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Solicitation Addendum

Addendum No.:	1
Solicitation No.:	23-TA004735LP
Project No.:	6110880
Solicitation Title:	North Regional Water Reclamation Facility Storage Expansion
Addendum Date:	June 5, 2023
Procurement Contact:	Leslie Peer

IFBC 23-TA004735LP is amended as set forth herein. Responses to questions posed by prospective bidders are provided below. This Addendum is hereby incorporated in and made a part of IFBC 23-TA004735LP

The deadline to submit all inquiries concerning interpretation, clarification or additional information pertaining to this IFBC was May 31, 2023.

ADD:

SECTION C, BID ATTACHMENTS, BID ATTACHMENT 3 – PLANS/DRAWINGS

Bid Attachments, Bid Attachment 3 – Plans/Drawings:
The attached Geotechnical Engineering Report, is hereby incorporated into the IFBC.

REPLACE:

SECTION C, BID ATTACHMENTS, BID ATTACHMENT 3 – PLANS/DRAWINGS

Bid Attachments, Bid Attachment 3 – Plans/Drawings:
Replace NWRF Maintenance Building Bid Ready Design page 22 of 24 E-00-002 published with this Addendum.

QUESTIONS AND RESPONSES:

Q1. What is the Engineer/Budget/Project Estimate?
R1. The Engineer's estimated opinion of cost is $843,499.75.

Q2. Do you have an Excel Sheet for the pricing of this bid?

R2. Excel version of Appendix K, Bid Pricing Form (Fillable) will be published with this Addendum 1 and available for download as a separate attachment.

Q3. No structural plans are provided. Without pre-engineered metal building reactions, the slab foundation design will be based on previous contractor experience with similar "typical" metal building foundations. Final foundation design will be subject to approval?

R3. Agreed, Final foundation design will be subject to approval. Refer to Spec 13491 for Metal Building Foundation. Performance/Design Criteria for the Metal building is shown in the Spec 13491. Contractor/Delegated design engineer should coordinate Metal Building column reaction with Metal building manufacturer and design the foundation for required load combinations. Refer to Project Geotechnical report for foundation recommendations for metal building (attached herewith). Final foundation and floor slab design shall be prepared by a PE registered in State of FL per section 13491-1.04.A.6.

Q4. Please provide thickness of building slab on grade.

R4. Final foundation and floor slab design shall be prepared by a PE registered in the state of Florida per section 13491–1.04-A.6. The floor slab shall be designed for 250 psf or forklift load whichever is greater per section 13491-2.02-C-2.

Q5. Sheet C-09-11 shows only existing contour lines. Can a grading/drainage plan be provided?

R5. The area shall maintain the existing grading/drainage as shown on the drawings. The building foundation slab (finished floor elevation) shall be at least 6 inches higher than the surrounding elevation which is approximately at elevation 27. The concrete pad elevation on C-09-11 shall be revised to 27.50 in lieu of 27.25 as shown on the drawing. See Geotechnical Engineering Report published with this Addendum.

Q6. Sheet C-01-00 Civil Site Plan. Please confirm that new water line for the hose bibb is 3" diameter PVC?

R6. Correct. The new 3" RCW-PVC shown on C-01-00 is for the hose-bibb connection.

Q7. What size of the existing water line to be tapped?

R7. The existing water line to be tapped is a 3" RCW-PVC.

Q8. Sheet C-01-00/Detail C. Please confirm that the Type 2" "Access Restriction Bollard" design is required (in lieu of Type 1).

R8. Type 2 Access Restriction Bollard is required for the project.

Q9. Will lightning protection be required for the new maintenance building?

R9. Yes. Please see attached herewith revised Sheet E-00-002 Electrical Specifications that includes the requirements for the lightning protection.

NOTE:

Deleted items will be ~~struck through~~, added or modified items will be <u>underlined</u>. All other terms and conditions remain as stated in the IFBC.

INSTRUCTIONS:
Receipt of this Addendum must be acknowledged as instructed in the solicitation document. Failure to acknowledge receipt of this Addendum may result in the response being deemed non-responsive.

END OF ADDENDUM

AUTHORIZED FOR RELEASE

Appendix K, Bid Pricing Form(Fillable)
North Regional Water Reclamation Facility Storage Expansion Project# 6110880
IFBC 23-TA004735LP

Bidders must provide prices for each line item for their bid to be considered responsive.

Pay Item No.	Description	Unit	Qty	Bid 'A' Unit Price ($) 120 Calendar Days	Bid 'A' Total Bid Price ($) 120 Calendar Days Construction	Bid 'B' Unit Price ($) 180 Calendar Days	Bid 'B' Total Bid Price ($) 180 Calendar Days Construction
1	Mobilization, Demobilization and Site Work (Up to 10% of Items 2 - 3 total)	LS	1				
2	Pre-Engineered Metal Building	LS	1				
3	Electrical Improvements	LS	1				
Allowance for permits and fees issued by Manatee County Government		LS	1		$5,000.00		$5,000.00
SUBTOTAL PRICE							
Construction Contingency 10% of Subtotal Price (Used Only With County Approval)							
TOTAL BID PRICE (Subtotal Price plus the Construction Contingency)							

*To be considered responsive, it is the sole responsibility of the bidder to correctly calculate and manually enter all sub-total, contingency and total bid price fields.

Bidders Name_____

Bidders Signature_____

GENERAL

1.1 SCOPE OF WORK

A. FOR PURPOSE OF LEGIBILITY, DRAWINGS ARE DIAGRAMMATIC AND ALTHOUGH LOCATION OF EQUIPMENT IS SHOWN TO SCALE, THE CONTRACTOR SHALL VERIFY ALL INFORMATION AT THE SITE BEFORE BIDDING THE JOB.
B. WHEN DRAWINGS, NOTES AND THESE REQUIREMENTS ARE IN CONFLICT, THE MOST STRINGENT CONDITION SHALL APPLY UNLESS OTHERWISE APPROVED BY THE ENGINEER.
C. THE WORK CONSISTS OF ALL SUPERVISION, LABOR, MATERIALS, EQUIPMENT AND INSTALLATION REQUIRED FOR THE COMPLETE ELECTRICAL SYSTEMS AS SHOWN ON THE DRAWINGS OR CALLED FOR IN THESE REQUIREMENTS
D. CONTRACTOR SHALL PROVIDE THE LIGHTNING PROTECTION SYSTEM DESIGN BY A QUALIFIED LIGHTNING PROTECTION SYSTEM (LPS) FIRM REGISTERED TO DESIGN LIGHTNING PROTECTION SYSTEMS.
D.A. CONTRACTOR SHALL FURNISH AND INSTALL A COMPLETE LIGHTNING PROECTION SYSTEM.
D.B. CONTRACTOR SHALL TEST AND CERTIFY THAT THE LIGHTNING PROTECTION SYSTEM DESIGN, INSTALLATION, AND TESTING COMPLY WITH THE LIGHTNING PROTECTION INDUSTRY STANDARDS AS APPLIED TO THE PROJECT STRUCTURE.
D.C. CONTRACTOR SHALL SUBMIT THE DESIGN TO THE DESIGN REVIEW AGENCY FOR APPROVAL AND TO THE ENGINEER FOR REFERENCE.
D.D. INTERCONNECT THE LIGHTNING PROTECTION SYSTEM TO THE BUILDING GROUND GRID AT ONE LOCATION. SUGGEST THE DESIGN INDICATE THE INTERCONNECTION BE ON OPPOSITE SIDE OF THE BUILDING'S SERVICE ENTRANCE LOCATION,
D.E. CONTRACTOR SHALL USE ALUMINUM AIR TERMINALS AND SHALL BEAR THE UL LABEL. 1

1.2. CODES AND STANDARDS - PERFORM WORK AND FURNISH EQUIPMENT COMPLYING WITH THE FOLLOWING CODES:

A. NATIONAL ELECTRICAL CODE (NEC)
B. NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)
C. UNDERWRITERS' LABORATORIES (UL)
D. NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)
E. AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)
F. INSULATED POWER CABLE ENGINEERS ASSOCIATION (IPCEA)
G. FLORIDA BUILDING CODE (FL) STATE BUILDING CODE
H. INSTITUTE OF ELECTRICAL AND ELECTRONIC ENGINEERS (IEEE)

1.3 AS-BUILT/RECORD DRAWINGS

A. AFTER FINAL INSPECTION, FURNISH A PDF SET OF REPRODUCIBLE "AS BUILT DRAWINGS" SHOWING DEPTHS AND ROUTING OF CONCEALED ELECTRICAL BELOW GRADE INSTALLATIONS AND ALL VARIATIONS BETWEEN THE ACTUAL WORK AND AS IT WAS SHOWN ON THE CONTRACT DRAWINGS.

