Project No. 66C-0101

Prepared For:
Wiley|Wilson
127 Nationwide Drive
Lynchburg, Virginia 24502

Prepared By:
Froehling & Robertson, Inc.
310 Hubert Street
Raleigh, North Carolina 27603

November 14, 2024

FROEHLING & ROBERTSON

Engineering Stability Since 1881

November 14, 2024

Aaron S. Tice, P.E.
Vice President/Project Manager
Wiley|Wilson
127 Nationwide Drive
Lynchburg, Virigina 24502

Subject: Report of Subsurface Exploration and Geotechnical Engineering Evaluation
278-50 WWTP Warehouse CIP Project
Chapel Hill, North Carolina
F&R Project No. 66C-0101

Dear Mr. Tice:

Froehling & Robertson, Inc. (F&R) has completed a subsurface exploration and geotechnical engineering evaluation for the proposed 278-50 WWTP Warehouse CIP project located in Chapel Hill, North Carolina. Our services were performed in general accordance with F&R's Proposal 2466-00040 dated March 4, 2024. The attached report presents our understanding of the project, reviews our exploration procedures, describes existing site and subsurface conditions, and presents geotechnical engineering design and construction recommendations for the proposed project.

Please contact us if you should have any questions regarding this report or if we may be of further service.

Sincerely,

FROEHLING & ROBERTSON, INC.

NORTH CAROLINA PROFESSIONAL SEAL 047377 ENGINEER Brian William McCarthy

Brian W. McCarthy, P.E.
Staff Geotechnical Engineer

Michael S. Sabodish, Jr., Ph.D., P.E.
Geotechnical Department Manager

TABLE OF CONTENTS

SECTION		PAGE
EXECUTIVE SUMMARY		IV
1.0	PURPOSE & SCOPE OF SERVICES	1
2.0	PROJECT INFORMATION	1
2.1	SITE LOCATION AND DESCRIPTION	1
2.2	PROPOSED CONSTRUCTION	2
3.0	EXPLORATION PROCEDURES	2
3.1	SUBSURFACE EXPLORATION	2
3.2	LABORATORY TESTING	3
4.0	REGIONAL GEOLOGY & SUBSURFACE CONDITIONS	3
4.1	REGIONAL GEOLOGY	3
4.2	SUBSURFACE CONDITIONS	4
4.2.1	GENERAL	4
4.2.2	SURFICIAL MATERIALS	5
4.2.3	FILL AND POSSIBLE FILL MATERIALS	5
4.2.4	RESIDUAL SOILS	6
4.2.5	PARTIALLY WEATHERED ROCK	6
4.3	SOIL MOISTURE AND GROUNDWATER CONDITIONS	6
5.0	GEOTECHNICAL ENGINEERING RECOMMNEDATIONS	7
5.1	GENERAL CONSIDERATIONS	7
5.2	FOUNDATION DESIGN	9
5.2.1	SHALLOW FOUNDATIONS	9
5.2.2	AGGREGATE PIERS (GROUND IMPROVEMENT)	10
5.3	SITE SEISMIC CLASSIFICATION	12
5.4	SLAB-ON-GRADE FLOORS	12
5.5	RETAINING WALLS	13
6.0	GEOTECHNICAL CONSTRUCTION RECOMMENDATIONS	15
6.1	SITE PREPARATION	15
6.2	STRUCTURAL FILL PLACEMENT AND COMPACTION	16
6.3	BUILDING FOUNDATION CONSTRUCTION RECOMMENDATIONS	17
6.4	FLOOR SLAB CONSTRUCTION RECOMMENDATIONS	18
6.5	DEWATERING	19
6.6	TEMPORARY EXCAVATION RECOMMENDATIONS	19
7.0	CONTINUATION OF SERVICES	20
8.0	LIMITATIONS	21

APPENDICES

APPENDIX I
Figure No. 1 - Site Vicinity Map
Figures No. 2, 2A, and 2B – Boring Location Plans
Figure No. 3 - Subsurface Profile

APPENDIX II
Table of Boring Coordinates
Key to Soil Classification
Unified Soil Classification Chart
Boring Logs

APPENDIX III
Laboratory Test Results

APPENDIX IV
GBA Document “Important Information about Your Geotechnical Engineering Report”

EXECUTIVE SUMMARY

This Executive Summary is provided as a brief overview of our geotechnical engineering evaluation for the project and is not intended to replace more detailed information contained elsewhere in this report. As an overview, this summary inherently omits details that could be very important to the proper application of the provided geotechnical design/construction recommendations. This report should be read in its entirety prior to implementation into design and construction.

- *The subsurface exploration consisted of performing 5 soil test borings to depths ranging from 18.7 to 48.7 feet below the existing ground surface.*
- *Fill and possible fill material were encountered in all 5 borings from the existing ground surface or just below the surficial organic soils to depths ranging from 8.5 to 16.5 feet. The fill and possible fill soils consisted of very soft to stiff sandy clays (USCS – CL) with SPT N-values ranging from 1 to 12 blows-per-foot (bpf), and very loose to medium dense silty and clayey sands (USCS – SM and SC) with SPT N-values ranging from 1 to 30 bpf. A very dense layer of possible fill soils with a SPT N-value of 50/3.5" was observed in 1 boring at a depth of 13.5 to 16.5 feet of the soil profile.*
- *Underlying the fill and/or possible fill soils, residual soils were encountered in 4 borings at depths ranging from 8.5 to 13.5 feet below the existing ground surface, and extended to depths ranging from 12.5 to 18.5 feet. The residual soils typically consisted of firm to hard, low to high plasticity silts, sandy silts, and sandy clays (USCS – ML, MH, and CL) with SPT N-values ranging from 6 to 55 bpf. A layer of very hard (SPT N-values greater than 50 bpf) sandy silt (ML) was encountered in 1 boring at a depth of 13.5 feet below the existing ground surface and extended to a depth of 14.5 feet.*
- *Partially Weathered Rock (PWR) was encountered in 5 borings at depths ranging from 12.5 to 18.5 feet. The borings that encountered PWR, were terminated in PWR.*
- *A majority of the soil samples recovered from the borings were typically described as being wet and/or saturated, and were encountered in each boring at depths ranging from the existing ground surface to 2 feet, and extended to depths ranging from 12.5 to 16.5 feet. Deeper layers of wet PWR were encountered in 2 borings at a depth of 18.5 feet below the existing ground surface, and extended to the borings termination depth of 18.7 feet. The remaining soil samples recovered from the borings were typically described as being moist.*
- *Groundwater level measurements were recorded in the test borings upon completion of drilling and after a stabilization period of at least 24-hours. Immediately after drilling, groundwater was encountered in the borings at depths ranging from 11.2 to 33.5 feet below existing ground surface. After a stabilization period of at least 24-hours, groundwater was encountered at depths ranging from 6.1 to 33.9 feet below existing ground surface.*
- *The presence of uncontrolled, poorly compacted fill material to depths ranging from 8.5 to 16.5 feet will impact site development. These materials are unsuitable to directly support the proposed building due to the potential for detrimental settlement of the foundation and floor slab system unless efforts are made to improve subgrade support conditions.*

- *One option to improve building subgrade support conditions that will allow the use of conventional shallow spread foundations and a slab-on-grade floor is to undercut all of the unsuitable fill within the building area. If the unsuitable fill soils are removed and replaced with compacted structural fill, the building can be supported on shallow spread foundations using a net allowable soil bearing capacity of 2,000 psf.*
- *An alternative to the use conventional shallow spread foundations and the associated subgrade repairs would be to improve the existing subgrade support conditions by installing an aggregate pier system to support the foundations and floor slab.*
- *Another alternative would be to support the structure on a pile foundation system. F&R anticipates that a pile foundation system may be less economical than other methods of structural support and, as such, detailed pile support recommendations are not presented in this report.*
- *The borings generally encountered low to moderately plastic sandy clays or silts and silty or clayey sands (USCS – CL, ML, SM, and SC). These lower-plasticity clays and granular soil types are generally considered fair to good materials for use as structural earth fill provided they are at a moisture content suitable to achieve proper compaction.*
- *Once final site layout, grading and utility plans are developed, F&R should be afforded an opportunity to review the plans and provide additional geotechnical recommendations as necessary. Depending upon the nature of the grading and utility plans, additional subsurface exploration may be recommended.*

1.0 PURPOSE & SCOPE OF SERVICES

The purpose of the subsurface exploration and geotechnical engineering evaluation was to explore the subsurface conditions in the area of the proposed construction and to provide geotechnical engineering recommendations that can be used during the design and construction phases of the project.

F&R's scope of services included the following:

- Completion of five (5) soil test borings (C-1 through C-5) to depths ranging from 18.7 to 48.7 feet below the existing ground surface;
- Performing geotechnical laboratory testing on representative soil samples;
- Preparation of typed Boring Logs and development of a Subsurface Profile;
- Performing a geotechnical engineering evaluation of the subsurface conditions with regard to their suitability for the proposed construction; and,
- Preparation of this geotechnical report by professional engineers.

2.0 PROJECT INFORMATION

2.1 SITE LOCATION AND DESCRIPTION

The project site is located at the existing Mason Farm Wastewater Treatment Plant (WWTP) at 170 Old Mason Farm Road in Chapel Hill, North Carolina. More specifically, the proposed site is located in the northwest corner of the WWTP in an area that previously contained two (2) structures that were recently razed (see attached Figure 1 in Appendix 1). The site is bound on the north and west sides by sheet pile walls that encompass the larger WWTP. Additional WWTP structures and tanks are present to the south and east of the project site. Morgan Creek is present along the southern and western boundaries of the larger WWTP. A gravel parking lot and athletic fields are present to the north, outside of the sheet pile walls. Prior to F&R's exploration, two previously existing structures which were located within the footprint of the proposed building had been razed by a demolition contractor.

Based on the ground surface elevations obtained from Orange County GIS topographic data, the project site is relatively flat in the area of the proposed warehouse footprint, with ground surface elevations in this area ranging from EL 258 to EL 260.

2.2 PROPOSED CONSTRUCTION

We understand the proposed construction consists of a warehouse structure with a footprint of approximately 3,200 ft^2. We understand the building will be a pre-engineered, single-story, metal structure supported on shallow foundations with a concrete slab-on-grade. Two potential layouts have been provided to F&R, which are shown in Figures 2A and 2B in Appendix I. Wall loads are anticipated to be 4 kips per linear foot with column loads of up to 100 kips. F&R also anticipates that maximum cut and/or fill depths in the building footprint should be on the order of 1 to 2 feet based the existing site grades and an assumed finished floor elevation (FFE) set at EL 260.

3.0 EXPLORATION PROCEDURES

3.1 SUBSURFACE EXPLORATION

F&R advanced a total of five (5) soil test borings (C-1 to C-5) to depths ranging from 18.7 to 48.7 feet below the existing ground surface. The borings were advanced at the approximate locations shown on the Boring Location Plans presented on Figures 2 through 2B in Appendix I. Please note that updated concept plans for the project were provided to F&R after our subsurface exploration was completed. The conditions encountered in our borings may not be fully representative of conditions at the proposed building locations.

The test boring locations were established in the field by F&R using a hand-held GPS unit. Ground surface elevations at the boring locations were interpolated from Orange County GIS topographic data. Given these methods of determination, the boring locations and ground surface elevations should only be considered approximate.

The test borings were advanced by an ATV-mounted drill rig using 2-1/4" inside diameter (I.D.) hollow stem augers for borehole stabilization. Representative soil samples were obtained using a standard two-inch outside diameter (O.D.) split-barrel sampler in general accordance with ASTM D 1586, Penetration Test and Split-Barrel Sampling of Soils (Standard Penetration Test). The number of blows required to drive the split barrel sampler three, consecutive 6-inch increments with an automatic hammer is recorded, and the blows of the last two 6-inch increments are added to obtain the Standard Penetration Test (SPT) N-value representing the

penetration resistance of the soil. Five (5) Standard Penetration Tests were performed within the top 10 feet and then at a nominal interval of approximately 5 feet thereafter.

A representative portion of the soil was obtained from each SPT sample, sealed in an eight-ounce glass jar, labeled, and transported to our laboratory for final classification and analysis by a geotechnical engineer. The soil samples were classified in general accordance with the Unified Soil Classification System (USCS), using visual-manual identification procedures (ASTM D2488). A Boring Log for each of the test borings is presented in Appendix II.

Groundwater level measurements were attempted at the termination of drilling and after a stabilization period of about 24-hours following the completion of drilling in all of the borings. Temporary piezometers were installed in two (2) borings (C-3 and C-5) to facilitate the measurement of stabilized groundwater levels. The temporary piezometers consisted of 1-inch diameter, hand-slotted PVC pipe installed into the completed borings. Following the collection of the stabilized groundwater readings, the temporary piezometers were removed from the borings and the borings were backfilled with soil cuttings.

3.2 LABORATORY TESTING

F&R selected representative soil samples from the borings and subjected them to geotechnical index testing consisting of natural moisture content, sieve analyses (% passing #200 sieve only) and Atterberg Limits determinations. The purpose of the index testing was to aid in our classification of the soil samples and development of engineering recommendations. The laboratory tests were performed in general accordance with applicable ASTM standards. The laboratory test results are presented in Appendix III of this report.

4.0 REGIONAL GEOLOGY & SUBSURFACE CONDITIONS

4.1 REGIONAL GEOLOGY

The project site is located within the Triassic Basin of the Piedmont Physiographic Province of North Carolina. The Piedmont Province generally consists of hills and ridges that are intertwined with an established system of draws and streams. The Triassic basin is filled with sedimentary rocks (e.g., sandstone, siltstone and mudstone) that formed approximately 190-200 million years

ago. The basin was formed by differential movement along a fault that resulted in a long narrow northeast trending basin, which gradually filled with sediments eroded from upland areas of the surrounding topography. The sediments are thought to be several thousand feet deep and have resulted in sedimentary rock formations. The soils that overly the rock typically consist of silty and sandy clays that are frequently highly plastic in the upper portion of the soil profile and become less plastic with depth. The clayey soils typically transition into lower plasticity sandy silts and silty sands, and then into very dense/hard partially weathered rock (PWR) and bedrock. The boundary between soil and rock is not sharply defined. This transitional zone is termed Partially Weathered Rock (PWR) and is defined for engineering purposes as soil material exhibiting Standard Penetration Resistances in excess of 100 blows per foot (bpf). The sedimentary Triassic Basin formations are commonly interspersed with diabase dikes and sills that have intruded the sedimentary formations. PWR was encountered in the five (5) borings at depths ranging from 12.5 to 18.5 feet below existing ground surface.