1.4 INSTALLATION AND COORDINATION

A. INSTALL EQUIPMENT AT THE LOCATIONS SHOWN ON THE DRAWINGS FOLLOWING THE MANUFACTURER'S INSTALLATION RECOMMENDATIONS.
B. COORDINATE INSTALLATION OF UNDERGROUND DUCTS AND CONDUITS WITH EXISTING UNDERGROUND UTILITIES. FIELD VERIFY ROUTING AND BURIAL DEPTH. DRAIN DUCTS AWAY FROM BUILDINGS TOWARD MANHOLES. LOW POINTS IN DUCT BANK RUNS ARE NOT ACCEPTABLE.
C. INSTALL FLOOR MOUNTED SELF SUPPORTED EQUIPMENT ON 4-INCHES HIGH CONCRETE PADS WITH STEEL REINFORCING. USE REQUIRED BOLTS, ANCHORS, INSERTS AND CONDUIT SLEEVES.
D. MAKE OPENINGS THROUGH WALLS, CEILINGS, ROADWAYS, FLOOR SLABS, ETC. REQUIRED FOR THE INSTALLATION OF ELECTRICAL EQUIPMENT, BUT CUTTING, WELDING, OR OTHER WEAKENING OF BUILDING STRUCTURE TO SIMPLIFY ELECTRICAL EQUIPMENT AND MATERIALS' INSTALLATION ARE NOT BE PERMITTED. WHERE EXISTING WALLS, CEILINGS OR FLOOR SLABS HAVE TO BE CUT, THE CONTRACTOR SHALL COORDINATE WITH THE ENGINEER BEFORE MAKING SUCH CUTS. THE CONTRACTOR SHALL BE HELD RESPONSIBLE FOR ANY DAMAGE DONE WHILE PROVIDING SUCH OPENINGS AND SHALL PATCH THE SURFACE TO MATCH ADJACENT MATERIALS AND FINISHES.
E. NO CONDUITS, SLEEVES, PIPES OR ANY OTHER ITEM SHALL BE EMBEDDED IN CONCRETE ALONG OR THROUGH ANY BEAM, COLUMN, FOOTING, GRADE BEAM, SLAB, WALL OR ANY OTHER STRUCTURAL MEMBER WITHOUT THE PRIOR APPROVAL OF THE ENGINEER.
F. ALL ELECTRICAL MATERIALS AND EQUIPMENT FURNISHED ON THIS PROJECT SHALL COMPLY WITH THE REQUIREMENTS OF APPLICABLE STANDARD OR CODE FOR APPROVAL OF ELECTRICAL INSTALLATIONS
1. ALL PARTS, COMPONENTS, EQUIPMENT AND MATERIALS SHALL BE LISTED AND LABELED BY UL, ETL OR INDEPENDENT TESTING AGENCY AS RECOGNIZED BY THE APPROPRIATE BOARD.
2. SHOP DRAWING SUBMITTALS SHALL INCLUDE EVIDENCE

1.5 SUBMITTALS

A. THE FOLLOWING INFORMATION SHALL BE PROVIDED FOR ALL ELECTRICAL EQUIPMENT AND MATERIALS ACCORDANCE WITH SECTION 01300.
1. CATALOG CUTS OF EQUIPMENT DEVICES, AND MATERIALS REQUESTED BY THE INDIVIDUAL SPECIFICATION SECTIONS.
- CATALOG INFORMATION WITH TECHNICAL SPECIFICATIONS AND APPLICATION INFORMATION INCLUDING RATINGS, RANGE, WEIGHT, ACCURACY, AND OTHER PERTINENT PRODUCT INFORMATION.
- EDIT CATALOG CUTS TO SHOW ONLY THE ITEMS, MODEL NUMBERS, AND INFORMATION THAT APPLY.
- ASSEMBLE CATALOG CUTS ON A DVD OR OTHER SECURE ELECTRONIC MEDIA.
2. ARRANGE, LAYOUT, AND OUTLINE DRAWINGS WITH DIMENSIONS AND WEIGHT, AS APPROPRIATE.
3. CONTROL SCHEMATICS AND INTERCONNECTION WIRING DIAGRAMS DEPICTING INTERNAL AND EXTERNAL WIRE AND CABLE TERMINATIONS. DRAWING CROSS-REFERENCE TO SPECIFICATION AND CONTRACT DOCUMENT DRAWINGS.
4. SUBMITTAL WILL CLEARLY INDICATE ANY SUBSTITUTIONS OR DEVIATIONS.

1.6 ENVIRONMENTAL CONDITIONS -

A. REFER TO SECTION 01560 FOR ENVIRONMENTAL CONDITIONS

1.7 SITE CONDITIONS

INDOOR NON-CORROSIVE	EXPOSED	RMC-STEEL
OUTDOOR	EXPOSED	RMC STEEL
UNDERGROUND	POWER DIRECTLY BURIED (NON-POWER UTILITY)	RNC40
NONHAZARDOUS	FINAL CONNECTION TO EQUIPMENT	RMC-STEEL

MATERIAL

2.1 IDENTIFICATION

A. IDENTIFY ELECTRICAL EQUIPMENT WITH PERMANENTLY ATTACHED PHENOLIC PLATES WITH 1/4" WHITE OR BLACK ENGRAVED LETTERING ON THE FACE OF EACH, ATTACHED WITH TWO SCREWS.
B. INCLUDE THE FOLLOWING INFORMATION ON EQUIPMENT IDENTIFICATION PLATES FOR ENCLOSED SWITCHES, CIRCUIT BREAKERS, AND MOTOR CONTROLLERS (INCLUDING VARIABLE FREQUENCY MOTOR CONTROLLERS):
1. VOLTAGE AND PHASE
2. POWER SOURCE AND CIRCUIT NUMBER, INCLUDE LOCATION
3. LOAD(S) SERVED. INCLUDE LOCATION WHEN NOT WITHIN SIGHT OF EQUIPMENT.
C. USE WIRE AND CABLE MARKERS TO IDENTIFY CIRCUIT NUMBER OR OTHER DESIGNATION INDICATED FOR POWER, CONTROL, AND INSTRUMENTATION CONDUCTORS
1. AT EACH SOURCE AND LOAD CONNECTION
2. WITHIN BOXES WHEN MORE THAN ONE CIRCUIT IS PRESENT
3. WITHIN EQUIPMENT ENCLOSURES WHEN CONDUCTORS AND CABLE ENTER OR LEAVE THE ENCLOSURE.
D. USE WRAP-AROUND SELF-ADHESIVE VINYL CLOTH, HEAT-SHRINK SLEEVE, OR PLASTIC SLEEVE TYPE MARKERS FOR THE CONDUCTOR OR CABLE TO BE IDENTIFIED.

2.2 WIRE/CABLE

A. CONDUCTORS SHALL BE SOFT DRAWN COPPER, WITH XHHW-2 600V INSULATION EXCEPT WHERE OTHERWISE SPECIFIED OR INDICATED. WIRE SHALL BE 12 AWG MINIMUM EXCEPT LOW-VOLTAGE CONTROL WIRE MAY BE #14 XHHW COPPER STRANDED. INSTRUMENTATION CONDUCTORS TO BE BELDON TWISTED, STRANDED, SHIELDED #14 GAUGE THROUGH #18 GAUGE OR EQUAL. FOR CONDUCTORS ROUTED IN CABLE TRAY, PROVIDE TYPE -C CABLE.
B. CONDUCTORS SHALL BE THE PRODUCT OF AN APPROVED MANUFACTURER SUCH AS CABELEC, GENERAL, COBLE, HATFIELD, OKONITE, ROME, OR SOUTHWIRE:COLOR-CODED WITH MAKE, TYPE AND SIZE LEGIBLY AND DURABLY MARKED ON COVERING AT FREQUENT INTERVALS.

2.3 CONDUITS

A. ALL WIRES (EXCEPT LOW VOLTAGE CONTROL CABLE) SHALL BE RUN IN CONDUIT.
B. PVC CONDUIT MAY BE USED FOR UNDERGROUND SECTIONS OF ELECTRICAL RACEWAYS TO THE POINT OF ABOVE GRADE TRANSITION.
C. PVC CONDUIT MAY BE USED FOR UNDERGROUND SECTIONS OF ELECTRICAL RACEWAYS TO THE POINT OF ABOVE GRADE TRANSITION.
D. PVC COATED RIGID GALVANIZED STEEL CONDUIT (PVC-RGSC) SHALL BE USED FOR ABOVE-GROUND INSTALLATION AND FOR TRANSITION TO ABOVE GRADE OR WHERE SUBJECT TO DAMAGE. TOP OF UNDERGROUND CONDUITS SHALL NOT BE LESS THAN 24".
E. EMT AND FLEXIBLE STEEL CONDUIT IS PERMITTED IN CONCEALED, IN-WALL CONSTRUCTION.
F. ALL CONDUIT SHALL BE RIGIDLY SUPPORTED WITH STAINLESS STEEL OR PVC COATED STEEL, DURABLE STRAPS AND HANGERS AT INTERVALS NOT TO EXCEED SIX FEET. COUPLINGS, CONNECTORS, AND LOCKNUTS SHALL BE TIGHTLY SECURED TO PROVIDE ELECTRICAL CONTINUITY OF GROUNDING.
G. PROVIDE WARNING TAPE FOR DIRECT BURIED CONDUIT. AT LEAST 12" ABOVE THE UNDERGROUND INSTALLATION.