4.2 SUBSURFACE CONDITIONS

4.2.1 General

The subsurface conditions discussed in the following paragraphs and those shown on the attached boring logs represent an estimate of the subsurface conditions based on interpretation of the boring data using normally-accepted geotechnical engineering judgments. Although individual soil test borings are representative of the subsurface conditions at the boring locations on the dates shown, they are not necessarily indicative of subsurface conditions at other locations or at other times. Data from the specific soil test borings are shown on the Boring Logs presented in Appendix II of this report.

A Subsurface Profile has been prepared from the boring data to graphically illustrate the subsurface conditions encountered at the site. The subsurface profile is presented as Figure 3 in Appendix I. Strata breaks designated on the boring logs, and subsurface profile represent approximate boundaries between soil types. The transition from one soil type to another may be gradual or occur between soil samples.

4.2.2 Surficial Materials

Surficial Organic Soils were not encountered at the ground surface of the borings during our exploration likely due to the recent razing of the previously existing structure at the project site. Actual Surficial Organic Soil depths should be expected to vary. We note that the transition from Surficial Organic Soil to underlying materials may be gradual, and therefore the observation and measurement of Surficial Organic Soil depths are subjective.

4.2.3 Fill and Possible Fill Materials

Fill and possible fill materials were encountered in each of the borings extending from the existing ground surface to depths ranging from 8.5 to 16.5 feet. It is noted that sometimes the relatively small and disturbed sample obtained in the field is insufficient to definitively describe the origin of the subsurface material. Since man-made materials, deleterious materials, or other obvious evidence of fill were not encountered in the soil samples that appeared to be earth fill, the materials are referred to as "possible fill". The fill and possible fill soils consisted of very soft to stiff sandy clays (USCS – CL) with SPT N-values ranging from 1 to 12 blows-per-foot (bpf), and very loose to medium dense silty and clayey sands (USCS – SM and SC) with SPT N-values ranging from 1 to 30 bpf. Thick layers of very loose/soft (SPT N-values of 4 bpf or less) fill and possible fill soils were present in borings C-1 and C-4 with thicknesses of 8.5 and 8.0 feet, respectively, within the soil profiles. Additionally, a very dense layer of possible fill soils with a SPT N-value of 50/3.5" was observed in boring C-4 at a depth of 13.5 to 16.5 feet of the soil profile.

Fill and possible fill soils exhibiting SPT N-values of 4 bpf or less are generally indicative of fill with poor compaction while fill soils exhibiting SPT N-values of 5 to 8 bpf are generally indicative of fill with moderate compaction. Well-compacted fill, that does not contain gravel, would typically exhibit SPT N-values of 9 bpf or higher. In general, it appears that the fill varied from being poor to well-compacted, with a majority of the fill soils being poorly to moderately compacted. However, it should be noted that due to the presence of trace organics, and gravel in the fill materials, the observed SPT N-values were likely inflated and do not represent the true consistency of the fill materials. In addition, it appears a majority of the fill materials were placed without formal compaction and quality control procedures as evidenced by the low SPT N-values.

4.2.4 Residual Soils

Extending below the fill and possible fill soils, residual soils were encountered in each boring, with the exception of boring C-4. The residual soils typically consisted of firm to hard, low to high plasticity silts, sandy silts, and sandy clays (USCS – ML, MH, and CL) with SPT N-values ranging from 6 to 55 bpf.

A layer of very hard (SPT N-values greater than 50 bpf) sandy silt (ML) was encountered in boring C-3 at a depth of 13.5 feet below the existing ground surface and extended to a depth of 14.5 feet.

A deep layer of high plasticity silt (MH) was encountered in boring C-3 at a depth of 38.5 feet below the existing ground surface and extended to a depth of 43.5 feet. The high plasticity silt exhibited a very stiff consistency with a SPT N-value of 25 bpf.

4.2.5 Partially Weathered Rock

Partially Weathered Rock (PWR) was encountered in the five (5) borings at depths ranging from 12.5 to 18.5 feet below the existing ground surface. PWR is defined for engineering purposes as residual material that exhibits an SPT N-value of more than 100 blows per foot (bpf). The SPT N-values in the PWR ranged from 50/1.5” (50 blows for 1.5” of sampler penetration) to 50/5”, with a typical SPT N-value in the 50/2” to 50/4” range. The borings that encountered PWR, were terminated in PWR.

4.3 Soil Moisture and Groundwater Conditions

A majority of the soil samples recovered from the borings were typically described as being wet and/or saturated (i.e., 3 percentage points or greater above the estimated optimum moisture content). Wet/saturated soils were encountered in all borings, with the exception of boring C-5, at depths ranging from the existing ground surface to 2 feet, and extended to depths ranging from 12.5 to 16.5 feet. In boring C-4, wet soils and PWR extended to the boring termination depth of 19.2 feet. Deeper layers of wet PWR were encountered in borings C-2 and C-5 at a depth of 18.5 feet below the existing ground surface, and extended to the borings termination depth of

18.7 feet. The remaining soil samples recovered from the borings were typically described as being moist (within 3 percentage points of the estimated optimum moisture content).

Groundwater level measurements were recorded in the test borings upon completion of drilling and after a stabilization period of at least 24-hours. Immediately after drilling, groundwater was encountered in the borings at depths ranging from 11.2 to 33.5 feet below existing ground surface. After a stabilization period of at least 24-hours, groundwater was encountered at depths ranging from 6.1 to 33.9 feet below existing ground surface. Temporary piezometers were installed in borings C-3 and C-5 to facilitate the measurement of stabilized groundwater levels.

It should be noted that groundwater levels fluctuate depending upon seasonal factors such as precipitation and temperature. As such, soil moisture and groundwater conditions at other times may vary or be different from those described in this report. F&R notes that due to the presence of relatively impervious silty and clayey soils and PWR noted on the project site, trapped or perched water conditions may be encountered during periods of inclement weather and during seasonally wet periods.

5.0 GEOTECHNICAL ENGINEERING RECOMMNEDATIONS

5.1 GENERAL CONSIDERATIONS

The conclusions and recommendations contained in this section of the report are based upon the results of the five (5) borings, laboratory testing performed by F&R as part of the exploration, the information provided to F&R regarding the proposed development, and our experience with similar subsurface conditions and projects. It is our opinion that the subsurface conditions encountered at the project site will require improvement for the proposed development from a geotechnical engineering perspective. Provided the recommendations presented in subsequent sections of this report are followed throughout the design and construction phases of this project, the site can be made suitable for the proposed development.

The presence of uncontrolled, poorly compacted fill material of variable composition/consistency will impact site development. These materials are unsuitable to directly support the proposed building due to the potential for detrimental settlement of the foundation and floor slab system

unless efforts are made to improve subgrade support conditions. These subsurface conditions and remedial recommendations will be subsequently discussed and should be taken into consideration during the design and construction phases of the project. Allowances should be made in the construction documents for various subgrade repair procedures, quantities and materials.

The subsurface conditions of particular note include the following:

Existing Fill Soils: Existing fill soils were encountered in each of the five (5) borings advanced at the project site to depths ranging from 8.5 to 16.5 feet below existing ground surface. The consistency of the fill materials was quite variable with SPT N-values ranging from 1 to 30 bpf, but were typically less than 5 to 6 bpf. Zones of poorly to moderately compacted fill were encountered in four (4) borings. The variability in the consistency of the fill materials indicates the fill may not have been placed and compacted using formal construction techniques. These lower consistency soils are not considered suitable for support of the building due to the potential for adverse settlement. One conventional technique to improve foundation bearing conditions is to undercut the unsuitable fill materials beneath the footings and replace the undercut with clean, washed NCDOT #57 stone or other structural fill (e.g., flowable fill). However, this repair technique is not recommended because the excavations will extend to depths of as much as 8.5 feet below existing grades and through very loose, soft, and/or wet soils, and are likely to collapse during excavation or before the excavation can be backfilled. There is also a concern that post construction floor slab settlement could occur if only the foundation bearing grades were undercut and repaired. As such, in order to utilize conventional shallow spread foundations and floor slabs, F&R recommends that all of the unsuitable fill be undercut within the building area and replaced with compacted structural fill. The excavation should extend at least 5 feet beyond the limits of the perimeter (outer edge) wall foundation. F&R estimates that this repair method would require excavation and replacement of approximately 1,330 cubic yards of material. It is anticipated that subsurface water could be encountered in the lower portions of the undercut excavation and dewatering will be required. Some modification will likely need to be made at the time of construction depending on the conditions encountered, but it is anticipated that most of old fill will need to be undercut and replaced.

Wet and Saturated Soils: Wet and/or saturated soil conditions were encountered in the upper 2 feet of the soil profile in four (4) borings, and extended to depths ranging from 12.5 to 19.5 feet. Wet and/or saturated soils were encountered deeper in the soil profile in one boring at a depth 18.5 feet and extended to a depth 18.7 feet. Additionally, immediately after drilling, groundwater was encountered in the borings at depths ranging from 11.2 to 33.5 feet below existing ground surface. After a stabilization period of at least 24-hours, groundwater was encountered in at depths ranging from 6.1 to 33.9 feet below existing ground surface. As such, soil with excessive

moisture and/or groundwater is likely be encountered during site development depending upon proposed site grades and utility inverts. Soil moisture conditioning should be expected if wet or saturated soils are encountered. The use of temporary and/or permanent ditches and interceptor drains (e.g., French drains, edge drains, etc.) may be needed to improve site and soil profile drainage, improve soil moisture conditions, and aid in draining/controlling groundwater during construction.

***Partially Weathered Rock (PWR)*:** Partially Weathered Rock (PWR) was encountered in each of the five (5) borings at depths ranging from 12.5 to 18.5 feet. F&R does not anticipate that PWR will be encountered during site grading and foundation excavations, and will likely not be encountered during utility excavations for the project.

5.2 FOUNDATION DESIGN

5.2.1 Shallow Foundations

Based on F&R's analysis of the borings located at the project site, repairs to the foundation bearing grades will be necessary for support of the structure. We anticipate these repairs would likely consist of undercutting the poorly compacted fill soils and/or otherwise unsuitable soils that may be encountered across the building footprint to depths ranging from 5 to 8.5 feet below existing grades. These undercuts would then be backfilled with properly placed and compacted structural fill soils approved by the project geotechnical engineer. The excavation should extend at least 5 feet beyond the limits of the perimeter (outer edge) wall foundation. F&R estimates that this repair method would require excavation and replacement of approximately 1,330 cubic yards of material. It is anticipated that subsurface water could be encountered in the lower portions of the undercut excavation and dewatering may be required. The initial lift of structural backfill may need to be a select backfill such as a 2-foot layer thick lift of clean sand (less than 10% fines) and/or NCDOT #57 stone wrapped in geotextile filter fabric.

For building foundations bearing on newly-placed and properly compacted structural fill, F&R recommends the use of a net allowable soil bearing pressure of 2,000 pounds per square foot (psf) for the design of building foundations. For bearing capacity considerations, it is recommended that wall and column foundations should have minimum widths of 24 and 36 inches, respectively, and should be embedded at least 18 inches below adjacent exterior grades for bearing capacity and frost protection considerations. Final foundation sizes should be

determined by the project structural engineer based on actual design loads, building code requirements and other structural considerations.

For foundations designed and constructed in accordance with the recommendations provided in this report, it is estimated that maximum settlements should be on the order of approximately 1-inch or less. We anticipate that such settlements would be structurally acceptable; however, this should be determined by the Project Structural Engineer.

5.2.2 Aggregate Piers (Ground Improvement)

Due to the uncertainty of the composition and consistency of the existing fill soils, an intermediate foundation system, such as aggregate piers, could be used to support the proposed structure. Aggregate Piers are a ground improvement technique that would reinforce the existing fill soils such that the structures can be supported on conventional shallow footing/slab foundations, provide higher net allowable soil bearing pressure, and reduce the need for undercutting and repairs of the existing fill soils for foundation support. One such ground improvement technique is Geopier Impact Pier elements. Impact Piers are considered subgrade improvement elements and not a deep foundation system. Impact pier elements consist of highly-densified, open-graded aggregate that is placed in controlled lifts using a special high-energy mandrel/hopper system. The mandrel is advanced into the ground to a design depth, filled with stone via the hopper, and withdrawn to allow stone to flow into the pier and then be compacted by the mandrel that transfers the impact compaction energy to the aggregate. The process can be augmented with grouting to increase the pier modulus and reduce the potential for bulging of the aggregate pier columns.

The piers are typically 16 to 30 inches in diameter and spaced on a 8 to 12 foot grid. The piers would likely extend to a depth of 10 to 15 feet at this site. The aggregate pier approach would allow building foundations to be designed as shallow spread footings to be supported on the piers based on an allowable soil bearing pressure. The piers can also be designed to support the floor slab. Typically, an allowable soil bearing pressure in the 4,000 to 6,000 psf range can be considered for sizing foundations supported on aggregate piers.

Aggregate piers are designed, installed and warranted by a specialty contractor. GeoStructures, Inc. and Menard USA are two such contractors and can provide final design and construction of aggregate pier foundation system. We recommend that you contact them to review and analyze the subsurface data in this report, as well as the proposed structural loads for the project, and provide you with an updated settlement estimate and a cost estimate for installation. It is anticipated that the ground improvement should be able to limit total slab and foundation settlements to 1 inch or less; however, they should confirm and provide estimated maximum foundation settlements. In the event the proposed FFE is different than we assumed, the contractor should be made aware that new earth fill will be required to establish the floor slab subgrade since this may be a concern of the contractor and could impact the timing of aggregate pier installation.

GeoStructures, Inc. (Geopier system)
Tel: 919-886-1186
Jason Phillips
jphillips@geostructures.com

Menard USA (Stone Column system)
Tel: 813-519-0069
Matt Mooney
mmooney@menardusa.com

Similar to pile foundations, a load test (modulus test) should be performed on an Impact Pier element at the project site. The test should be performed to confirm the assumed element stiffness modulus at the maximum theoretical Impact pier stress. The modulus test should be observed and documented by the project geotechnical engineer. Loading of the test pier should be conducted up to approximately 150 percent of the maximum theoretical stress to which the Impact Pier elements will be subjected. At 100 percent of the maximum theoretical Impact Pier stress, settlement of the footing supported by the Impact Pier element should not exceed one inch.