2.4 GROUNDING

A. INSTALL GROUNDING ELECTRODE CONDUCTORS IN RACEWAY WHERE EXPOSED TO PHYSICAL DAMAGE. BOND GROUNDING ELECTRODE CONDUCTOR TO METALLIC RACEWAYS AT EACH END WITH BONDING JUMPER. PROVIDE ADDITIONAL GROUND ELECTRODE(S) AS REQUIRED TO ACHIEVE SPECIFIED GROUNDING ELECTRODE SYSTEM RESISTANCE.
B. PROVIDE BONDING FOR EQUIPMENT GROUNDING CONDUCTORS, EQUIPMENT GROUND BUSES, METALLIC EQUIPMENT ENCLOSURES, METALLIC RACEWAYS AND BOXES, DEVICE GROUNDING TERMINALS, AND OTHER NORMALLY NON-CURRENT-CARRYING CONDUCTIVE MATERIALS ENCLOSING ELECTRICAL CONDUCTORS/EQUIPMENT OR LIKELY TO BECOME ENERGIZED.
C. WHERE CIRCUIT CONDUCTOR SIZES ARE INCREASED FOR VOLTAGE DROP, INCREASE SIZE OF EQUIPMENT GROUNDING CONDUCTOR PROPORTIONALLY

2.5 ENCLOSURES/BOXES

A. PROVIDE GROUNDING TERMINALS WITHIN BOXES WHERE EQUIPMENT GROUNDING CONDUCTORS TERMINATE. GROUND BOX IN ACCORDANCE WITH GROUNDING SPECIFICATION.
B. USE SHEET-STEEL BOXES FOR DRY LOCATIONS UNLESS OTHERWISE
C. USE CAST IRON BOXES OR CAST ALUMINUM BOXES FOR DAMP OR WET LOCATIONS UNLESS OTHERWISE INDICATED OR REQUIRED; FURNISH WITH COMPATIBLE WEATHERPROOF GASKETED COVERS.
D. BOXES FOR GANGED DEVICES. USE MULTI-GANG BOXES OF SINGLE-PIECE CONSTRUCTION. DO NOT USE FIELD-CONNECTED GANGABLE BOXES.
E. ACCEPTABLE MANUFACTURERS
1. COOPER-CROUSE-HINDS
2. HUBBELL
3. OZ-GEDNEY
4. THOMAS & BETTS
F. LOCATE BOXES TO BE ACCESSIBLE. INSTALL PLUMB AND LEVEL TO PRESERVE INSULATION INTEGRITY WITH NO GAPS OR OPEN SPACES GREATER THAN 1/8 INCH AT THE EDGE OF THE BOX.
G. SECURE AND SUPPORT BOXES USING SUITABLE SUPPORTS AND METHODS.
H. PROVIDE INDEPENDENT SUPPORT FROM BUILDING STRUCTURE. DO NOT PROVIDE SUPPORT FROM PIPING, DUCTWORK, OR OTHER SYSTEMS. EXCEPTION: CAST METAL BOXES (OTHER THAN BOXES USED FOR FIXTURE SUPPORT) SUPPORTED BY THREADED CONDUIT CONNECTIONS.
I. INSTALL PERMANENT BARRIER BETWEEN GANGED WIRING DEVICES WHEN VOLTAGE BETWEEN ADJACENT DEVICES EXCEEDS 300 V.
J. INSTALL FIRESTOPPING TO PRESERVE FIRE RESISTANCE RATING OF PARTITIONS AND OTHER ELEMENTS, USING MATERIALS AND FOR THAT PURPOSE.

2.6 SWITCHES AND RECEPTACLES

A. RECEPTACLES
1. STANDARD CONVENIENCE RECEPTACLES: INDUSTRIAL SPECIFICATION GRADE, 20A, 125V, NEMA 5-20R; SINGLE OR DUPLEX AS INDICATED ON THE DRAWINGS.
2. WEATHER RESISTANT GFI RECEPTACLES: INDUSTRIAL SPECIFICATION GRADE, DUPLEX, 20A, 125V, NEMA 5-20R, RECTANGULAR DECORATOR STYLE, LISTED AND LABELED AS WEATHER RESISTANT TYPE COMPLYING WITH UL 498 SUPPLEMENT SE SUITABLE FOR INSTALLATION IN DAMP OR WET LOCATIONS.
3. PROVIDE WIRING DEVICES SUITABLE FOR INTENDED USE AND WITH RATINGS ADEQUATE FOR LOAD SERVED.
4. ACCEPTABLE MANUFACTURERS
a. HUBBELL
b. LEVITON
c. PASS & SEYMOUR
5. FOR SINGLE RECEPTACLES INSTALLED ON AN INDIVIDUAL BRANCH CIRCUIT, PROVIDE A RECEPTACLE WITH AN AMPERE RATING NOT LESS THAN THAT OF THE BRANCH CIRCUIT.
6. PROVIDE WEATHER RESISTANT GFI RECEPTACLES WITH WHILE-IN-USE, HEAVY DUTY, WEATHERPROOF COVERS FOR THE RECEPTACLES INSTALLED OUTDOORS OR IN DAMP OR WET LOCATIONS.

B. WALL SWITCHES
1. ACCEPTABLE MANUFACTURERS
a. HUBBELL
b. LEVITON
c. PASS & SEYMOUR
d. LUTRON
C. STANDARD WALL SWITCHES: INDUSTRIAL SPECIFICATION GRADE, 20A, 120/277 V WITH STANDARD TOGGLE TYPE SWITCH ACTUATOR MAINTAINED CONTACTS: SINGLE POLE THROW, DOUBLE POLE SINGLE THROW, THREE WAY, OR FOUR WAY AS INDICATED ON THE DRAWINGS

EQUIPMENT

3.1 PANELBOARDS

A. PANELBOARDS SHALL BE BOLT-ON TYPE, WITH THERMAL MAGNETIC, QUICK-BREAK, QUICK-MAKE, FULL SIZE BREAKERS AND SPARES AS INDICATED ON THE DRAWINGS, EQUIVALENT TO SQUARE D, TYPE NQOD OR NF. COVERS SHALL BE DOOR-IN-DOOR TYPE. FRONTS OF CABINETS SHALL BE SLUSH OR SURFACE MOUNTED AS SHOWN ON DRAWINGS WITH A DIRECTORY CARD NEATLY TYPED OR PRINTED WHICH IDENTIFIES THE LOADS SERVED. EXTERIOR PANELS SHALL HAVE RAIN-TIGHT ENCLOSURES EQUIPPED WITH LOCK.
B. MANUFACTURERS SHALL BE SQUARE D, GENERAL ELECTRIC, CUTLER-HAMMER, SIEMENS.

3.2 TRANSFORMERS

A. FURNISH DRY TYPE, THREE OR SINGLE PHASE TRANSFORMERS OF SIZE AND VOLTAGE INDICATED ON THE DRAWINGS, WITH FOUR (TWO ABOVE AND TWO BELOW) 2-1/2 PROOF ENCLOSURE WITH FRONT WIRING COMPARTMENT AND CONFORMING TO THE APPLICABLE REQUIREMENTS OF ANSI, IEEE AND NEMA STANDARDS.
B. CORE AND COIL ASSEMBLY TO BE VACUUM IMPREGNATED WITH CLASS H INSULATION. TEMPERATURE RISE NOT TO EXCEED 115 DEGREE C.
C. TRANSFORMERS SOUND LEVEL NOT TO EXCEED FOLLOWING VALUES; 0 TO 9 KVA, 36 DB; 10 TO 45 KVA, 42 DAB; 50 TO 100 KVA, 45 DB.
D. BOLT FLOOR MOUNTED TRANSFORMERS TO FLOOR. WHEN WALL MOUNTED, PROVIDE STEEL BRACKET ANGLES AND BOLT TRANSFORMER TO BRACKET. USE NEOPRENE ISOLATION PADS TO ISOLATE VIBRATIONS.
E. ADJUST PRIMARY TAPS TO PROVIDE A SECONDARY VOLTAGE WITHIN + 5% OF NOMINAL VOLTAGE.

3.3 MCC REPLACEMENT BUCKETS

A. MATCH EXISTING MANUFACTURER AND MCC MODEL.

EXECUTION

4.1 CONSTRUCTION

A. PERFORM THE WORK SPECIFIED BY CONTRACT DOCUMENTS IN ACCORDANCE WITH THESE SPECIFICATIONS.
B. COORDINATE THE LOCATION OF ELECTRICAL MATERIAL OR EQUIPMENT WITH THE WORK AND ADJUST CONDUIT LOCATION TO ACCOMMODATE EQUIPMENT IN ACCORDANCE WITH THE ACCEPTED SUBMITTAL DRAWINGS FROM THE MANUFACTURER

4.2 HOUSEKEEPING

A. PROTECT ELECTRICAL EQUIPMENT TEMPORARILY EXPOSED TO WEATHER, DEBRIS, LIQUIDS, OR DAMAGE DURING CONSTRUCTION AS SPECIFIED IN SHIPMENT, PROTECTION, AND STORAGE SECTION. TOUCH UP SCRATCHES ON EQUIPMENT AS SPECIFIED IN COATING SYSTEMS SECTION BEFORE FINAL ACCEPTANCE.
B. WIPE CLEAN AND VACUUM EQUIPMENT ON THE INSIDE PRIOR TO ACCEPTANCE TESTING AND ENERGIZATION AND AGAIN PRIOR TO DETAILED INSPECTION AND ACCEPTANCE OF THE WORK.