We recommend that the Impact Pier installer's quality control (QC) program be monitored full-time by the project geotechnical engineer. The QC program includes verification of pier locations,

aggregate lift thickness, and impact crowd per lift. These items should be documented for each Impact Pier element installed to provide a complete record of Impact Pier foundation quality.

5.3 SITE SEISMIC CLASSIFICATION

The following recommendations are based on the 2018 North Carolina Building Code (NCBC). Our scope of services did not include site specific soil shear wave velocity testing and evaluation. F&R has evaluated the SPT data obtained from the soil test borings for assignment of seismic Site Class.

In accordance with procedures outlined in the 2018 NC Building Code for determining Site Class, a weighted average of the soil conditions in the upper 100 feet was performed using SPT N-values with the assumption that PWR is present below the maximum approximately 48.7-foot depth explored. Based on this evaluation of the SPT N-values and the completion of the recommended site repairs, the soil profile indicates a **Site Class D** is applicable to the project. If the project would benefit from a better site class (e.g., like going from a Site Class D to C), then F&R can perform site specific shear wave velocity testing using our Refraction Microtremor - SeisOpt® ReMi™ equipment.

It is noted that F&R has not performed an evaluation of liquefaction potential since this was not part of our scope work for the project. However, based on the soil types, consistency of the subsurface soils and groundwater conditions encountered, there does not appear to be a significant potential for liquefaction at this site based on the available boring data. If a detailed evaluation of liquefaction is desired, F&R would be available to perform such an evaluation at your request for an additional fee.

5.4 SLAB-ON-GRADE FLOORS

Ground floors may be designed as a slab-on-grade. We recommend that a modulus of subgrade reaction (k) of 125 pounds per cubic inch (pci) be used for slab design. The subgrade soils for support of floor slabs should be prepared as outlined in subsequent sections of this report. If the geopier option is selected for foundation support, undercutting of the upper 1 to 2 feet of

unsuitable fill soils may still need to be performed to establish a stable slab subgrade. The extent and depth of the subgrade repair should be determined during initial site preparation.

The floor slab should be supported on at least 4 inches of NCDOT #57 washed stone or well-compacted NCDOT ABC stone to provide a uniformly well-compacted zone of material immediately beneath the slab. The floor slab should be underlain by a vapor barrier to reduce the potential for floor slab dampness. Vapor barrier construction should be performed in accordance with applicable ACI guidelines. Proper vapor barrier specification and construction are particularly important on the project to minimize the risk of damp slab problems.

Floor slab design and construction should incorporate isolation joints around columns, utility penetrations, and along bearing walls to allow for differential movement to occur without damage to the floor. Final slab design should be determined by the project structural engineer based on actual design loads, building code requirements and other structural considerations.

5.5 RETAINING WALLS

While not shown on the provided plans, if conventional cantilever retaining walls of cast-in-place concrete or reinforced masonry construction are planned, F&R should be contacted to provide geotechnical recommendations including, but not necessarily limited to: active, at-rest and passive earth pressures, drainage requirements, and wall construction practices.

If segmental retaining walls (SRW) or Mechanically Stabilized Earth (MSE) retaining walls are considered for this project, it is recommended that F&R be given an opportunity to review the preliminary site grading plans. In addition, F&R should be given an opportunity to review all SRW/MSE wall plans and designs relevant to geotechnical considerations prior to final design of the walls. Once wall locations are determined, it may be recommended to perform additional subsurface exploration along the wall alignment. The purpose of the exploration would be to ascertain the bearing conditions for the wall foundation and reinforced zone, and to determine if bearing grade repair is anticipated. F&R recommends that geotechnical laboratory testing be performed on the soil(s) that is being considered for use as MSE wall reinforced-zone structural fill. This laboratory testing should include, but not necessarily be limited to geotechnical index testing (natural moisture content, grain size distribution & Atterberg limits), Standard Proctor

testing, and Triaxial shear testing. This laboratory testing will provide soil strength properties and engineering characteristics that can be used by the designer in the wall design. It is F&R's opinion that clays and silts should not be used as backfill for retaining walls. F&R recommends that MSE retaining wall reinforced zone backfill consist of low-plasticity granular soils with no more than 35% passing the #200 sieve. A cleaner (less percent fines) granular material may be required for the reinforced zone backfill depending on wall heights, groundwater considerations, surcharge loads and other design considerations. However, final approval and acceptance of the soils used as wall backfill is the wall designer's responsibility. All reinforced and retained zone soil must be approved by the wall designer.

F&R also recommends constructing buildings/structures and utility installations outside of the reinforced zone and the active pressure zone of the MSE walls due to the potential for long-term settlement and undesirable cracking that may occur as a result of normal wall movement/creep. F&R recommends that structures not be built within a 1H:2V projection up from the heel of the reinforced zone of the MSE Wall. F&R recommends that the designer take into account surcharge loads imposed by the structures and also consider tolerable wall movement/creep. F&R recommends that the wall designer discuss with the owner the potential for damage to structures as a result of expected wall movements.

In addition, F&R recommends that the wall designer perform global stability analyses of each wall and/or contact a geotechnical engineer to perform such analysis to check the overall stability of the wall upon completion of the wall plans and prior to starting construction. The global stability analysis will likely require an additional subsurface exploration to be conducted along the retaining wall alignments.

F&R recommends that surface drainage and grading around MSE walls be carefully considered during design. MSE wall plans typically include details that depict the final site grades at both the top and bottom of the wall. A drainage swale is generally constructed back from the top of the wall that directs surface water parallel to the wall alignment and prevents surface water from flowing over the wall and/or from ponding in the reinforced zone of the wall. In addition, installation of chimney drains should be strongly considered for all MSE walls to keep the

reinforced zone in a drained condition. Final wall grading details are important for the life of the structure, and failure to maintain adequate drainage or embedment can cause poor wall performance and failure. F&R recommends that the responsibility for final grading of site MSE retaining walls be assigned at the outset of wall construction.

6.0 GEOTECHNICAL CONSTRUCTION RECOMMENDATIONS

6.1 Site Preparation

After clearing and grubbing, all surficial organic soils, roots, vegetation and any other deleterious materials should be stripped from the structural and other load areas. The stripping should extend a distance of at least 5 feet beyond the building perimeters, but not less than the area within a 2H:1V slope projecting down to original grade from the perimeter footings or building pad in fill areas, whichever is greater. It should be noted, as with any site where previous construction has occurred, that there is some potential of encountering construction debris, unknown fills, or isolated soft soils in areas adjacent to the previous construction, in unexplored portions of the project, or in areas affected by demolition activities. As such, close observation of subgrade conditions should be performed across the site, especially in areas of the previous structures. Additionally, if any abandoned, open pipes or conduits are to be left in-place, they should be bulk-headed or grouted as they may serve as conduits for subsurface erosion.

Very soft/loose and/or soft fill and possible fill soils were encountered within the upper 11.5 feet of the soil profile in the borings. **These lower consistency soils are not suitable for support of the warehouse structure and need to be repaired. One repair option is to undercut the entire building footprint to approximately EL 252 feet and backfill the undercut excavation with properly placed and compacted structural fill.** Due to the presence of wet soils, it may be necessary to bridge over the remaining loose subgrade soils by using a geo-textiles and/or geo-grids with an initial 2-foot thick lift of clean sand (less than 10% fines) and/or NCDOT #57 stone. Bridging over the loose soils is acceptable provided a stable subgrade at the surface of the bridge lift can be achieved. **Alternatively, ground improvement techniques (geopiers) may be utilized to improve the existing fill soils present within the proposed building footprint in order to**

provide adequate foundation support for the structure, but will likely still require limited undercut to support the slab-on-grade.

Following stripping and subgrade repair, we recommend that all areas at or below final subgrade be observed and evaluated by the project geotechnical engineer or experienced representative working under the direction of the geotechnical engineer. The evaluation may include proofrolling exposed subgrades with a loaded tandem axle dump truck, scraper, or other similar heavy construction equipment to confirm the stability of the subgrade soils and detect the presence of soft or unstable areas. If the evaluation reveals unstable conditions, the method of repair should be as directed by the project geotechnical engineer. Methods of repair may include, but are not necessarily limited to drying and re-compaction; undercutting and replacement with suitable structural fill; use of geo-textiles and/or geo-grids with select fill; use of lime stabilization; or other methods deemed appropriate by the project geotechnical engineer.

The on-site soils have sufficient silt/clay content to render them moisture sensitive. The on-site soils will become unstable (i.e., pump and rut) during normal construction activities when in the presence of excess moisture. Soils with a moisture content greater than 3 percentage points above the optimum moisture content are generally considered to have excessive moisture. During earthwork and construction activities, surface water runoff must be drained away from the construction areas to prevent water from ponding on or saturating the soils within excavations or on subgrades. This is especially important considering the moisture sensitivity of the soils at this site.

6.2 STRUCTURAL FILL PLACEMENT AND COMPACTION

It is expected that the low plasticity silts/clays and sands (USCS – CL, ML, SM and SC) can be used as structural fill material provided they are free of deleterious materials. Low plasticity soils are generally considered fair to good materials for use as structural earth fill. Highly plastic soils (CH and MH) are considered poor materials for use as structural fill. It is likely that the on-site soils could be wet. If encountered, drying of cut soils may be required in order to properly compact these soils as structural fill. The grading contractor should be prepared to moisture condition soils (drying of wet soils and adding moisture to dry soils) prior to use as structural fill. As such,

it is recommended that earthwork be performed during the seasonally drier late spring to early fall months (typically May through October) when weather conditions are more conducive to moisture conditioning of fill materials.

Structural earth fill should be compacted at a moisture content within ±3 percentage points of the optimum moisture content. All structural earth fill should be placed in loose lifts not exceeding 8 inches and be compacted to at least 95 percent of the Standard Proctor maximum dry density as determined by ASTM D-698. The top 12 inches of fill should be compacted to at least 98 percent of the Standard Proctor maximum dry density. All areas requiring grade increases that are steeper than a slope of 4H:1V should be plowed, stepped and leveled to assure that fill is placed on near level surfaces. All structural fill material should be placed and compacted under the full-time observation of a qualified geotechnical engineer or engineering technician working under the direction of the geotechnical engineer. The placement and compaction of all fill material should be tested at frequent intervals in order to confirm that the recommended degree of compaction is being achieved.

If imported borrow is required to grade the site, it should consist of granular or low plasticity soils (LL<35, PI <20) that have a maximum dry density of at least 100 pcf. F&R should approve borrow soils prior to them being transported to the site.

All structural fill placement and compaction activities should be observed on a full-time basis by a geotechnical engineer or qualified engineering technician working under the supervision of the geotechnical engineer.

6.3 BUILDING FOUNDATION CONSTRUCTION RECOMMENDATIONS

Subsequent to bringing the site to finished grade levels in an approved manner, and repairing unsuitable earth fill as previously discussed, the excavation of building foundations may be initiated. We recommend that the footing excavations be observed by a qualified geotechnical engineer or their representative prior to placement of reinforcing steel and concrete. The purpose of the observation would be to determine that the foundations bear in suitable soils at the proper embedment depths, and that unsuitable soft or loose materials are undercut and backfilled with approved structural fill material. Hand auguring and Dynamic Cone Penetrometer

(DCP) testing should be performed at the direction of the project geotechnical engineer to verify the consistency of the bearing soils and underlying support soils. It is recommended that a smooth bladed backhoe bucket be used to remove the final 6 to 12 inches of soils above the foundation bearing grade in order to prevent disturbing soils below the bearing grade and/or prevent gouging narrow grooves in the bearing grade as may occur with a toothed-end bucket.

Exposure to the environment may weaken the soils at the footing bearing level if excavations remain open for long periods of time. The foundation bearing surface should be level or suitably benched and free of loose soil, ponded water and debris. If the bearing soils are softened by surface water intrusion or exposure, the softened soils must be removed from the foundation excavation immediately prior to placement of concrete. Foundation excavations must be maintained in a drained/de-watered condition throughout the foundation construction process. If the foundation excavations must remain open overnight, or if rainfall becomes imminent while the bearing soils are exposed, we recommend that a 2 to 4 inch thick "mud mat" of lean concrete (2,000 psi) be placed on the bearing soils before placing the reinforcing steel. In addition, F&R stresses the need for positive perimeter surface drainage around building areas to direct all runoff water away from buildings and foundations.

6.4 FLOOR SLAB CONSTRUCTION RECOMMENDATIONS

The subgrade soils for support of floor slabs should be prepared as outlined in sections 6.1 and 6.2 of this report. Utility and other construction excavations performed in the prepared floor slab subgrade should be backfilled with properly compacted structural fill to aid in providing uniform slab support. Prior to base course placement, the subgrade should be evaluated by the project engineer and soft, wet or otherwise unsuitable subgrade soils should be removed. Based on the results of F&R soil test borings, some subgrade repairs should be anticipated during floor slab construction. To reduce the risks of unsightly slab cracking, F&R recommends that concrete quality control testing be performed during concrete placement, control joints (as designed by the structural engineer) be cut into the slab as soon as possible after the concrete placement, and the slab be cured as appropriate for the prevailing weather conditions.

6.5 DEWATERING

As previously mentioned, groundwater was encountered in all five (5) borings at depths ranging from 6.1 to 33.9 feet. Additionally, wet and/or saturated soil conditions were encountered in the four (4) borings at a depths ranging from just below the existing ground surface to 2 feet. As such, it is anticipated wet soils and/or groundwater will be encountered if the excavation and replacement of the unsuitable soils option is chosen. As such, dewatering may be necessary in order to maintain drained, stable excavations and to prevent softening/loosening of the excavation subgrades. The groundwater should be lowered to a depth of at least 3 to 4 feet below the bottoms of the excavations. However, groundwater elevations will likely vary throughout the year, and will be elevated especially during the seasonally-wet months (October through April). If groundwater is encountered, dewatering may be able to be handled by sump and pumping techniques. However during periods of inclement weather, sump pits and pumping may not be sufficient to control both groundwater and surface water, and more extensive drainage/dewatering measures may be required. The method of surface water and groundwater control should be determined and designed by the contractor, but may require well points, sheet piling, or other means.

It should be noted that if groundwater levels are not effectively maintained below the base of the excavations during construction, unstable and loosened subgrade conditions could develop, which may cause excessive settlements to develop beneath the water line or require additional subgrade repair (*e.g.,* densification, undercutting & replacement with washed stone, etc.). Therefore, efforts should be incorporated in the construction sequence to properly control groundwater levels during construction. Additionally, it is recommended that only excavation contractors experienced in similar excavations and groundwater control should be allowed to perform this work.

6.6 TEMPORARY EXCAVATION RECOMMENDATIONS

Mass excavations and other excavations required for construction of this project should be performed in accordance with the United States Department of Labor, Occupational Safety and Health Administration (OSHA) guidelines (29 CFR 1926, Subpart P, Excavations) or other applicable jurisdictional codes for permissible temporary side-slope ratios and/or shoring

requirements. The OSHA guidelines require daily inspections of excavations, adjacent areas and protective systems by a "competent person" for evidence of situations that could result in cave-ins, indications of failure of a protective system, or other hazardous conditions. All excavated soils, equipment, building supplies, etc., should be placed away from the edges of the excavation at a distance equaling or exceeding the depth of the excavation. F&R cautions that the actual excavation slopes will need to be evaluated frequently each day by the "competent person" and flatter slopes or the use of shoring may be required to maintain a safe excavation depending upon excavation specific circumstances. The contractor is responsible for providing the "competent person" and all aspects of site safety. F&R can evaluate specific excavation slope situations if we are informed and requested by the owner, designer or contractor's "competent person".

7.0 CONTINUATION OF SERVICES

As previously discussed, a Geotechnical Engineer should be retained to monitor and test earthwork activities, and observe subgrade preparations for slopes, foundations, floor slabs, and pavements. It should be noted that the actual soil conditions at the various subgrade levels and footing bearing grades will vary across this site and thus the presence of the Geotechnical Engineer and/or their representative during construction will serve to validate the subsurface conditions and recommendations presented in this report. A geotechnical engineer should be employed to monitor the earthwork and foundation construction, and to report that the recommendations contained in this report are completed in a satisfactory manner. The continued geotechnical engineering involvement on the project will aid in the proper implementation of the recommendations discussed herein. The following is a recommended scope of services:

- Additional geotechnical exploration may be warranted based on the currently provided building options. The additional exploration should focus on areas not investigated during this exploration;
- Review of project plans and construction specifications to verify that the recommendations presented in this report have been properly interpreted and implemented;
- Observe the earthwork process to document that subsurface conditions encountered during construction are consistent with the conditions anticipated in this report;
- Observe the subgrade conditions before placing structural fill including proofroll observations;

- Observe the placement and compaction of any structural fill and backfill, and perform laboratory and field compaction testing of the fill; and,
- Observe all foundation excavations and footing bearing grades for compliance with the recommended design soil bearing capacity. We also stress the importance of conducting hand auger and DCP testing at and extending several feet below the footing bearing grade in order to give an indication of the anticipated subsurface conditions and define footings that should be undercut and repaired as outlined in this report.

8.0 LIMITATIONS

This report has been prepared for the exclusive use of Wiley|Wilson for specific application to the referenced project. This report has been prepared in accordance with generally accepted soil and foundation engineering practices. No other warranty, express or implied, is made. Our evaluations and recommendations are based on design information furnished to us; the data obtained from the subsurface exploration program, and generally accepted geotechnical engineering practice. The evaluations and recommendations do not reflect variations in subsurface conditions which could exist intermediate of the boring locations or in unexplored areas of the site.

There are important limitations to this and all geotechnical studies. Some of these limitations are discussed in the information prepared by GBA, which is included in Appendix IV. We ask that you please review this GBA information.

Regardless of the thoroughness of a subsurface exploration, there is the possibility that conditions between borings and test pits will differ from those at the boring and test pit locations, that conditions are not as anticipated by the designers, or that the construction process has altered the soil conditions. Therefore, experienced geotechnical engineers should evaluate earthwork, pavement, and foundation construction to verify that the conditions anticipated in design actually exist. Otherwise, we assume no responsibility for construction compliance with the design concepts, specifications, or recommendations.

In the event that changes are made in the proposed construction, the recommendations presented in the report shall not be considered valid unless the changes are reviewed by our firm and conclusions of this report modified and/or verified in writing. If this report is copied or transmitted

to a third party, it must be copied or transmitted in its entirety, including text, attachments, and enclosures. Interpretations based on only a part of this report may not be valid.

APPENDIX I

FIGURES



Site Vicinity Map

0 115 230 460 690 920 Feet

FROEHLING & ROBERTSON
Engineering Stability Since 1881
310 Hubert Street
Raleigh, North Carolina 27603
T 919.828.3441

Client:	Wiley|Wilson
Project:	278-50 WWTP Warehouse CIP Project
Location	Chapel Hill, Orange County, NC
Project Number:	66C-0101
Data:	Open Street
Date:	November 2024
Scale:	1 inch = 460 feet

FIGURE No.: 1



Boring Location Plan

0 5 10 20 30 40 Feet

FROEHLING & ROBERTSON
Engineering Stability Since 1881

310 Hubert Street
Raleigh, North Carolina 27603
T 919.828.3441

Client:	Wiley|Wilson		
Project:	278-50 WWTP Warehouse CIP Project		
Location	Chapel Hill, Orange County, NC		
Project Number:	66C-0101		FIGURE No.: 2
Data:	NCOne Map Aerial 2021		
Date:	November 2024	Scale: 1 inch = 29.88 feet	



Boring Location Plan

0 5 10 20 30 40 Feet

FROEHLING & ROBERTSON
Engineering Stability Since 1881

310 Hubert Street
Raleigh, North Carolina 27603
T 919.828.3441

Client:	Wiley|Wilson		
Project:	278-50 WWTP Warehouse CIP Project		
Location	Chapel Hill, Orange County, NC		
Project Number:	66C-0101		FIGURE No.: 2A
Data:	NCOne Map Aerial 2021		
Date:	November 2024	Scale: 1 inch = 25 feet	



Boring Location Plan

0 5 10 20 30 40 Feet

FROEHLING & ROBERTSON
Engineering Stability Since 1881

310 Hubert Street
Raleigh, North Carolina 27603
T 919.828.3441

Client:	Wiley|Wilson		
Project:	278-50 WWTP Warehouse CIP Project		
Location	Chapel Hill, Orange County, NC		
Project Number:	66C-0101		FIGURE No.: 2B
Data:	NCOne Map Aerial 2021		
Date:	November 2024	Scale: 1 inch = 25 feet	

FROEHLING & ROBERTSON

Engineering Stability Since 1881

SUBSURFACE PROFILE

Plot Based on Elevation

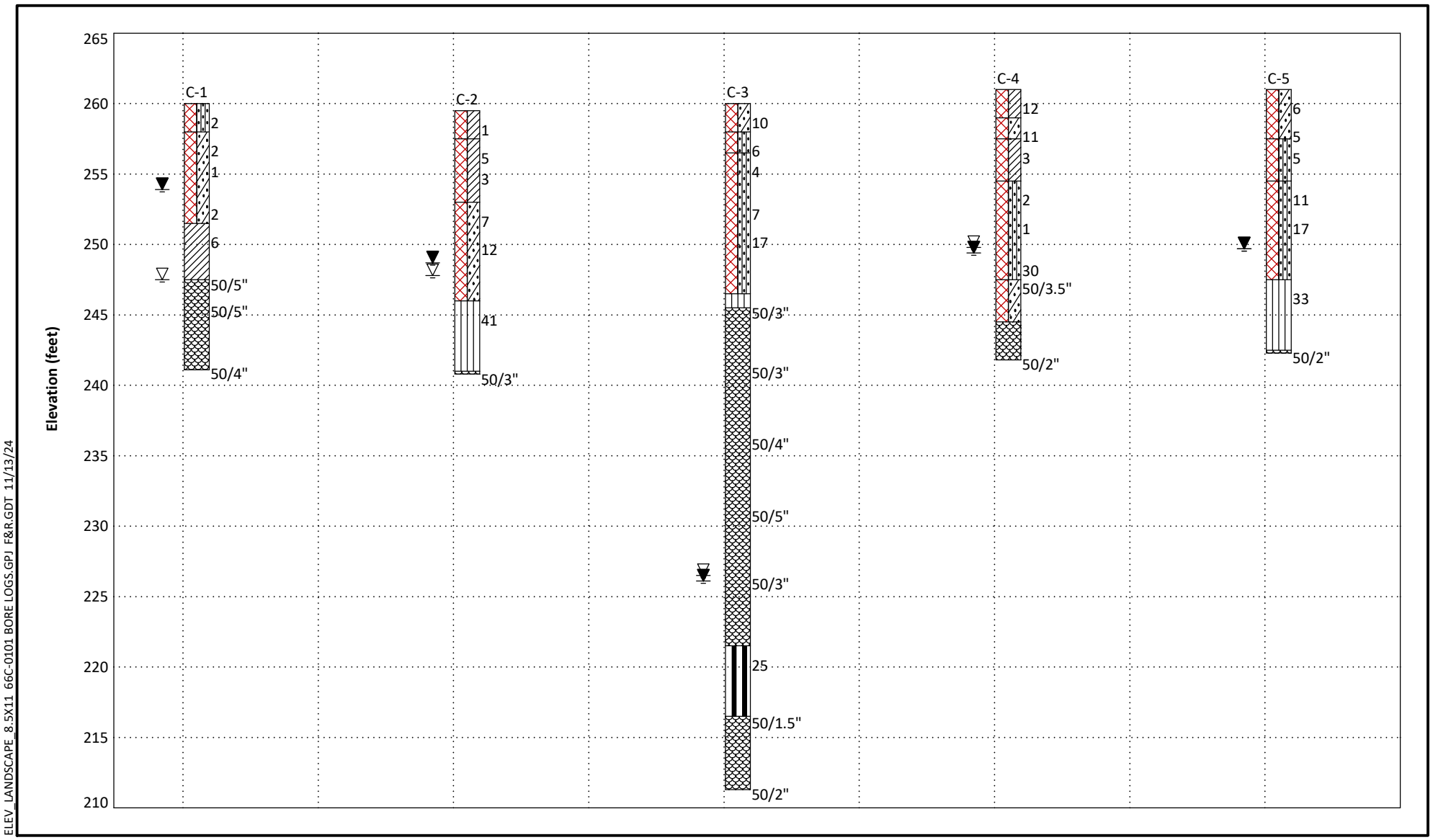
Profile Name: Figure No. 3

Project No: 66C-0101

Client: Wiley|Wilson

Project: WWTP Warehouse CIP

City/State: Chapel Hill, NC



ELEV_LANDSCAPE_8.5X11 66C-0101 BORE LOGS.GPJ F&R.GDT 11/13/24

APPENDIX II

BORING LOGS

FROEHLING & ROBERTSON

Engineering Stability Since 1881

Table 1: Boring Coordinates		
Boring	**Northing**	**Easting**
C-1	781728	1992073
C-2	781728	1992145
C-3	781681	1992091
C-4	781625	1992038
C-5	781608	1992094

KEY TO SOIL CLASSIFICATION

Correlation of Penetration Resistance with Relative Density and Consistency

Sands and Gravels

No. of Blows, N	Relative Density
0 - 4	Very loose
5 - 10	Loose
11 - 30	Medium dense
31 - 50	Dense
Over 50	Very dense

Silts and Clays

No. of Blows, N	Relative Density
0 - 2	Very soft
3 - 4	Soft
5 - 8	Firm
9 - 15	Stiff
16 - 30	Very stiff
31 - 50	Hard
Over 50	Very hard

Particle Size Identification (Unified Classification System)

Boulders:	Diameter exceeds 8 inches
Cobbles:	3 to 8 inches diameter
Gravel:	**Coarse** - 3/4 to 3 inches diameter **Fine** - 4.76 mm to 3/4 inch diameter
Sand:	**Coarse** - 2.0 mm to 4.76 mm diameter **Medium** - 0.42 mm to 2.0 mm diameter **Fine** - 0.074 mm to 0.42 mm diameter
Silt and Clay:	Less than 0.07 mm (particles cannot be seen with naked eye)

Modifiers

The modifiers provide our estimate of the amount of silt, clay or sand size particles in the soil sample.