4.3 INSTALLATION

A. PERFORM THE INSTALLATION WORK SPECIFIED IN ACCORDANCE WITH THESE SPECIFICATIONS.
1. SPLICES ARE NOT ALLOWED EXCEPT BY PERMISSION. SUBMIT PROPOSED SPLICE LOCATIONS TO THE ENGINEER AND CONSTRUCTION MANAGER FOR REVIEW PRIOR TO INSTALLATION. SPLICES AND TERMINATIONS ARE SUBJECT TO INSPECTION PRIOR TO AND AFTER INSULATING AND MAY REQUIRE RE_TERMINATION AFTER INSPECTION. UNDERGROUND SPLICES WILL NOT BE ALLOWED.
2. LIGHTING AND RECEPTACLE CIRCUITS MAY BE IN THE SAME CONDUIT IN ACCORDANCE WITH DERATING REQUIREMENTS OF THE NEC. LIGHTING AND RECEPTACLE CIRCUITS IN CONDUITS WITH POWER OR CONTROL CONDUCTORS IS PROHIBITED.
3. ADHERE TO THE NEC RACEWAY FILL LIMITATIONS. PROVIDE SEPARATE CONDUITS FOR SIGNAL AND INSTRUMENT CONDUCTORS AND CABLES.
4. INSTALL POWER CONDUCTORS DERIVED FROM UNINTERRUPTIBLE POWER SUPPLY SYSTEMS IN SEPARATE RACEWAYS.
5. PROVIDE TERMINATIONS AT 460-VOLT MOTORS BY BOLT-CONNECTING THE LUGGED CONNECTORS AND INSULATION. ALTERNATELY, PROVIDE TYCO ELECTRONICS GELCOP MOTOR CONNECTION KIT BY RAYCHEM.
6. INSTALL PRE-APPROVED IN-LINE SPLICES AND TEES WITH TUBULAR COMPRESSION CONNECTORS AND INSULATE. SPLICES AND TEES IN UNDERGROUND HANDHOLES OR PULL BOXES SHALL BE INSULATED USING SCOTCH-CAST EPOXY RESIN SPLICING KITS.
7. ADJUST MOTOR CIRCUIT PROTECTORS IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS AND NEC REQUIREMENT.
8. ADJUST MOTOR CIRCUIT OVERLOAD DEVICE IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS AND NEC REQUIREMENTS.

4.4 CONDUCTORS, WIRE, AND CABLE INSTALLATION

A. IDENTIFY CONDUCTORS AT EACH CONNECTION TERMINAL AND AT SPLICE POINTS WITH THE IDENTIFICATION MARKING SYSTEM SPECIFIED.
B. INSTALL WIRE AND CABLE INTO RACEWAYS, CONDUIT, CABLE TRAYS, OR WIREWAYS WITHOUT DAMAGING OR PUTTING UNDUE STRESS ON THE INSULATION OR JACKET. PROVIDE MANUFACTURE'S RECOMMENDED AND UL LISTED PULLING COMPOUNDS LUBRICANTS FOR PULLING WIRE AND CABLE. GREASE IS PROHIBITED.
C. RACEWAY CONSTRUCTION SHALL BE COMPLETE, CLEANED, AND PROTECTED FROM THE WEATHER BEFORE CABLE IS INSTALLED. PROVIDE WIRE OR CABLE SUPPORT WHERE WIRE OR CABLE EXITS A RACEWAY. PROVIDE REUSABLE STAINLESS STEEL KELLUMS GRIPS OR EQUAL PRODUCT WHERE CABLE SUPPORT IS REQUIRED AND WHERE LOADS ARE REMOVABLE.
D. SCRATCH-BRUSH THE CONTACT AREAS AND TINPLATE THE CONNECTION WHERE FLAT BUS BAR CONNECTIONS ARE MADE WITH TINPLATED OR UNPLATED FLAT BUS BAR. PROVIDE NON-OXIDE MATERIAL APPROVED FOR THE FUNCTION. TORQUE BOLTS TO THE BUS MANUFACTURER'S RECOMMENDATIONS.
E. PROVIDE ADDITIONAL PULLBOXES
F. INSTALL WIRE AND CABLE INTO RACEWAYS, CONDUIT, CABLE TRAYS, OR WIREWAYS WITHOUT DAMAGING OR PUTTING UNDUE STRESS ON THE INSULATION OR JACKET. PROVIDE MANUFACTURE'S RECOMMENDED AND UL LISTED PULLING COMPOUNDS LUBRICANTS FOR PULLING WIRE AND CABLE. GREASE IS PROHIBITED.
G. RACEWAY CONSTRUCTION SHALL BE COMPLETE, CLEANED, AND PROTECTED FROM THE WEATHER BEFORE CABLE IS INSTALLED. PROVIDE WIRE OR CABLE SUPPORT WHERE WIRE OR CABLE EXITS A RACEWAY. PROVIDE REUSABLE STAINLESS STEEL KELLUMS GRIPS OR EQUAL PRODUCT WHERE CABLE SUPPORT IS REQUIRED AND WHERE LOADS ARE REMOVABLE.
H. SCRATCH-BRUSH THE CONTACT AREAS AND TINPLATE THE CONNECTION WHERE FLAT BUS BAR CONNECTIONS ARE MADE WITH TINPLATED OR UNPLATED FLAT BUS BAR. PROVIDE NON-OXIDE MATERIAL APPROVED FOR THE FUNCTION. TORQUE BOLTS TO THE BUS MANUFACTURER'S RECOMMENDATIONS.
I. ADHERE TO RACEWAY FILL LIMITATIONS DEFINED BY NEC AND THE FOLLOWING: LIGHTING AND RECEPTACLE CIRCUITS MAY BE IN THE SAME CONDUIT IN ACCORDANCE WITH DE-RATING REQUIREMENTS OF THE NEC. LIGHTING AND RECEPTACLE CIRCUITS SHALL NOT BE IN CONDUITS WITH POWER OR CONTROL CONDUCTORS. SIGNAL CONDUCTORS SHALL BE IN SEPARATE CONDUITS.
J. INSTALL PRE-APPROVED IN-LINE SPLICES AND TEES MADE WITH TUBULAR COMPRESSION CONNECTORS AND INSULATED AS SPECIFIED FOR TERMINATIONS AND FOR MOTOR TERMINATIONS. SPLICES AND TEES IN UNDERGROUND HANDHOLES OR PULL BOXES SHALL BE INSULATED USING SCOTCH-CAST EPOXY RESIN OR EQUAL SPLICING KITS.
K. CONDUCTORS IN ALL HANDHOLES AND MANHOLES SHALL HAVE ADEQUATE SLACK TO BE TIED UP AROUND THE PERIMETER OF THE VAULT AND WILL BE SUSPENDED BY INSULATORS AROUND THE VAULT'S PERIMETER AS NEEDED TO SUPPORT THE CABLE.

4.5 RACEWAY INSTALLATION

A. PROVIDE ADDITIONAL PULLBOXES FOR CONDUIT RUNS WITH GREATER THAN 360 DEGREES IN ANY RUN BETWEEN PULL BOXES. LIMIT MAXIMUM CONDUIT RUNS WITHOUT ADDITIONAL PULLBOXES TO 400 FEET, LESS 100 FEET FOR EVERY 90 DEGREES FOR THE CONDUIT RUN CHANGE IN DIRECTION.
B. DETERMINE CONDUIT ROUTING THAT CONFORMS TO THE INSTALLATION REQUIREMENTS SET FORTH HEREIN AND IN ACCORDANCE WITH THE NEC REQUIREMENTS FOR SIZE AND NUMBER OF PULLBOXES.
1. INSTALL EXPOSED CONDUIT EITHER PARALLEL OR PERPENDICULAR TO STRUCTURAL MEMBERS AND SURFACES
2. ROUTE TWO OR MORE EXPOSED CONDUITS IN THE SAME GENERAL ROUTING PARALLEL WITH SYMMETRICAL BENDS.
3. INSTALL EXPOSED CONDUIT ON SUPPORTS SPACED NOT MORE THAN 10 FEET APART.
4. INSTALL CONDUITS OUT FROM THE WALL USING FRAMING CHANNEL WHERE THREE OR MORE CONDUITS ARE LOCATED IN PARALLEL RUN.
5. INSTALL CONDUITS BETWEEN THE REINFORCING STEEL IN WALLS OR SLABS THAT HAVE REINFORCING IN BOTH FACES. VERIFY INSTALLATION METHOD FOR CONDUITS LARGER THAN 2-INCH WITH CONSTRUCTION MANAGER PRIOR TO INSTALLATION.
6. INSTALL CONDUIT IN SLABS THAT HAVE ONLY A SINGLE LAYER OF REINFORCING STEEL, UNDER THE REINFORCEMENT.
7. INSTALL CONDUITS WITH LARGE RADII UNDER THE SLAB IN A ONE-SACK CONCRETE SLURRY.
8. ROUTE CONDUIT CLEAR OF STRUCTURAL OPENINGS AND SHOWN FUTURE OPENINGS.
9. PROVIDE CONDUIT ROOFS OR WALL PENETRATIONS WITH FLASHING SEALED WATERTIGHT AND FIRE-STOP, AS REQUIRED TO MAINTAIN THE STRUCTURAL RATING.
10. GROUT CONDUIT INTO ANY OPENINGS CUT INTO CONCRETE AND MASONRY STRUCTURES.
11. CAP CONDUITS DURING CONSTRUCTION TO PREVENT ENTRANCE OF DIRT, TRASH, AND WATER.
12. TERMINATE EXPOSED CONDUIT STUBS FOR FUTURE USE WITH PIPE-CAPS AND PROVIDE COUPLINGS AND PIPE-PLUGS WHERE FLUSH WITH THE SLAB.
13. DETERMINE CONCEALED CONDUIT STUB-UP LOCATIONS FROM THE MANUFACTURER'S SHOP DRAWINGS.
14. TERMINATE CONDUIT IN EQUIPMENT WITH CONDUIT COUPLINGS WITH PIPE-PLUGS FLUSH WITH STRUCTURAL SURFACES FOR EMPTY CONDUIT.
15. INSTALL CONDUIT HORIZONTALLY WITH AT LEAST 7-FEET HEADROOM CLEARANCE.
16. TERMINATE CONDUIT WITH FITTINGS THAT ENSURE THAT THE NEMA RATING OF THE ENCLOSURE AND PROVIDE CONDUIT HUBS, AS REQUIRED HERETOFORE.
17. CONNECT UNDERGROUND METALLIC OR NONMETALLIC CONDUIT THAT TURNS OUT OF CONCRETE, MASONRY, OR EARTH TO A 90-DEGREE ELBOW OF PVC-COATED RIGID STEEL CONDUIT BEFORE EMERGENCE. TAPED OR PAINTED RMC-STEEL OR RNC IS PROHIBITED.
18. PROVIDE CONDUIT CROSSING STRUCTURAL JOINTS WITH STRUCTURAL MOVEMENT WITH O-Z "TYPE DX" OR CROUSE-HINDS "TYPE XJG-SA," ALUMINUM, BONDED, WEATHER-TIGHT EXPANSION FITTING OF THE SAME SIZE AND TYPE AS THE CONDUIT.
19. SEAL CONDUITS IN CORROSIVE AREAS USING REMOVABLE MASTIC MATERIAL.