Approximate Content	Modifiers
≤ 5%:	Trace
5% to 12%:	Slightly silty, slightly clayey, slightly sandy
12% to 30%:	Silty, clayey, sandy
30% to 50%:	Very silty, very clayey, very sandy

Field Moisture Description	
Saturated:	Usually liquid; very wet, usually from below the groundwater table
Wet:	Semisolid; requires drying to attain optimum moisture
Moist:	Solid; at or near optimum moisture
Dry:	Requires additional water to attain optimum moisture

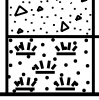
Ground Water

▽ Water Level in Bore Hole Immediately after Drilling

▼ Static Water Level after 24 Hours

SINCE F&R 1881

UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)

MAJOR DIVISION				TYPICAL NAMES
GRAVELS More than 50% of coarse fraction larger than No. 4 sieve	CLEAN GRAVEL (little or no fines)		GW	Well graded gravels
			GP	Poorly graded gravels
	GRAVELS with fines		GM	Silty gravels
			GC	Clayey gravels
SANDS More than 50% of coarse fraction smaller than No. 4 sieve	CLEAN SAND (little or no fines)		SW	Well graded sands
			SP	Poorly graded sands
	SAND with fines		SM	Silty sands, sand/silt mixtures
			SC	Clayey sands, sand/clay mixtures
SILTS AND CLAYS Liquid Limit is less than 50			ML	Inorganic silts, sandy and clayey silts with slightly plasticity
			CL	Sandy or silty clays of low to medium plasticity
			OL	Organic silts of low plasticity
SILTS AND CLAYS Liquid Limit is greater than 50			MH	Inorganic silts, sandy micaceous or clayey elastic silts
			CH	Inorganic clays of high plasticity, fat clays
			OH	Organic clays of medium to high plasticity
HIGHLY ORGANIC SOILS			PT	Peat and other highly organic soils
MISCELLANEOUS MATERIALS				PWR (Partially Weathered Rock)
				Rock
				Asphalt
				ABC Stone
				Concrete
				Surficial Organic Soil

FROEHLING & ROBERTSON
Engineering Stability Since 1881

BORING LOG

Boring: C-1 (1 of 1)

Project No: 66C-0101
Client: Wiley|Wilson
Project: WWTP Warehouse CIP
City/State: Chapel Hill, NC

Elevation: 260 ±
Total Depth: 18.8'
Boring Location: See Boring Location Plan

Drilling Method: 2.25" ID HSA
Hammer Type: Automatic
Date Drilled: 9/23/24
Driller: W. Shenberger

Elevation	Depth	Description of Materials (Classification)	* Sample Blows	Sample Depth (feet)	N-Value (blows/ft)	Remarks
		FILL: Very Loose, Dark Brown, Wet, Silty Fine SAND (SM)	WOH-1-1	0.0	2	GROUNDWATER DATA: 0 Hr: 12.5', Caved at 16.8' 24 Hrs: 6.1', Caved at 8.9'
				1.5		
258.0	2.0	FILL: Very Loose, Tan-Orange, Wet, Clayey Fine SAND (SC)	WOH-1-1	2.0	2	
			WOH-WOH-1	3.5	1	
				5.0		
		Saturated at 6.5'	1-1-1	6.5	2	
				8.0		
251.5	8.5	RESIDUAL: Firm, Orange and Gray, Wet, Fine Sandy CLAY (CL)	4-3-3	8.5	6	
				10.0		
			9-30-50/5"	11.5	100+	
247.5	12.5	PARTIALLY WEATHERED ROCK: Sampled as Dark Purple-Brown and Gray, Moist, SILT		12.9		
			33-50/5"	13.5	100+	
				14.4		
			50/4"	18.5		
241.1	18.9	Boring Terminated at 18.9 feet.			100+	

*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the second and third increments of penetration is termed the standard penetration resistance, N-Value.

FROEHLING & ROBERTSON
Engineering Stability Since 1881

BORING LOG

Boring: C-2 (1 of 1)

Project No: 66C-0101
Client: Wiley|Wilson
Project: WWTP Warehouse CIP
City/State: Chapel Hill, NC

Elevation: 259.5 ±
Total Depth: 18.7'
Boring Location: See Boring Location Plan

Drilling Method: 2.25" ID HSA
Hammer Type: Automatic
Date Drilled: 9/23/24
Driller: W. Shenberger

Elevation	Depth	Description of Materials (Classification)	* Sample Blows	Sample Depth (feet)	N-Value (blows/ft)	Remarks
		FILL: Very Soft, Gray and Tan, Wet, Fine Slightly Gravelly Fine to Coarse Sandy CLAY (CL)	WOH-1-0	0.0	1	GROUNDWATER DATA: 0 Hr: 11.7', Caved at 13.9' 24 Hrs: 10.8', Caved at 11.0'
				1.5		
257.5	2.0	FILL: Firm, Orange-Brown, Wet, Fine Sandy CLAY (CL)	2-2-3	2.0	5	
			1-2-1	3.5	3	
				5.0		
253.0	6.5	FILL: Loose to Medium Dense, Orange-Tan, Wet, Clayey Fine SAND (SC) with Trace Fine Gravel	1-2-5	6.5	7	
				8.0		
			3-2-10	8.5	12	
				10.0		
246.0	13.5	RESIDUAL: Hard, Dark Red-Brown, Moist, SILT (ML)	11-15-26	13.5	41	
				15.0		
241.0	18.5			18.5		
240.8	18.7	PARTIALLY WEATHERED ROCK: Sampled as Gray, Wet, SILT	50/3"		100+	
		Boring Terminated at 18.7 feet.				

BORING_LOG 66C-0101 BORE LOGS.GPJ F&R.GDT 11/13/24

*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the second and third increments of penetration is termed the standard penetration resistance, N-Value.

FROEHLING & ROBERTSON
Engineering Stability Since 1881

BORING LOG

Boring: C-3 (1 of 1)

Project No: 66C-0101
Client: Wiley|Wilson
Project: WWTP Warehouse CIP
City/State: Chapel Hill, NC

Elevation: 260 ±
Total Depth: 48.7'
Boring Location: See Boring Location Plan

Drilling Method: 2.25" ID HSA
Hammer Type: Automatic
Date Drilled: 9/20/24
Driller: W. Shenberger

Elevation	Depth	Description of Materials (Classification)	* Sample Blows	Sample Depth (feet)	N-Value (blows/ft)	Remarks
		FILL: Loose, Tan, Wet, Clayey Fine to Coarse SAND (SC) with Trace Fine Gravel	1-3-7	0.0 1.5	10	GROUNDWATER DATA: 0 Hr: 33.5' inside PVC 24 Hrs: 33.9' inside PVC
258.0	2.0	FILL: Loose, Brown, Wet, Silty Fine SAND (SM)	4-3-3	2.0		
256.5	3.5	FILL: Very Loose to Medium Dense, Brown, Wet, Slightly Clayey Silty Fine SAND (SM)	3-1-3	3.5	6	
				5.0	4	
			4-3-4	6.5		
				8.0	7	
			5-5-12	8.5		
				10.0	17	
246.5	13.5	RESIDUAL: Very Hard, Dark Purple-Brown, Moist, Fine Sandy SILT (ML)	11-44-50/3"	13.5		
245.5	14.5	PARTIALLY WEATHERED ROCK: Sampled as Dark Purple-Brown, Moist, Fine Sandy SILT		15.0	100+	
			50/3"	18.5	100+	
			50/4"	23.5	100+	
			50/5"	28.5	100+	
			50/3"	33.5	100+	
221.5	38.5	RESIDUAL: Very Stiff, Dark Purple-Brown, Wet, Fine Sandy Clayey SILT (MH)	11-8-17	38.5 40.0	25	
216.5	43.5	PARTIALLY WEATHERED ROCK: Sampled as Dark Purple-Brown, Moist, Fine Sandy SILT	50/1.5"	43.5	100+	
211.3	48.7	Boring Terminated at 48.7 feet.	50/2"	48.5	100+	

*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the second and third increments of penetration is termed the standard penetration resistance, N-Value.

FROEHLING & ROBERTSON
Engineering Stability Since 1881

BORING LOG

Boring: C-4 (1 of 1)

Project No: 66C-0101
Client: Wiley|Wilson
Project: WWTP Warehouse CIP
City/State: Chapel Hill, NC

Elevation: 261 ±
Total Depth: 19.2'
Boring Location: See Boring Location Plan

Drilling Method: 2.25" ID HSA
Hammer Type: Automatic
Date Drilled: 9/23/24
Driller: W. Shenberger

Elevation	Depth	Description of Materials (Classification)	* Sample Blows	Sample Depth (feet)	N-Value (blows/ft)	Remarks
		FILL: Stiff, Gray-Brown, Moist, Fine Sandy CLAY (CL)	4-8-4	0.0	12	GROUNDWATER DATA: 0 Hr: 11.2', Caved at 11.9' 24 Hrs: 11.6', Caved at 12.3'
				1.5		
259.0	2.0	FILL: Medium Dense, Dark Orange-Brown, Wet, Clayey Fine to Medium SAND (SC) with Slightly Fine Gravel	4-3-8	2.0	11	
257.5	3.5	FILL: Soft, Brown, Wet, Slightly Fine Gravelly Fine Sandy CLAY (CL)	2-2-1	3.5	3	
				5.0		
254.5	6.5	FILL: Very Loose to Medium Dense, Brown, Wet, Silty Fine SAND (SM)	2-1-1	6.5	2	
				8.0		
			WOH-0-1	8.5	1	
				10.0		
	▽		22-19-11	11.5	30	
				13.0		
247.5	13.5	POSSIBLE FILL: Very Dense, Orange-Brown, Wet, Fine to Coarse Gravelly Clayey Fine to Coarse SAND (SC)	50/3.5"	13.5	100+	
244.5	16.5	PARTIALLY WEATHERED ROCK: Sampled as Dark Purple-Red-Brown, Wet, Fine Sandy SILT				
			35-50/2"	18.5		
241.8	19.2	Boring Terminated at 19.2 feet.		19.2	100+	

*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the second and third increments of penetration is termed the standard penetration resistance, N-Value.

FROEHLING & ROBERTSON
Engineering Stability Since 1881

BORING LOG

Boring: C-5 (1 of 1)

Project No: 66C-0101
Client: Wiley|Wilson
Project: WWTP Warehouse CIP
City/State: Chapel Hill, NC

Elevation: 261 ±
Total Depth: 18.7'
Boring Location: See Boring Location Plan

Drilling Method: 2.25" ID HSA
Hammer Type: Automatic
Date Drilled: 9/23/24
Driller: W. Shenberger

Elevation	Depth	Description of Materials (Classification)	* Sample Blows	Sample Depth (feet)	N-Value (blows/ft)	Remarks
		FILL: Loose, Brown, Moist, Clayey Fine to Coarse SAND (SC) with Trace Fine Gravel and Trace Organics (Leaves & Roots 2.0'-3.5')	1-1-5	0.0	6	GROUNDWATER DATA: 0 Hr: 11.3' inside PVC 24 Hrs: 11.3' inside PVC
				1.5		
			6-3-2	2.0	5	
257.5	3.5	FILL: Loose, Dark Brown, Moist, Silty Fine SAND (SM)	2-2-3	3.5	5	
				5.0		
254.5	6.5	FILL: Medium Dense, Dark Orange and Gray, Moist, Fine to Coarse Gravelly Silty SAND (SM)	2-6-5	6.5	11	
				8.0		
			11-8-9	8.5	17	
				10.0		
247.5	13.5	RESIDUAL: Very Stiff, Purple-Red-Brown, Moist, SILT (ML)	6-9-24	13.5	33	
				15.0		
242.5	18.5			18.5		
242.3	18.7	PARTIALLY WEATHERED ROCK: Sampled as Dark Purple-Red-Brown, Wet, SILT	50/2"		100+	
		Boring Terminated at 18.7 feet.				

*Number of blows required for a 140 lb hammer dropping 30" to drive 2" O.D., 1.375" I.D. sampler a total of 18 inches in three 6" increments. The sum of the second and third increments of penetration is termed the standard penetration resistance, N-Value.

APPENDIX III

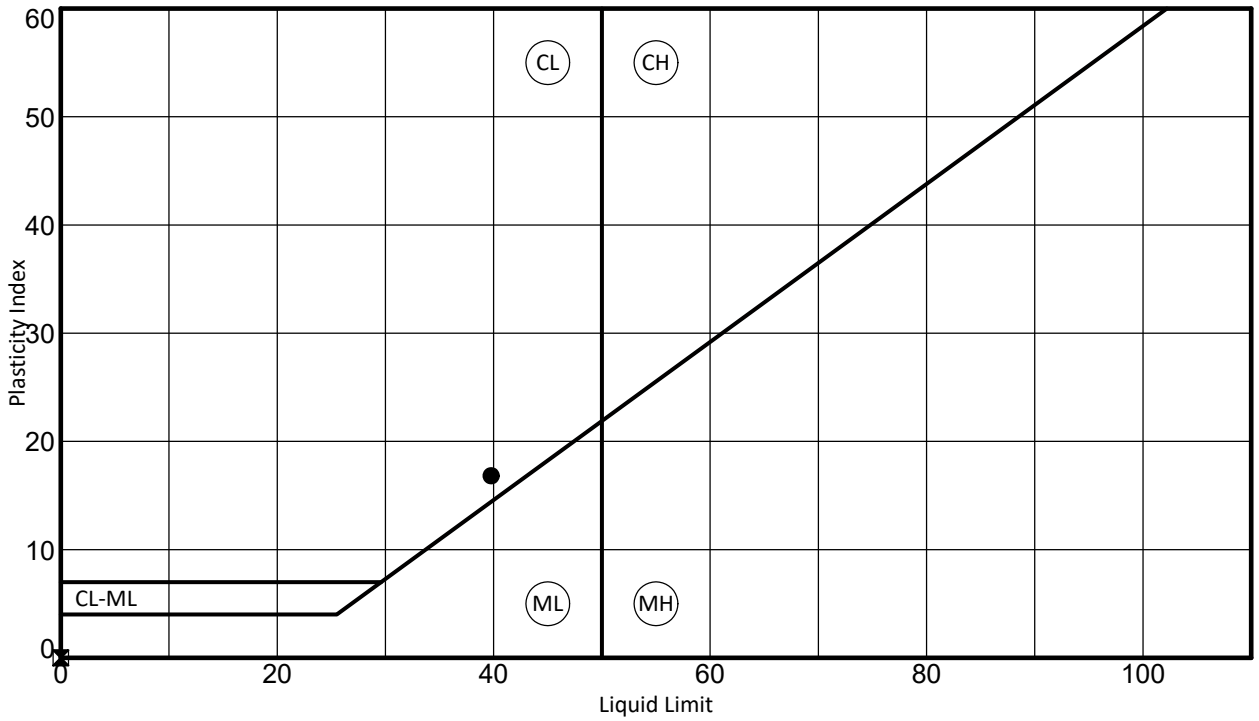
LABORATORY TEST RESULTS

FROEHLING & ROBERTSON
Engineering Stability Since 1881

ATTERBERG LIMITS

Sheet: 1 of 1

Project No: 66C-0101
Client: Wiley | Wilson
Project: 278-50 WWTP Warehouse
City/State: Chapel Hill, North Carolina



Boring No.	Depth	LL	PL	PI	% PASSING #200	Classification	% Natural Water Content
● C-1	8.5' - 10.0'	40	23	17	54.3	SANDY LEAN CLAY (CL)	25.3
⧓ C-3	3.5' - 5.0'	NP	NP	NP	41.5	SILTY SAND (SM)	16.1

APPENDIX IV

GBA DOCUMENT

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, clients can benefit from a lowered exposure to the subsurface problems that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed below, contact your GBA-member geotechnical engineer. Active involvement in the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Geotechnical-Engineering Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. *Those who rely on a geotechnical-engineering report prepared for a different client can be seriously misled*. No one except authorized client representatives should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one – not even you – should apply this report for any purpose or project except the one originally contemplated.*

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read it *in its entirety*. Do not rely on an executive summary. Do not read selected elements only. *Read this report in full.*

You Need to Inform Your Geotechnical Engineer about Change

Your geotechnical engineer considered unique, project-specific factors when designing the study behind this report and developing the confirmation-dependent recommendations the report conveys. A few typical factors include:

- the client's goals, objectives, budget, schedule, and risk-management preferences;
- the general nature of the structure involved, its size, configuration, and performance criteria;
- the structure's location and orientation on the site; and
- other planned or existing site improvements, such as retaining walls, access roads, parking lots, and underground utilities.

Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.*

This Report May Not Be Reliable

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, that it could be unwise to rely on a geotechnical-engineering report whose reliability may have been affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If your geotechnical engineer has not indicated an "apply-by" date on the report, ask what it should be*, and, in general, *if you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying it. A minor amount of additional testing or analysis – if any is required at all – could prevent major problems.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface through various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing were performed*. The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgment to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team from project start to project finish, so the individual can provide informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, *they are not final*, because the geotechnical engineer who developed them relied heavily on judgment and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* revealed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a full-time member of the design team, to:

- confer with other design-team members,
- help develop specifications,
- review pertinent elements of other design professionals' plans and specifications, and
- be on hand quickly whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction observation.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for informational purposes only*. To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report, but they may rely on the factual data relative to the specific times, locations, and depths/elevations referenced. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely*. Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures*. If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. As a general rule, *do not rely on an environmental report prepared for a different client, site, or project, or that is more than six months old.*

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, none of the engineer's services were designed, conducted, or intended to prevent uncontrolled migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration.*** Confront the risk of moisture infiltration by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are not building-envelope or mold specialists.***

GEOPROFESSIONAL BUSINESS ASSOCIATION

Telephone: 301/565-2733
e-mail: info@geoprofessional.org www.geoprofessional.org

Copyright 2016 by Geoprofessional Business Association (GBA). Duplication, reproduction, or copying of this document, in whole or in part, by any means whatsoever, is strictly prohibited, except with GBA's specific written permission. Excerpting, quoting, or otherwise extracting wording from this document is permitted only with the express written permission of GBA, and only for purposes of scholarly research or book review. Only members of GBA may use this document or its wording as a complement to or as an element of a report of any kind. Any other firm, individual, or other entity that so uses this document without being a GBA member could be committing negligent



Corporate HQ: 3015 Dumbarton Road Richmond, Virginia 23228 T 804.264.2701 F 804.264.1202 www.fandr.com

VIRGINIA • NORTH CAROLINA • MARYLAND • DISTRICT OF COLUMBIA

A Minority-Owned Business

ORANGE WATER AND SEWER AUTHORITY WAREHOUSE STUDY

SPACE NEEDS ASSESSMENT





COMMISSION # 240052.00

FINAL NEEDS ASSESSMENT WITH OPINION OF PROBABLE COST
29 AUGUST 2024



CONTACT:
Aaron S. Tice, PE
434.455.3210
atice@wileywilson.com

WAREHOUSE NEEDS ASSESSMENT

Table of Contents

1 Introduction 2
1.1 Background 2
2 Investigations 2
2.1 Methodology 2
2.2 Observations 2
3 Design Workshop 3
3.1 Summary 3
3.2 Site Considerations 4
3.3 Floor Plan Considerations 4
4 Recommendations 5
4.1 Site Plan Recommendations 5
4.2 Floor plan Recommendation 5
5 Appendix A 7
5.1 Space needs Index 7
6 Appendix B 8
6.1 Opinion of Probable Cost 8
7 Appendix C 9
7.1 Conceptual Design 9

1 Introduction

1.1 Background

Orange Water And Sewer Authority (OWASA) requested that Wiley|Wilson (WW) perform a space needs assessment for a proposed new warehouse building. The proposed building, located at OWASA's Mason Farm Waste Water Treatment Plant (WWTP), would be used to store maintenance and facilities related equipment. As well, the building is proposed to include at least one conditioned space accommodating electrical equipment storage and testing at 120, 240, and 480v.

The objective of this report is to analyze and recommend the ideal building size and layout to maximize OWASA's value for investment.

2 Investigations

2.1 Methodology

This evaluation included a pre-site-visit Stakeholder Questionnaire formatted to help gather information about user's current and projected storage needs and workflow. Questionnaire responses were returned and evaluated in preparation for WW's site visit to the WWTP that occurred May 22, 2024.

The site visit included 1) stakeholder interviews and 2) a site-walk and investigation of the currently utilized storage areas. WW interviewed the Director of Wastewater Management and the Maintenance Supervisor for the future Warehouse to understand goals and objectives for the future Warehouse space. WW then visually inspected, photographically documented, and made use of measurement tools to evaluate the various current storage spaces.

A second site visit was conducted at the Mist Lake Water Management Facility in Durham, NC. The facility has been operational long enough for the staff to gather valuable insights and lessons learned on what has been effective and what has not. Additionally, the facility has been opened recent enough that all the feedback and lessons learned remain relevant and applicable to this project.

2.2 Observations

Mason Farm WWTP

During the site visit to the Mason Farm WWTP, it was evident that the staff lacked appropriate and adequate storage space for reserve stock equipment and materials. WW observed that various items, including pumps, hoses, and fittings, were stored outside. This exposure subjects the reserve stock to physical wear, including UV degradation of plastic-containing components, in particular, hoses. While we were not provided with specific numbers of current parts being stored, we were able to estimate numbers of pallet (4 foot x 4 foot) sized storage space and linear feet of existing storage racks. These estimates are included in the existing square foot numbers in the Space Needs Index located in Appendix A.

Some areas that remain in use as enclosed storage were not intended to be used as storage or were designed only for temporary use. WW observed that storage in some areas precludes maintenance ability, while others were accompanied by safety hazards. For example, items were stored in a 40-foot-long Conex box. While this type of storage provides protection from the elements, wasp nests were found attached to the inside of the door upon opening. As well, access to materials at the interior rear of the Conex was blocked by materials stored towards the front.

Additional items were stored in the lower level of the Switch Gear Building. Although this space shields items from the elements, it is not ideal for long-term storage. Limited headroom is available due to overhead cable

management and other electrical equipment. Furthermore, items requiring conditioned storage were kept on the upper floor of the Switch Gear Building, occupying space not designed for storage. This situation potentially encroaches on the required working clearances for electrical equipment in the building.

Mist Lake Water Management Facility

During the site visit to the Mist Lake Water Management Facility WW observed the facility's open storage areas, caged tool vending area, exterior storage yard. The open storage area consisted of traditional pallet storage racks, a self-contained operable storage rack system (Rapistak system), open shelving, hardware storage (maintained by vendor), and a caged area for miscellaneous longer tools such as ladders. Ladders were chosen to be stored vertically stacked in a separate caged area for easy access while preventing them from falling.

The staff provided valuable feedback on what aspects of their workflow were effective and which caused difficulties. For example, the Rapistak system was intended to increase efficiency by automating the storage and retrieval of items. However, the staff did not prefer the system once it was implemented. The proprietary pallet sizes required by the Rapistak system force the staff to take unnecessary steps transferring items from their original pallets to the proprietary pallets before they can be stored. Additionally, the system's reliance on electricity means that it becomes unusable during power outages, requiring the staff to use standard forklifts to access items stored on higher racks. Originally, there was an option to add more Rapistak bays in the future, but the staff have decided against this, opting instead to use standard pallet racks that better suit their workflow.

The staff provided input on the types and quantities of smaller open shelving. They determined that using approximately 70% of the shelving with an 18-inch depth was most effective. The remaining shelving was divided between 12-inch and 24-inch-deep options. Where possible, they implemented U-shaped configurations, with 18-inch shelves against the walls and 24-inch shelves as "islands." The 24-inch-deep shelves are stable as freestanding units and can be split into two 12-inch shelves on either side of the aisle. Staff preferred open shelving over closeable cabinets, as the cabinet doors obstructed accessways and were inefficient for storing the various sizes and shapes of their items.

Mist Lake staff also had recommendations for user comfort inside the building. Given the structural components are primarily concrete and steel, there are many hard surfaces that bounce sound causing high reverberation. The staff suggested installing acoustic panels or baffles to reduce noise. Regarding lighting, the warehouse was designed including several clerestory windows just below the roofline on the exterior wall. This feature increases user connection with nature, can be used in place of artificial lighting in the event of electrical outage, and amplifies lumens available via artificial light during daylight hours. In other areas of the building, skylights were utilized and were not recommended. Skylights are often weak points in a roofing system, and as the saying goes, it's not *IF* a skylight will leak but *WHEN.*

3 Design Workshop

3.1 Summary

On July 10th, 2024, stakeholders from OWASA and members of the WW design team convened for an interactive design workshop. The primary objective of this session was for the design team to present conceptual site plans and building layouts to the stakeholders and to gather immediate feedback. This collaborative approach aimed to reach a consensus on a design that would optimize staff workflow and maximize storage capacity within the project's budget.

3.2 Site Considerations

Various site related items were discussed and considered. We have included a list of design inclusion priorities noted by OWASA:

- Sheltered (covered) entrances, loading and unloading.
- Exterior covered storage.
- Minimize site cost.
    - Do not disturb existing stormwater pond.
    - Minimize new utilities work.
    - Efficiently use the site to minimize restrictions on future improvements.

During the workshop, various site plan options and building orientations were evaluated. The options discussed included shifting the building footprint southward on the site with future expansion to the north, moving the footprint westward toward the existing stormwater management pond, rotating the footprint 90 degrees and positioning it in different locations on the site, and relocating the covered storage areas to the front and rear of the building.

3.3 Floor Plan Considerations

Original Concept (Concept 1)

The original concept floor plan presented to the stakeholders, Concept 1, showed a footprint of 80 feet long by 40 feet wide running roughly north/south and sized approximately 3,200 SF. This plan also included a connected exterior covered storage area off the east façade sized approximately 1,200 square feet. The covered storage extends off the building by 15 feet and runs the full length of the building. As a 1-story building with an interior mezzanine, the first-floor area includes two divided spaces. The first is a large non-conditioned open storage space, approximately 2,400 SF (75%); and a conditioned storage space including equipment testing areas, approximately 800 SF (25%). The mezzanine is located directly above the conditioned storage space, providing an additional 800 SF of open storage.

The extents of the building would fall within the existing footprint of the demolished University of North Carolina (UNC) Research Building. The north end of the proposed building is located at the northern wall of the Research Building, approximately 15 feet from the metal sheet pile wall, allowing future expansion to the South. A future stand-alone covered storage shed was also shown.

Overall, Concept Plan 1 was well-received. However, it was suggested that the polymer tote storage, which requires recessed spill containment, might be better positioned in a separate area from the open storage to simplify the foundation. The placement and orientation of the tote storage were evaluated alongside the conditioned and non-conditioned storage spaces, leading to the development of three additional concepts during the workshop.

- Concept 2 involved rotating the floor plan 90 degrees from the original design, positioning the building on the footprint of the existing research building. This layout included a revised floor plan with the tote storage area separated and placed at the west end of the building, conditioned storage to the east, and the remainder as unconditioned warehouse space. A second level was proposed above the tote and conditioned storage areas, with plans for future expansion to the east. The design featured one large overhead door for forklift access, two personnel doors, wide aisles, and traditional 4-foot-deep pallet racks for large item storage, with smaller open shelving around the perimeter. This concept was deemed a viable solution.
- Concept 3 presented a floor plan that was a mirror image of Concept 2, placing the building where the current gravel turnaround and large tree are located, with future expansion directed toward the footprint of the

existing research building. However, it was noted that significant utilities in that area would need to be relocated for this concept to work.

- Concept 4 mirrored the floor plan of Concept 3 but positioned the doors and covered storage/overhang on the north side, at the rear of the building. It was determined that placing the doors and storage at the back would create challenges for vehicle access and require a retaining wall, making this option less desirable.

4 Recommendations

4.1 Site Plan Recommendations

After thorough consideration, we have developed two viable site plan concepts. The first is the original design (Concept 1) presented at the workshop, which requires minimal civil work and no additional utility relocation, as the building layout remains entirely within the footprint of the existing research facility. The second option (Concept 2) involves rotating the original footprint by 90 degrees. This configuration keeps the building mostly within the existing footprint while allowing for future expansion to the east, deferring any utility relocation work to a later phase. Both options position the covered storage at the front of the building for easy access. Concepts 1 and 2 are the most viable, offering efficient building orientation and the lowest implementation costs.

Concept 3 is not recommended at this time due to its higher upfront costs and potential liability related to utility relocation. Concept 4 is also not advised, both for the same reasons as Concept 3 and due to anticipated challenges with vehicular traffic.

4.2 Floor plan Recommendation

Based on the feedback gathered in the interactive design workshop, we have come to the conclusion that Concept 2 is the best option moving forward. This plan would work well with either of the recommended site plan concepts. The plan includes a non-conditioned tote storage space, a conditioned storage and testing area, and an open storage area connected via stairway to second level open storage above the enclosed spaces.

We propose situating the tote storage at one end of the building. This non-conditioned space would measure approximately 18 feet by 40 feet and include a 10-foot by 10-foot overhead coiling door and a 3-foot by 7-foot personnel door providing access to the building's exterior. The conditioned storage and testing area would be adjacent to the tote area and approximately 21 feet by 40 feet. This space would include an 8-foot by 8-foot double door leading to the exterior and a 3-foot by 7-foot personnel door connecting to the non-conditioned open storage area. Additionally, the non-conditioned open storage area would be approximately 42 feet by 40 feet, with two 3-foot by 7-foot personnel doors to the exterior and a 10-foot by 10-foot overhead coiling door. This open storage area would connect via stairway to second level open storage above the enclosed spaces.

A 15-foot-deep canopy would run along the building, providing extra storage for items that need protection from UV light but don't require indoor space. It also protects the building's doors from the weather.

While exterior aesthetics of the building were not discussed in detail, OWASA requested to reflect the campus design motif with an emphasis on maximizing budget. Several building massing options were considered, with three options noted as most cost effective while fitting campus aesthetics.