4.6 UNDERGROUND RACEWAY INSTALLATION

A. ADHERE TO THE POWER UTILITY UNDERGROUND SERVICE ENTRANCE REQUIREMENT FOR EXCAVATION, RACEWAYS INSTALLATION AND TERMINATION, PADS AND REINFORCEMENT, BACKFILLING, AND LOCATION CRITERIA. PROVIDE EXCAVATION, BACKFILLING, AND CONCRETE WORK AS SPECIFIED AND SHOWN.
B. ADHERE TO THE POWER UTILITY UNDERGROUND SERVICE ENTRANCE REQUIREMENT FOR EXCAVATION, RACEWAYS INSTALLATION AND TERMINATION, PADS AND REINFORCEMENT, BACKFILLING, AND LOCATION CRITERIA. PROVIDE EXCAVATION, BACKFILLING, AND CONCRETE WORK AS SPECIFIED AND SHOWN.
1. PROVIDE UNDERGROUND CONDUIT INSTALLATIONS THAT CONFORM TO THE FOLLOWING REQUIREMENTS:
2. DIRECT BURY UNDERGROUND CONDUITS THAT ARE NOT SHOWN TO BE INSTALLED IN AN ELECTRICAL DUCTBANK.
3. PVC COATED RMC-STEEL ELBOWS FOR UNDERGROUND TO ABOVE GROUND TRANSITIONS.
4. UNDERGROUND CONDUIT BEND RADIUS: NOT LESS THAN 2 FEET MINIMUM AT VERTICAL RISERS NOR LESS THAN 3 FEET ELSEWHERE FOR UP TO 2-INCH DIAMETER CONDUIT.
5. DETERMINE CONDUIT MANUFACTURER'S BENDING RADIUS REQUIREMENT FOR 3-INCH AND LARGER DIAMETER CONDUIT AND USE FACTORY "LONG RADIUS" ELLS.
6. UNDERGROUND DUCTBANKS AND DIRECT-BURIED CONDUITS: 2-FEET MINIMUM EARTH COVER, EXCEPT WHERE SHOWN OTHERWISE.

4.7 ELECTRICAL EQUIPMENT LABELING - ARC FLASH

A. ELECTRICAL EQUIPMENT SHALL HAVE FIELD MARKED SIGNS AND LABELING TO WARN QUALIFIED PERSONS OF THE POTENTIAL ELECTRIC ARC FLASH HAZARDS PER NEC ARTICLE 110.16 FLASH PROTECTION. THESE LABELS WILL BE PROVIDED BY THE [CONTRACTOR] [OWNER/ENGINEER]

Brown AND Caldwell
Certificate of Authorization No. 2602
6151 Lake Osprey Drive, 3rd Floor
Sarasota, FL 34240

BID SET

Manatee County FLORIDA

NWRF MAINTENANCE BUILDING

REVISIONS

REV	DATE	DESCRIPTION
1	6/1/23	ADDENDUM 1
#	#	#
#	#	#
#	#	#
#	#	#
#	#	#
#	#	
#	#	#
#	#	#

LINE IS 2 INCHES AT FULL SIZE

DESIGNED: S. CREAVALLE
DRAWN: S. CREAVALLE
CHECKED: G. NANA
CHECKED:
APPROVED: A. MODY

FILENAME
E-00-002.DWG
BC PROJECT NUMBER
158118
CLIENT PROJECT NUMBER
6110880

ELECTRICAL

ELECTRICAL SPECIFICATION 1

DRAWING NUMBER
E-00-002

22 SHEET NUMBER OF 24

Geotechnical Engineering Report

North Water Reclamation Facility - Maintenance Storage Building
Manatee County, Florida
January 31, 2023
Terracon Project No. HC225079

Prepared for:
Brown and Caldwell
Tampa, FL 33609Juno Beach, FL

Prepared by:
Terracon Consultants, Inc.
Sarasota, Florida

January 31, 2023

Brown and Caldwell
5405 Cypress Center Drive, Suite 250
Tampa, FL 33609Juno Beach, FL 33408

Attn: Mr. Anand Mody, P.E.
P: (813) 371 9323
E: AMody@brwncald.co

Re: Geotechnical Engineering Report
North Water Reclamation Facility - Maintenance Storage Building
8500 69th Street East
Manatee County, Florida
Terracon Project No. HC225079

Dear Mr. Mody:

We have completed the Geotechnical Engineering services for the above referenced project. This study was performed in general accordance with Terracon Proposal No. PHC225079 dated August 10, 2022. This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning earthwork and the design and construction of foundations for the proposed project.

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

Sincerely,
Terracon Consultants, Inc.

Jude Jean
Field Engineer

James M. Jackson, P.E.
Department Manager
FL License No. 77733

This item has been digitally signed and sealed by James M. Jackson, P.E. on the date adjacent to the seal.
Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

REPORT TOPICS

Note: This report was originally delivered in a web-based format. **Orange Bold** text in the report indicates a referenced section heading. The PDF version also includes hyperlinks which direct the reader to that section and clicking on the ***GeoReport*** logo will bring you back to this page. For more interactive features, please view your project online at client.terracon.com.

ATTACHMENTS

Note: Refer to each individual Attachment for a listing of contents.

Geotechnical Engineering Report

North Water Reclamation Facility - Maintenance Storage Building
8500 69th Street East
Manatee County, Florida

Terracon Project No. HC225079

January 31, 2023

INTRODUCTION

This report presents the results of our subsurface exploration and geotechnical engineering services performed for the proposed maintenance storage building to be located at the North Water Reclamation Facility (NWRF) at 8500 69th Street East in Manatee County, Florida. The purpose of these services is to provide information and geotechnical engineering recommendations relative to:

- Subsurface soil conditions
- Groundwater conditions
- Lateral earth pressure
- Foundation design and construction
- Site preparation and earthwork

The geotechnical engineering Scope of Services for this project included the advancement of two test borings to depths of approximately 25 feet below existing site grades.

Maps showing the site and boring locations are shown in the **Site Location** and **Exploration Plan** sections, respectively. The results of the laboratory testing performed on soil samples obtained from the site during the field exploration are included on the boring logs in the **Exploration Results** section.

SITE CONDITIONS

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

Item	Description
Parcel Information	The project is located at the North Water Reclamation Facility (NWRF) at 8500 69th Street East in Manatee County, Florida. See **Site Location**
Existing Improvements	The planned maintenance building area is currently covered with an unpaved access road and equipment storage area.
Current Ground Cover	The site is covered with bare soils and short grasses.