- Massing Option 1 would be a cost-effective option in terms of materials. This option has a standard lower-sloped standing seam gable roof, clerestory windows along the front and back of the building for natural daylighting, and lower canopy below the clerestory windows. Given the utilitarian nature of the building and campus as whole, this option would use industrial style metal panels for exterior walls and roof covering.
- Massing Option 2 would be the most cost-effective option in terms of structure but would provide a premium brick material on the building front facade. This option has a standard lower-sloped standing seam gable roof,

clerestory windows along the front and back of the building for natural daylighting, and higher canopy above the clerestory windows extending the roof slope. This option would also have industrial style metal panels for exterior walls and roof covering, except the aforementioned brick front façade.

- Massing Option 3 would be similar to both Options 1 and 2. The main difference being the roof. This option would have a single sloped membrane shed roof that slopes towards the back of the building. The exterior walls would consist of a premium brick front façade with other exterior walls made of metal panel walls, similar to Massing Option 2. The clerestory windows and canopy locations would be similar to Massing Option 1.

5 Appendix A

5.1 Space needs Index

SPACE NEEDS				
Space	***EXISTING SF (APPROXIMATE)***	***EXISTING LOCATION***	***PROPOSED BUILDING AREA (SF)***	***Remarks***
Climate Controlled Storage	500	Switchgear Building (Upper Floor)	600	Lift Station electronic storage, Plant electronics
Polymer Storage	250	Generator Building	500	2 totes deep x 7 totes long (existing) 2 totes deep x 5 totes long, with adequate circulation (proposed)
Parts Storage	448	Various locations (Exterior and Interior)	600	Open storage, racks and pallet storage
Pump/Equipment Testing	0	None	300	Include area for PPE storage
Inventory Workstation	0	None	30	Desk/counter space for two workstations (standing laptop area)
Interior Chemical & Lubricant Storage	12	Workshop	0	No hazardous material storage in this building
Covered Exterior Parking/Vehicle Storage	0	No covered parking/storage currently, vehicles stored where space is available	1,600*	15' deep x length of building storage/parking for a front-end loader/backhoe, skid steer, 4-5 trailer generators (this area will depend on length of building)
Sub-total	1210		2,030	
Internal Circulation		35%	711	
Proposed <u>Minimum</u> Building Size			*2,741*	~40x70 Building Footprint

* Covered exterior parking/storage not included in building area

6 Appendix B

6.1 Opinion of Probable Cost

The following opinion of probable construction cost presents a high and low range for a new warehouse building at the Mason Farm WWTP, flagged to be built in place of the existing UNC Research Facility at the northwest property corner. The figures below are based on recent construction projects of similar size, scope and location, and cost estimating software by RSMeans Data. "Soft costs" such as A/E fees, contractor overhead and profit, design and construction contingencies, and escalation have been included to provide a realistic expectation of what the project may cost. The estimated construction cost is based on a building size that is marginally larger than the minimum indicated in the space needs index. This estimate also factors in the cost of an attached covered storage area (canopy).

	Opinion of Probable Construction Cost				
	Proposed Building Size (SF)	$/SF Low	$/SF High	Building Cost (Low)	Building Cost (High)
**	3,800	$127	$200	$482,600	$ 760,000
	Contingency	30%		$144,780	$ 228,000
	Building Cost:			$627,380	$ 988,000
	A/E Fees	9.0%		$56,464	$ 88,920
	Contractor O&P	30%		$188,214	$ 296,400
	Escalation - 1 Year	9.5%		$59,601.10	$ 93,860.0
	Probable Construction Cost (not including sitework)			$ 931,659	$ 1,467,180

** 40x80 Building Footprint plus 15x80 Canopy w/ .5 area factor

7 Appendix C

7.1 Conceptual Design



PLAN NORTH

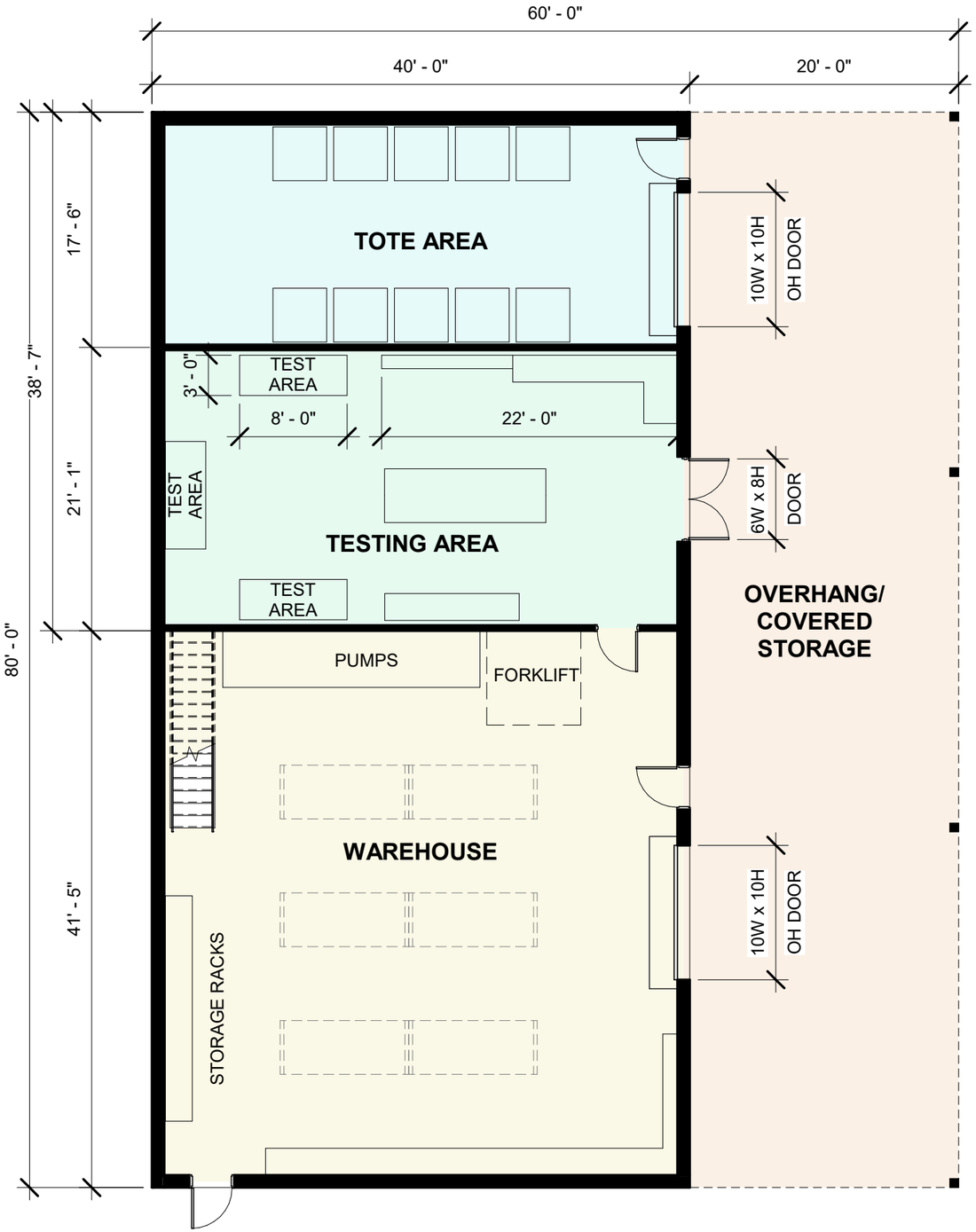
08/29/2024

OWASA WH SPACE NEEDS SITE PLAN CONCEPT 1

0' 10' 20' 40'

SCALE: 1"=20'-0"

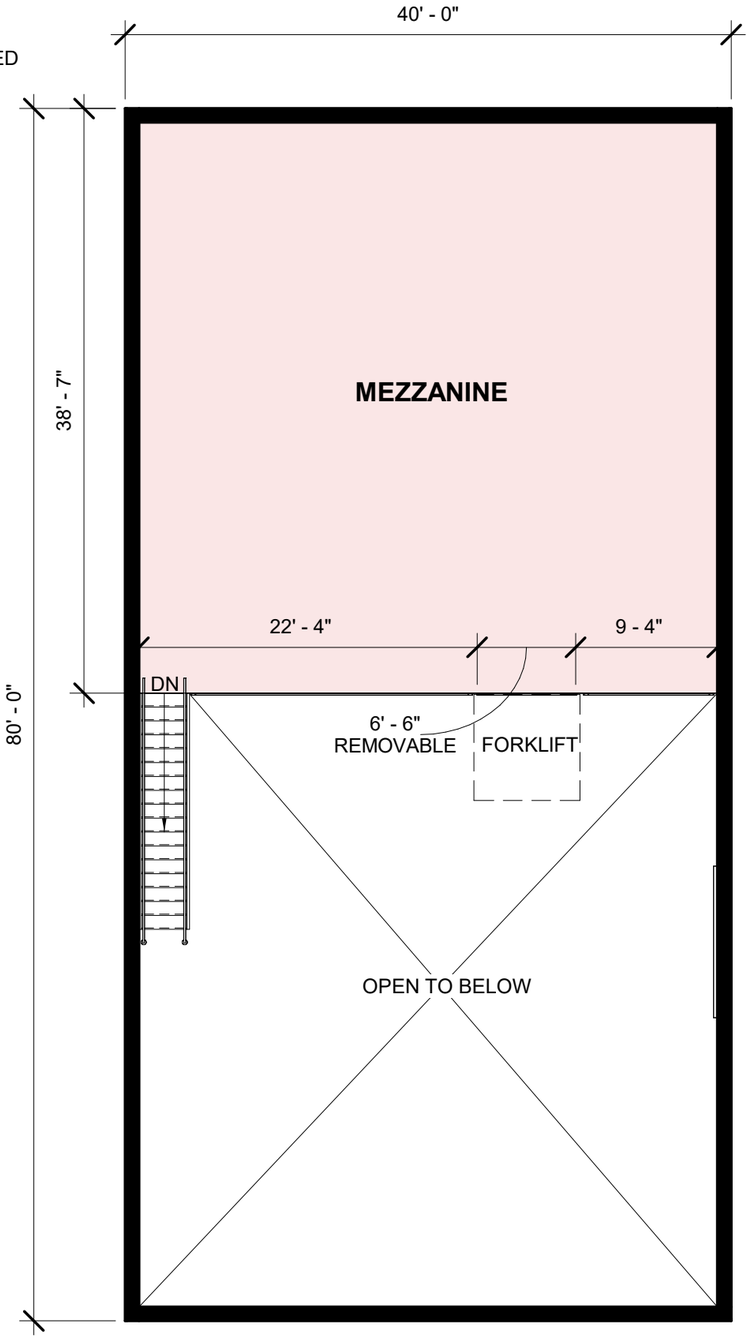
Wiley|Wilson®
Constant Progress



1 FIRST FLOOR PLAN
1" = 10'-0"
0' 5' 10' 20'

AREA LEGEND

- OVERHANG/ COVERED STORAGE
- TESTING AREA
- TOTE AREA
- WAREHOUSE
- MEZZANINE



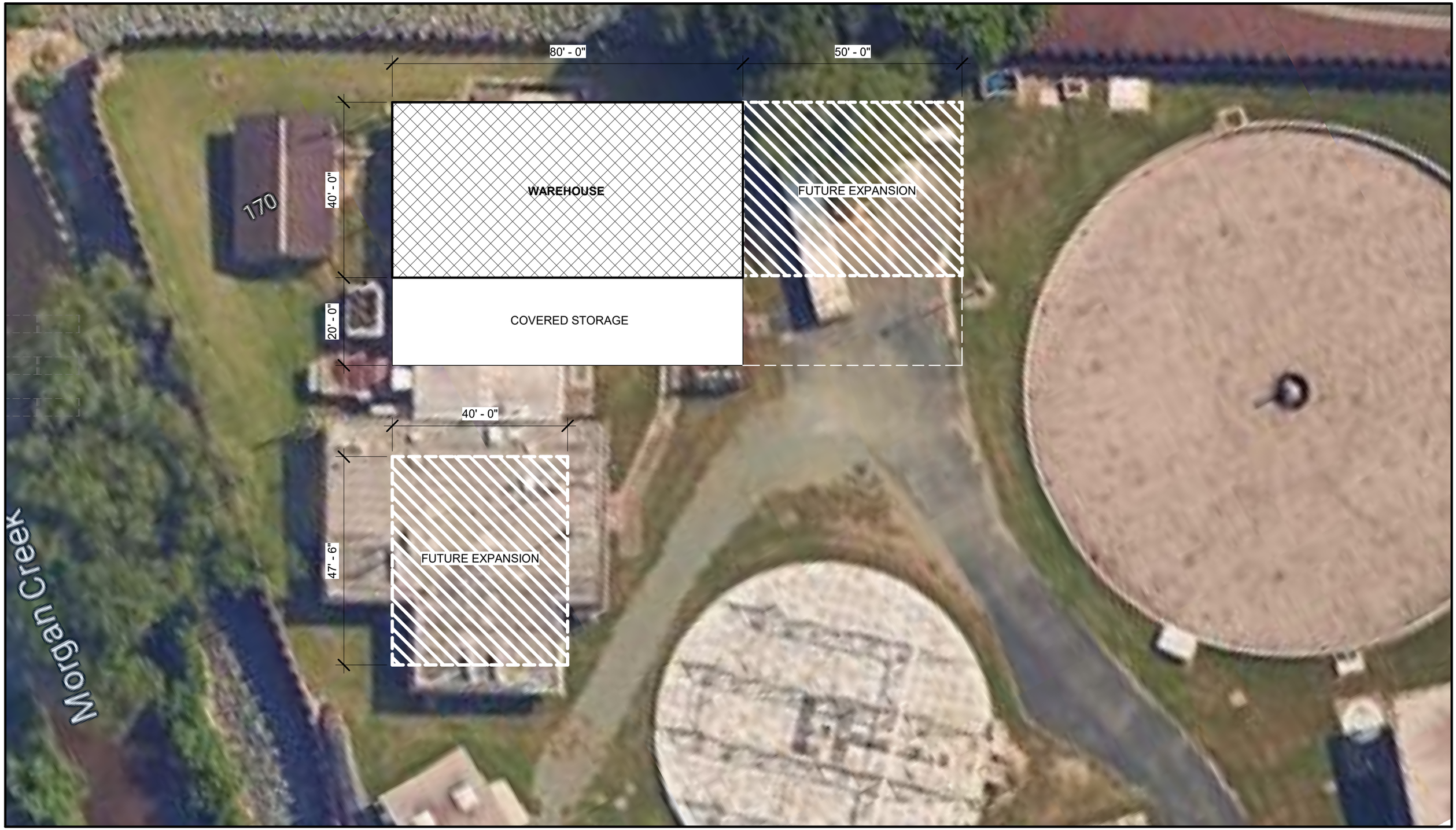
2 MEZZANINE PLAN
1" = 10'-0"
0' 5' 10' 20'