Item	Description
Existing Topography	The USGS topographic map for Parrish, Florida (1987) indicates the site is at an elevation of about +25 feet-NGVD and suggests that the site, prior to existing development, was pasture-land.
Prior Land Use	Review of aerial photographs (ref. Google Earth) indicate the site has been developed with the existing NWRF from at least 1994 to the present day.
Site Access	We expect the site, and all exploration locations, are accessible with our truck-mounted drilling equipment

PROJECT DESCRIPTION

Our final understanding of the project conditions is as follows:

Item	Description
Information Provided	The following information was provided by Mr. Anand Mody, P.E., via e-mail on August 9, 2022
Project Description	A new maintenance storage building is planned for the site.
Proposed Structures	The project includes a single-story pre-fabricated metal building with a footprint area of about 2,000 square feet.
Building Construction	Pre-fabricated metal building with a structural concrete slab-on-grade floor.
Finished Floor Elevation	Not provided
Maximum Loads	We assume an allowable bearing capacity of 2,000 pounds per square foot (psf) will be required for design. However, we expect the actual slab loading to be 1,000 psf or less
Grading/Slopes	We anticipate fill thicknesses to be minimal (i.e. less than 2 feet).

GEOTECHNICAL CHARACTERIZATION

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

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

Model Layer	Layer Name	General Description
1	**Sand**	Poorly graded sand with silt (SP-SM), loose to medium dense
2	**Silty sand**	Silty sand (SM), medium dense
3	**Clayey Sand**	Clayey sand (SC), with sand-sized phosphate grains, medium dense to dense

Groundwater

Groundwater was found at a depth of about 6 feet bgs while sampling. Groundwater level fluctuations occur due to seasonal variations in the amount of rainfall, runoff and other factors not evident at the time the borings were performed. Therefore, groundwater levels during construction or at other times in the life of the structure may be higher or lower than the levels indicated on the boring logs. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project.

If more accurate groundwater data is desired, we recommend the installation of piezometers that could be monitored over a period of time.

GEOTECHNICAL OVERVIEW

In general, the borings found loose to medium dense poorly graded fine sand with varying amounts of silt from the surface to a depth of about 13 feet bgs followed medium dense to dense clayey sand with sand-sized phosphate grains to the maximum borehole termination depth of 25 feet bgs. These materials are generally suitable for construction of the proposed structure supported on shallow foundations following completion of the recommendations in the **Earthwork** section of this report. The following hyperlinks can be used to quickly navigate to the referenced sections of the report:

- **Shallow Foundations**
- **Floor Slabs**
- **Lateral Earth Pressures**
- **General Comments**

EARTHWORK

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

Site Preparation

Earthwork operations should begin with the stripping of any surficial organic soils (topsoil) from the planned building and pavement areas and demolition of existing structure including their subterranean components. Tree removal should include roots down to finger sized roots and topsoil should be removed from the construction areas. Wet or dry material should either be removed or moisture conditioned and re-compacted. After stripping and grubbing, the exposed surface should be proof-rolled to aid in locating loose or soft areas. Proof-rolling should be performed with a vibratory roller with a minimum static weight of 20,000 pounds. The roller should make a minimum of eight overlapping passes over all areas of the site, the latter four passes at right angles to previous passes. The soils should be compacted sufficiently to obtain a minimum compaction. Unstable soil (pumping) should be removed or moisture conditioned and compacted in place prior to placing fill.

Fill Material Types

Structural Fill should meet the following material property requirements:

Fill Type [1]	USCS Classification	Acceptable Location for Placement
Structural [1]	SP, SP-SM (fines content < 12 percent, maximum particle size < 2 inches, organic content < 2 percent)	All locations and elevations

1. GeoModel Layer 1 soils at this site appear to meet this criterion. Soils with fines content > 12 percent may retain moisture and be difficult to compact and achieve specified density and stability. These soils may need to be maintained dry of optimum to properly compact.

Fill Compaction Requirements

Engineered fill should meet the following compaction requirements:

Item	Description
Fill Lift Thickness	12 inches or less in loose thickness when heavy vibratory compaction equipment is used. Maximum particle size should not exceed 2 inches in a 12-inch lift. 4 to 6 inches in loose thickness when hand-guided equipment (i.e. jumping jack or plate compactor) is used. Maximum particle size should not exceed 1 inch in a 4- to 6-inch lift.
Minimum Compaction Requirements [1]	Fill placed beneath the building footprint should be compacted to at least 95 percent of the maximum dry density as determined by the Modified Proctor Test (ASTM D-1557)
Moisture Content [2]	As needed to achieve compaction.

Item	Description
Minimum Testing Frequency	At least two field density tests per lift

1. The moisture content and compaction should be measured for each lift of engineered fill during placement. Should the results of the in-place density tests indicate the specified moisture or compaction limits have not been met, the area represented by the test should be reworked and retested as required until the specified moisture and compaction requirements are achieved.
2. Specifically, moisture levels should be maintained low enough to allow for satisfactory compaction to be achieved without the fill material pumping.

Utility Trench Backfill

All trench excavations should be made with sufficient working space to permit construction including backfill placement and compaction. Backfill for utility trenches should be compacted to at least 95% of the maximum dry density as determined by the Modified Proctor Test (ASTM D-1557).

Grading and Drainage

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

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

Earthwork Construction Considerations

Shallow excavations, for the proposed structure, are anticipated to be accomplished with conventional construction equipment. The site should be graded to prevent ponding of surface water on the prepared subgrades or in excavations. Water collecting over, or adjacent to, construction areas should be removed. If the subgrade desiccates, saturates, or is disturbed, the affected material should be removed, or the materials should be scarified, moisture conditioned, and re-compacted.

The groundwater table could affect excavation efforts. A temporary dewatering system consisting of sumps with pumps or well points could be necessary to achieve the recommended compaction requirements in excavations.

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

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

Construction Observation and Testing

The earthwork efforts should be monitored under the direction of the Geotechnical Engineer. Monitoring should include documentation of adequate removal of vegetation and topsoil, proof-rolling and mitigation of areas delineated by the proof-roll to require mitigation.

Each lift of compacted fill should be tested, evaluated, and reworked as necessary until approved by the Geotechnical Engineer prior to placement of additional lifts.

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

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

SHALLOW FOUNDATIONS

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

Design Parameters – Compressive Loads

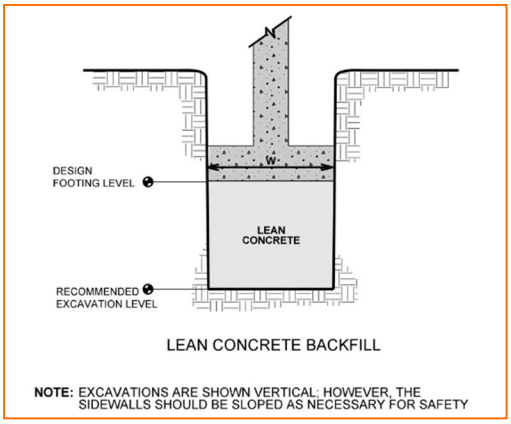
Item	Description
Maximum Net Allowable Bearing pressure [1, 2]	2,000 psf

Item	Description
Required Bearing Stratum [3]	Compacted Structural Fill or approved in-situ soil
Minimum Foundation Dimensions	Columns: 30 inches Continuous: 18 inches
Ultimate Coefficient of Sliding Friction [4]	0.35
Minimum Embedment below Finished Grade [5]	18 inches
Estimated Total Settlement from Structural Loads [2]	1 inch
Estimated Differential Settlement [2, 6]	¾ inch

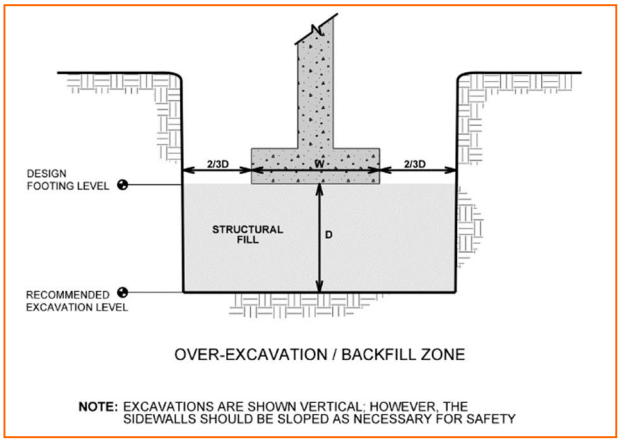
1. The maximum net allowable bearing pressure is the pressure in excess of the minimum surrounding overburden pressure at the footing base elevation. An appropriate factor of safety has been applied. It may be increased by 33% for transient loads, including wind.
2. Values provided are for maximum loads noted in **Project Description**.
3. Unsuitable or soft soils should be over-excavated and replaced per the recommendations presented in the **Earthwork**.
4. Can be used to compute sliding resistance where foundations are placed on suitable soil/materials. Should be neglected for foundations subject to net uplift conditions.
5. Embedment necessary to minimize the effects of seasonal water content variations.
6. Differential settlements are as measured over a span of 30 feet.

Foundation Construction Considerations

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



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



Over- excavation for structural fill placement below footings should be conducted as shown above. The over-excavation should be backfilled up to the footing base elevation with Structural Fill (as previously described) placed as recommended in the **Earthwork** section or FDOT No. 57 that is wrapped on all sides with a filter fabric and tamped.

FLOOR SLABS

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

Floor Slab Design Parameters

Item	Description
Floor Slab Support [1]	Granular material meeting the Structural Fill specifications
Estimated Modulus of Subgrade Reaction [2]	150 pounds per square inch per inch (psi/in) for point loads

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

The use of a vapor retarder should be considered beneath concrete slabs on grade covered with wood, tile, carpet, or other moisture sensitive or impervious coverings, or when the slab will support equipment sensitive to moisture. When conditions warrant the use of a vapor retarder, the slab designer should refer to ACI 302 and/or ACI 360 and the Florida Building Code (FBC) for procedures and cautions regarding the use and placement of a vapor retarder. We note that the FBC requires a minimum 6-mil polyethylene, which is typically used in Florida. However, local requirements that might affect what moisture barrier may be used should also be consulted.

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

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

Floor Slab Construction Considerations

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

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

LATERAL EARTH PRESSURES

Design Parameters

The following table provides recommended lateral earth pressure parameters for the design of below-grade elements to resist lateral forces.

Lateral Earth Pressure Design Parameters					
Soil Unit Weight (pcf) [1]		Friction Angle	Earth Pressure Coefficients [3]		
Unsaturated	Submerged		K_a [1]	K_o	K_p
110	48	30	0.33	0.5	3.0

1. To achieve "Unsaturated" conditions, a permanent drainage system should be installed to prevent development of hydrostatic pressures. "Submerged" conditions are recommended when drainage behind walls is not incorporated into the design.
2. For active earth pressure, wall must rotate about base, with top lateral movements 0.002 H to 0.004 H, where H is wall height. For passive earth pressure, wall must move horizontally to mobilize resistance.
3. No safety factor is included in these values.

Backfill placed against structures should consist of granular soils. For the granular values to be valid, the granular backfill must extend out and up from the base of the wall at an angle of at least 45 and 60 degrees from vertical for the active and passive cases, respectively. Additionally, only walk-behind compacting equipment (weighing less than 1,000 pounds) should be used within 3 feet of the back of the walls.

GENERAL COMMENTS

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

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

Our services and any correspondence or collaboration through this system are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third-party beneficiaries intended. Any third-party access to services or correspondence is solely for information purposes to support the services provided by Terracon to our client. Reliance upon the services and any work product is limited to our client, and is not intended for

third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly impact excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety, and cost estimating including, excavation support, and dewatering requirements/design are the responsibility of others. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing.

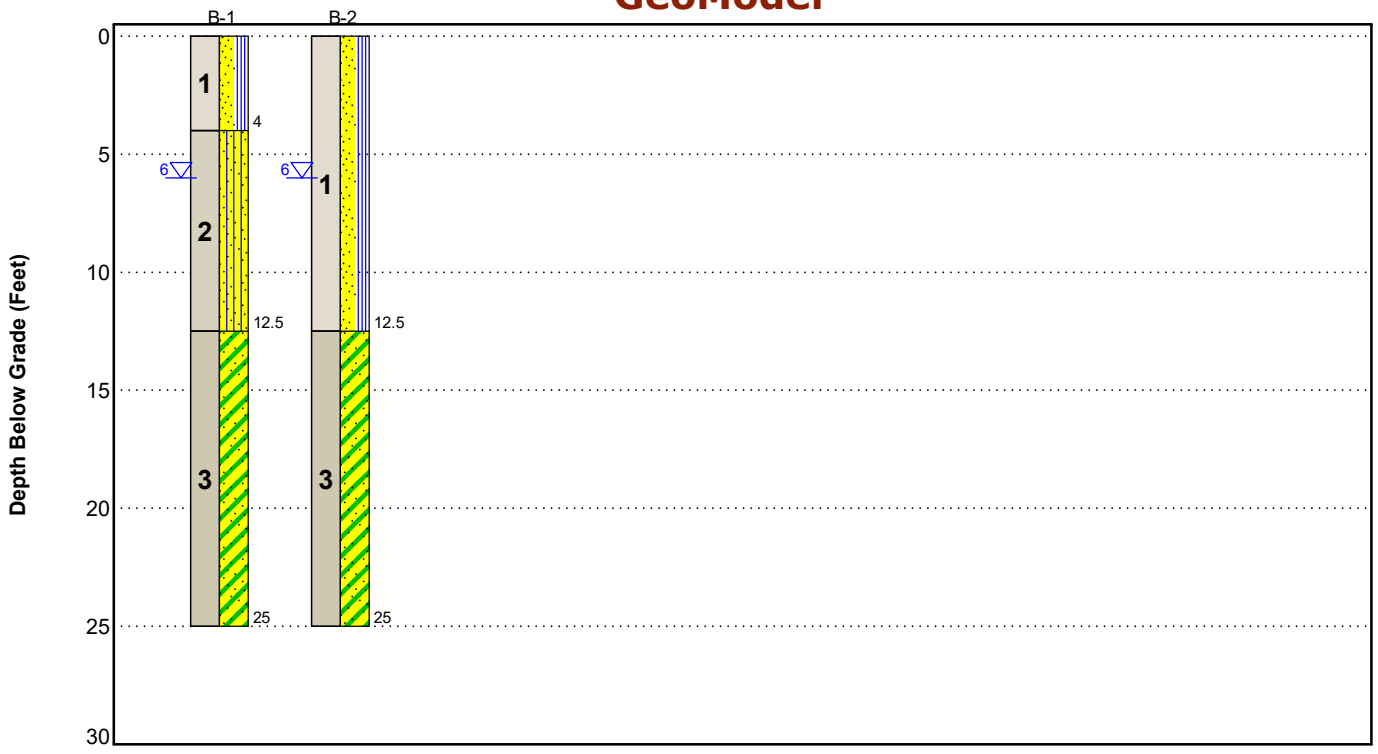
FIGURES

Contents:

NWRF Maintenance Storage Building
8500 69th Street East | Palmetto, FL
Terracon Project No. HC225079

Terracon
8260 Vico Ct, Unit B
Sarasota, FL

GeoModel



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

Model Layer	Layer Name	General Description
1	**Sand**	Poorly graded sand with silt (SP-SM), loose to medium dense
2	**Silty Sand**	Silty sand (SM), medium dense
3	**Clayey Sand**	Clayey sand (SC), with sand-sized phosphate grains, medium dense to dense

LEGEND

Poorly-graded Sand with Silt

Silty Sand

Clayey Sand

▽ First Water Observation

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

NOTES:
Layering shown on this figure has been developed by the geotechnical engineer for purposes of modeling the subsurface conditions as required for the subsequent geotechnical engineering for this project. Numbers adjacent to soil column indicate depth below ground surface.

ATTACHMENTS

EXPLORATION AND TESTING PROCEDURES

Field Exploration

Number of Borings	Boring Depth (feet)	Location
2	25	Planned maintenance building area

Boring Layout and Elevations: Terracon personnel provided the boring layout. Coordinates were obtained with a handheld GPS unit (estimated horizontal accuracy of about ±10 feet). If elevations and a more precise boring layout are desired, we recommend borings be surveyed following completion of fieldwork.

Subsurface Exploration Procedures: We advanced the borings with a track-mounted rotary drill rig using mud rotary procedures. Five samples were obtained in the upper 10 feet of each boring and at intervals of 5 feet thereafter. In the split-barrel sampling procedure, a standard 2-inch outer diameter split-barrel sampling spoon was driven into the ground by a 140-pound rope and cathead operated safety hammer falling a distance of 30 inches. The number of blows required to advance the sampling spoon the last 12 inches of a normal 18-inch penetration or the middle 12 inches of a 24-inch penetration is recorded as the Standard Penetration Test (SPT) resistance value. The SPT resistance values, also referred to as N-values, are indicated on the boring logs at the test depths. A split-barrel sampling spoon was used for sampling. We observed and recorded groundwater levels during drilling. All borings were backfilled with bentonite chips at their completion.

The sampling depths, penetration distances, and other sampling information was recorded on the field boring logs. The samples were placed in appropriate containers and taken to our soil laboratory for testing and classification by a Geotechnical Engineer. Our exploration team prepared field boring logs as part of the drilling operations. These field logs included visual classifications of the materials encountered during drilling and our interpretation of the subsurface conditions between samples. Final boring logs were prepared from the field logs. The final boring logs represent the Geotechnical Engineer's interpretation of the field logs and include modifications based on observations and tests of the samples in our laboratory.

Laboratory Testing

The project engineer reviewed the field data and assigned laboratory tests to understand the engineering properties of the various soil strata, as necessary, for this project. Procedural standards noted below are for reference to methodology in general. In some cases, variations to methods were applied because of local practice or professional judgment. Standards noted below include reference to other, related standards. Such references are not necessarily applicable to describe the specific test performed.

- ASTM D2216 Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
- ASTM D1140-17 Standard Test Method for Amount of Material in Soils Finer than No. 200 (75-µm) Sieve)

Our laboratory testing program also included review of soil samples by an engineer. Based on observation and test data, the engineer classified the soil samples in accordance with the Unified Soil Classification System (ASTM D2487).