PLAN NORTH

08/29/2024

OWASA WH SPACE NEEDS CONCEPT 1 PLANS

Wiley|Wilson®
Constant Progress



PLAN NORTH

OWASA WH SPACE NEEDS SITE PLAN CONCEPT 2

0' 10' 20' 40'

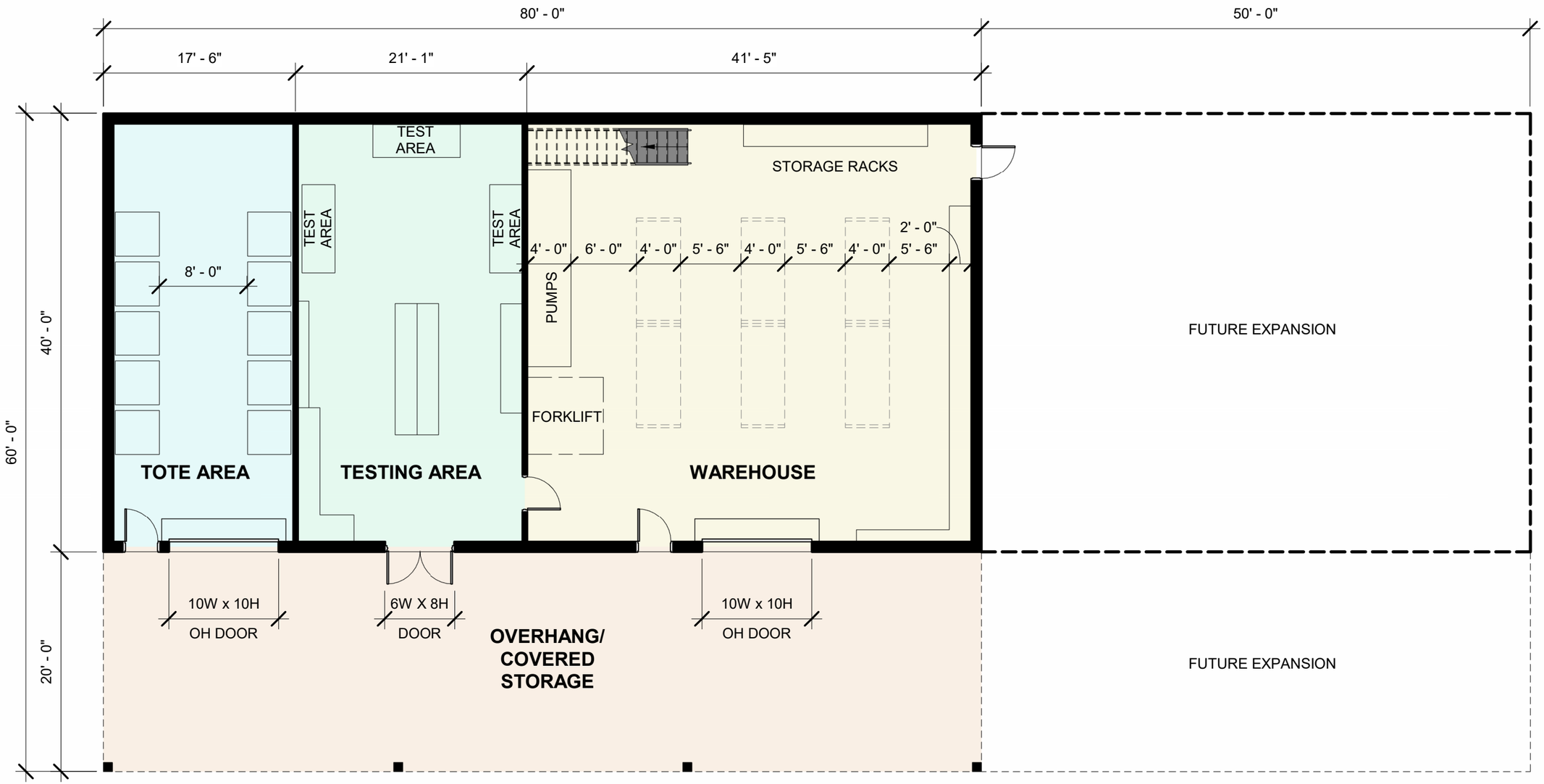
SCALE: 1"=20'-0"

08/29/2024

Wiley|Wilson®
Constant Progress

AREA LEGEND

- OVERHANG/ COVERED STORAGE
- TESTING AREA
- TOTE AREA
- WAREHOUSE



1 FIRST FLOOR PLAN CONCEPT 2
1" = 10'-0"

PLAN NORTH

OWASA WH SPACE NEEDS CONCEPT 2 PLAN

0' 5' 10' 20'

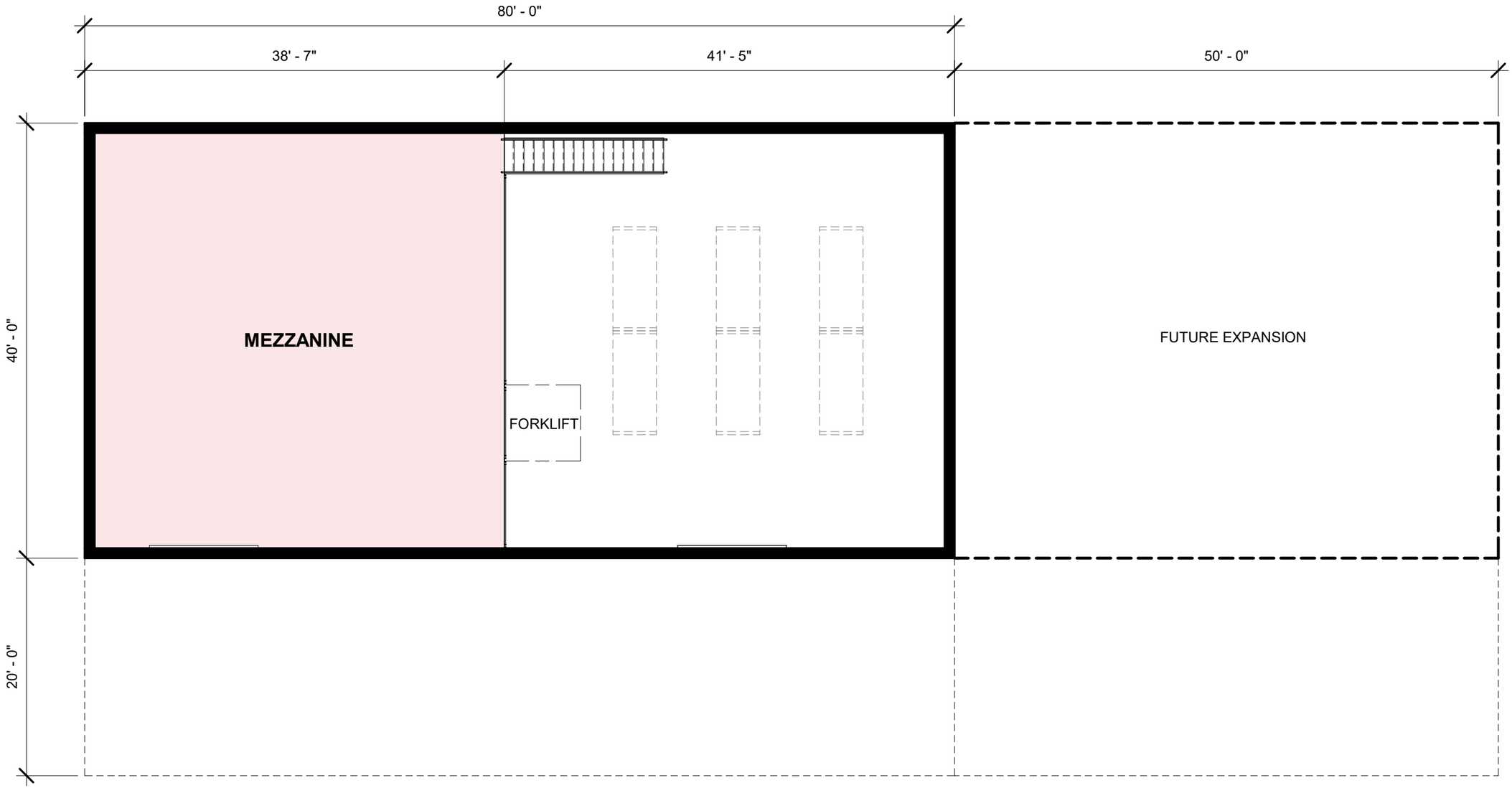
SCALE: 1"=10'-0"

08/29/2024

Wiley|Wilson®
Constant Progress

AREA LEGEND

MEZZANINE



2 MEZZANINE PLAN CONCEPT 2
1" = 10'-0"

PLAN NORTH

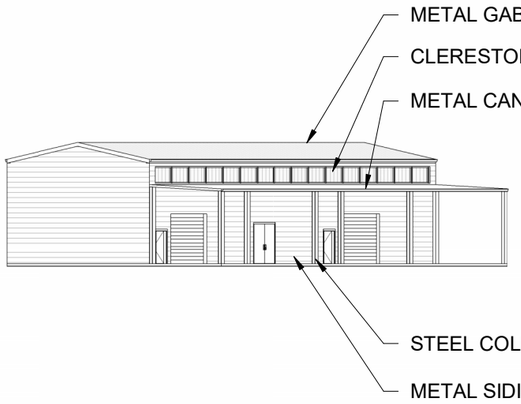
OWASA WH SPACE NEEDS CONCEPT 2 PLAN

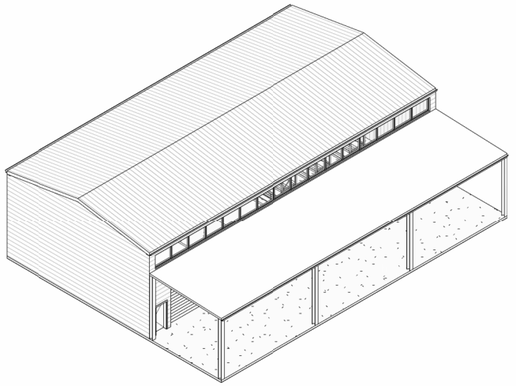
0' 5' 10' 20'

SCALE: 1"=10'-0"

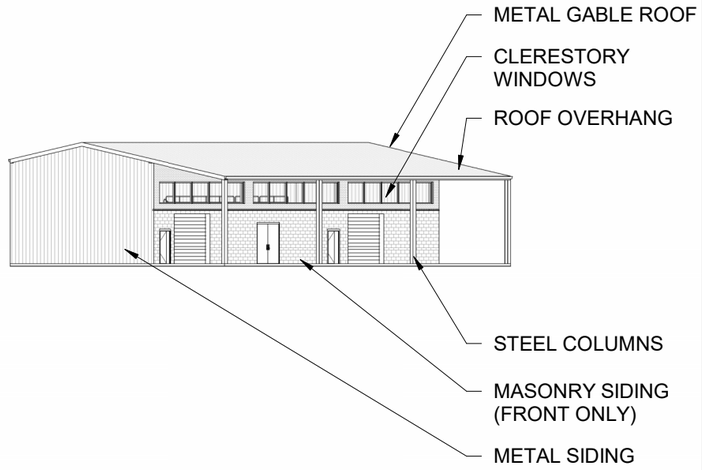
08/29/2024

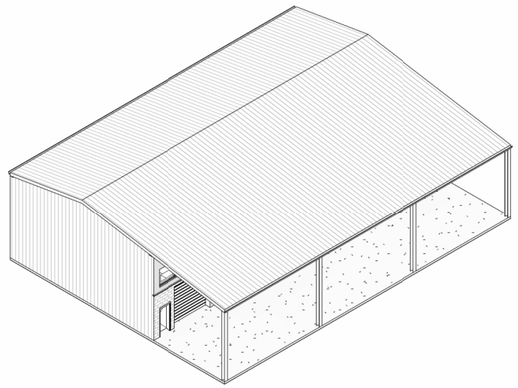
Wiley|Wilson®
Constant Progress



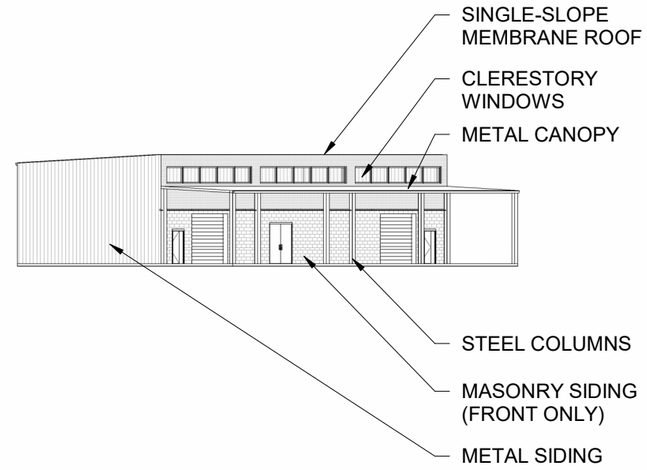


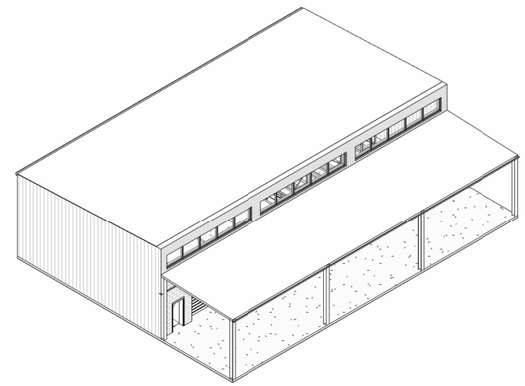
MASSING OPTION 1





MASSING OPTION 2





MASSING OPTION 3

08/29/2024

OWASA WH SPACE NEEDS CONCEPTUAL MASSES

Wiley|Wilson®
Constant Progress

CONSTANT PROGRESS