SITE LOCATION AND EXPLORATION PLANS

Contents:

SITE LOCATION

North Water Reclamation Facility - Maintenance Storage Building ■ Manatee County, Florida
January 31, 2023 ■ Terracon Project No. HC225079

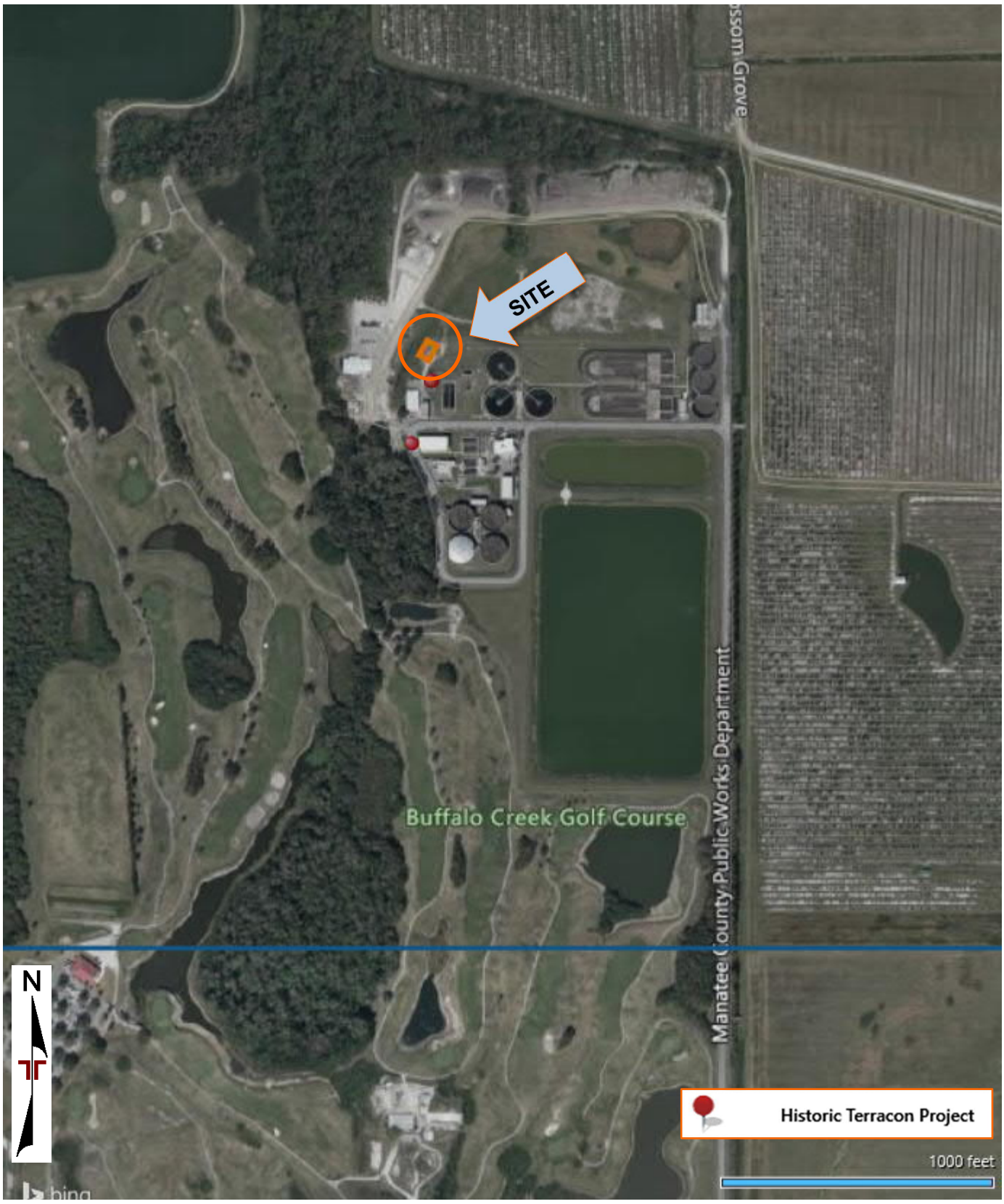


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY MICROSOFT BING MAPS

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

MAP PROVIDED BY MICROSOFT BING MAPS

EXPLORATION RESULTS

Contents:

Boring Logs (B-1 and B-2)

BORING LOG NO. B-1

PROJECT: NWRF Maintenance Storage Building

CLIENT: Brown and Caldwell
Tampa, FL

SITE: 8500 69th Street East
Palmetto, FL

LOCATION See Exploration Plan

Latitude: 27.5849° Longitude: -82.4781°

MODEL LAYER	GRAPHIC LOG	DEPTH		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	PERCENT FINES
1		0	**POORLY GRADED SAND WITH SILT (SP-SM)**, fine grained, brown						
		4.0							
2			**SILTY SAND (SM)**, fine grained, dark brown, loose	5	▽		4-3-4-5 N=7	19.5	13
							6-5-6-6 N=11		
				10			7-6-6-5 N=12	19.5	19
		12.5							
3			**CLAYEY SAND (SC)**, with sand-sized phosphate grains, fine grained, gray, medium dense to dense	15			5-8-9 N=17		
				20			9-11-9 N=20	28.0	23
				25			11-15-21 N=36		
		25.0	***Boring Terminated at 25 Feet***						

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Rope and Cathead

Advancement Method:
Mud rotary
Continuous sampling upper 10 feet
Samples at 5 foot intervals thereafter

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:
Begin mud rotary at 10 feet

Hand-augered upper 4 feet due to close proximity of buried utilities.

WATER LEVEL OBSERVATIONS

▽ *At 6' while sampling*

Terracon
8260 Vico Ct, Unit B
Sarasota, FL

Boring Started: 01-12-2023 | Boring Completed: 01-12-2023

Drill Rig: BR 2500 | Driller: L.W.

Project No.: HC225079

BORING LOG NO. B-2

PROJECT: NWRF Maintenance Storage Building

CLIENT: Brown and Caldwell
Tampa, FL

SITE: 8500 69th Street East
Palmetto, FL

LOCATION See Exploration Plan

Latitude: 27.5848° Longitude: -82.4781°

MODEL LAYER	GRAPHIC LOG	DEPTH	DESCRIPTION	FIELD TEST RESULTS	WATER CONTENT (%)	PERCENT FINES
1		0	**POORLY GRADED SAND WITH SILT (SP-SM)**, fine grained, brown, medium dense			
		5		10-9-8-9 N=17	17.0	10
				6-7-7-9 N=14		
		10		6-6-8-6 N=14	19.9	7
		12.5				
3			**CLAYEY SAND (SC)**, with sand-sized phosphate grains, fine grained, gray, medium dense			
		15		6-7-7 N=14		
		20		6-9-9 N=18		
		25		10-11-18 N=29		
		25.0	***Boring Terminated at 25 Feet***			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Rope and Cathead

Advancement Method:
Mud rotary
Continuous sampling upper 10 feet
Samples at 5 foot intervals thereafter

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:
Begin mud rotary at 10 feet

Hand-augered upper 4 feet due to close proximity of buried utilities.

WATER LEVEL OBSERVATIONS

▽ *At 6' while sampling*

Terracon
8260 Vico Ct, Unit B
Sarasota, FL

Boring Started: 01-12-2023 | Boring Completed: 01-12-2023

Drill Rig: BR 2500 | Driller: L.W.

Project No.: HC225079

SUPPORTING INFORMATION

Contents:

GENERAL NOTES

DESCRIPTION OF SYMBOLS AND ABBREVIATIONS
NWRF Maintenance Storage Building ■ Palmetto, FL
Terracon Project No. HC225079

Terracon GeoReport

SAMPLING	WATER LEVEL	FIELD TESTS
Auger Cuttings Standard Penetration Test	**Water Initially Encountered** **Water Level After a Specified Period of Time** **Water Level After a Specified Period of Time** **Cave In Encountered** Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.	**N** Standard Penetration Test Resistance (Blows/Ft.) **(HP)** Hand Penetrometer **(T)** Torvane **(DCP)** Dynamic Cone Penetrometer **UC** Unconfined Compressive Strength **(PID)** Photo-Ionization Detector **(OVA)** Organic Vapor Analyzer

DESCRIPTIVE SOIL CLASSIFICATION

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

LOCATION AND ELEVATION NOTES

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

STRENGTH TERMS

RELATIVE DENSITY OF COARSE-GRAINED SOILS (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance		CONSISTENCY OF FINE-GRAINED SOILS (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance		
Descriptive Term (Density)	**Standard Penetration or N-Value Blows/Ft.**	**Descriptive Term (Consistency)**	**Unconfined Compressive Strength Qu, (tsf)**	**Standard Penetration or N-Value Blows/Ft.**
Very Loose	0 - 3	Very Soft	less than 0.25	0 - 1
Loose	4 - 9	Soft	0.25 to 0.50	2 - 4
Medium Dense	10 - 29	Medium Stiff	0.50 to 1.00	4 - 8
Dense	30 - 50	Stiff	1.00 to 2.00	8 - 15
Very Dense	> 50	Very Stiff	2.00 to 4.00	15 - 30
		Hard	> 4.00	> 30

RELEVANCE OF SOIL BORING LOG

The soil boring logs contained within this document are intended for application to the project as described in this document. Use of these soil boring logs for any other purpose may not be appropriate.

UNIFIED SOIL CLASSIFICATION SYSTEM

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

[A] Based on the material passing the 3-inch (75-mm) sieve.

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay.

[E] $Cu = D_{60}/D_{10}$ $\quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ≥ 15% sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

[L] If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.

[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[N] PI ≥ 4 and plots on or above "A" line.

[O] PI < 4 or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.